

Final Report

Jamaica Logistics Hub Initiative: Market Analysis and Master Plan



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Acronyms

AAJ	Airports Authority of Jamaica
AMEGA	America's Gateway Development Corporation
ARCOS	Americas Region Caribbean Optical-ring System
ASYCUDA	Automated System for Customs Data
AWP	All-Water Panama
AWS	All-Water Suez
BASA	Bilateral Air Service Agreement
BATCO	Bauxite & Alumina Trading Company of Jamaica
BNDES	Brazilian Development Bank
BPO	Business Process Outsourcing
CAF	Customs Administration Fee
CAPEX	Capital Expenditures
CARICOM	Caribbean Community
CCT	Colon Container Terminal
CEDA	Caymanas Estate Development Area
CHEC	China Harbour Engineering Company
CSEZ	Caymanas Special Economic Zone
DBJ	Development Bank of Jamaica
DPW	Dubai Port World
ECNA	East Coast North America
FCGP	Foundations for Competitiveness and Growth Project
FCP	Freeport Container Port
FTC	Fair Trade Competition
GBPA	Grand Bahamas Port Authority Limited
GCT	General Consumption Tax
GCNA	Gulf Coast North America
GoJ	Government of Jamaica
HFO	Heavy Fuel Oil
HPH	Hutchison Port Holding
HSD	Hamburg Sud
ICT	Information and Communications Technology
IDB	Inter-American Development Bank
IDI	ICT Development Index
IFC	International Finance Corporation
IFIA	Ian Fleming International Airport
ICAO	International Civil Aviation
ISO	International Organization for Standardization
ITU	International Telecommunications Union
JAMPRO	Jamaica Promotions Corporation
JCAA	Jamaica Civil Aviation Authority
JCA	Jamaica Customs Authority
JCC	The Jamaica Chamber of Commerce
JIO	Jamaican Infrastructure Operator

JNSHC	Jamaica North South Highway Company Limited
JPS	Jamaica Public Service Company
JRC	Jamaica Railway Corporation
JSIF	Jamaica Social Investment Fund
KCT	Kingston Container Terminal
KFTL	Kingston Freeport Terminal Limited
KFZ	Kingston Free Zone
KPI	Key performance indicator
KWL	Kingston Wharves Terminal
LAC	Latin America and the Caribbean
LHI	Logistics Hub Initiative
LNG	Liquefied Natural Gas
LPI	Logistics Performances Index
LSCI	Liner Shipping Connectivity Index
MCA	Multi-Criteria Analysis
MGO	Marine Gas Oil
MICAF	Ministry of Industry, Commerce, Agriculture and Fisheries
MIIC	Ministry of Industry, Investment, and Commerce
MIT	Manzanillo International Terminal
MOU	Memorandum of Understand
MRO	Aircraft Maintenance, Repair and Overhaul
MSC	Mediterranean Shipping Company
NEPA	National Environment and Planning Agency
NFE	New Fortress Energy
NMIA	Norman Manley International Airport
NMIAL	NMIA Airports Limited
NROCC	National Road Operating and Constructing Company Limited
NWA	National Works Agency
NWC	National Works Commission
OUR	Office of Utilities Regulation
PAJ	Port Authority of Jamaica
PCC	Cristobal-Panama Ports Company
PIOJ	Planning Institute of Jamaica
PIR	Productive Input Relief
POS	Port of Spain
PPP	Public Private Partnership
PSOJ	The Private Sector Organisation of Jamaica
PSC	Port Community System
PSOJ	The Private Sector Organisation of Jamaica
PSP	Private Sector Partnership
PTC	Promotional Tax Credit
PTP	Pure Transshipment Port
RADA	Rural Agriculture Development Agency
RESAs	Runway End Safety Areas
RoRo	Roll-on roll-off
SARPS	Standards and Recommended Practices
SEZ	Special Economic Zone
SIA	Sangster International Airport

SPRC	Sociedad Portuaria Regional de Cartagena
STEM	Science, Technology, Engineering and Math
STS	Ship-To-Shore
SWOT	Strengths, Weakness, Opportunities, Threats
TEU	Twenty Foot Equivalent Unit
TJH	TransJamaican Highway Limited
TLF	Total Logistics Facility
TNCs	Transnational Corporations
UDC	Urban Development Corporation
VF	Vernamfield
VSA	Vessel Sharing Agreements
WCNA	West Coast North America
WCSA	West Coast South America
WDI	World Bank Development Indicators
WEF	World Economic Forum

Executive Summary

Jamaica, via its Logistics Hub Initiative (LHI), has the opportunity to capitalize on the global phenomenon of continuing industrial fragmentation. To do so, Jamaica intends to position itself as a global logistics hub by capitalizing on its strategic location to serve major trade corridors. With port and airport expansion and complementary logistics facilities already underway, Jamaica has a unique opportunity to leverage the physical and performance dimensions of its assets to attract investments; many industries have much to gain from the expanded transport connectivity and increased access to markets, which large domestic ports and transshipment ports can provide. Market access potential for industries is significant as the vessels plying the trade lanes of the Latin America and Caribbean region serve a consumer market of approximately 800 million people.

Jamaica's role, however, is not assured if location is the only consideration. There are established and emerging rivals in the region that have engaged in developing logistics-like hubs that arguably have similar proximity advantages relative to trade flows. Jamaica must establish its role within the global supply chain, the economic benefits of which ultimately must be tied to firms in both origin and destination countries.

Products destined for Brazil from Europe, for example, must show that the cost advantage for stopping in Jamaica for storage, sorting or processing extends to Brazil. Said another way, when products destined for Brazil are diverted to Jamaica, the cost and quality of packaging, labeling, or additional processing in Jamaica must be more competitive than performing the same functions in Brazil. In this way, Brazil's importers and consumers benefit from value-added activity that is less expensive when taking place in Jamaica, as does the originator of the goods.

Of course, competitiveness is affected by a myriad of factors, including the ease of the regulatory regime permitting value-added activities, timeliness of shipments, the existence of well-performing infrastructure (and the costs associated with using it), the effective integration of infrastructure assets for receiving, processing, and shipping goods, access to freight status information associated with these activities, competitive rates for reliable water and energy supply, transport connectivity, and human capital availability.

At full buildout, the LHI will comprise nearly 3,900 hectares of development across the island, with a total order-of-magnitude investment cost of over US\$28 billion (Table 1). This represents the creation of about 87,400 direct jobs¹. The potential for LHI development is undeniable, but several risks that may impair the its potential that go beyond the gaps addressed later in this report must be mitigated by the Government of Jamaica (GoJ).

With the above in mind, this report presents the results of the LHI Market Analysis and Master Plan Project. It is intended to serve as a reference and guide for Jamaica as it seeks to position itself as a global logistics hub. The project was divided into two distinct, but related parts.

¹ Each new high-tech manufacturing job creates five additional jobs in the service economy.

Table 1: Summary of Required LHI Development Costs by Infrastructure Type

	AREA (hectares)	COST (US\$ million)
Maritime Infrastructure	200	2,728
Aviation Infrastructure	360	1,698
Industrial Infrastructure	3,300	21,933
Utilities Infrastructure	25	519
Road and Rail Infrastructure	-	1,515
	3,885	28,393

The first part, constituting the project's Phase I, consists of a market analysis, which includes development of a vision statement for the Jamaica Logistics Hub Initiative (JLHI); analysis of surface and air cargo flows, market dynamics of regional and international maritime and aviation cargo and an evaluation of the relevant factors necessary to transform Jamaica into a regional transshipment center and global logistics hub; a review of ongoing and pipeline infrastructure projects in Jamaica including an assessment of the adequacy of supporting infrastructure and utilities; an analysis of the competitiveness of Jamaica vis-à-vis other countries competing for regional and global transshipment and logistics business leading to the definition of the JLHI's competitive position and the types of policies, infrastructure, and logistics facilities required in order to be globally competitive; an analysis of those industries that could potentially add the most value and gain the most benefit from the development of a global logistics hub in Jamaica with particular focus on identifying industries that should be targeted for location in the Caymanas Special Economic Zone (CSEZ).

The second part, comprising the project's Phase II, consists of the master plan for land use and specification of the infrastructure improvements necessary for successful LHI implementation considering both demand- and supply-driven development; an analysis of the structural and non-structural needs, or gaps, that must be addressed to achieve the LHI vision along with recommendations for mitigating these gaps; and finally a long-term development strategy and action plan to serve as a guide for relevant stakeholders in Jamaica as they implement the LHI.

The sub-sections below provide both brief overviews of the project's analyses as well as relevant findings related to each of the tasks identified above. They are organized according to the chapters that follow subsequently in this report:

Part I

- I.1 Vision Statement Formulation;
- I.2 Analysis and Forecasts of Cargo Flows;
- I.3 Review and Assessment of Existing and Pipeline Projects;
- I.4 Logistics Hub Competitiveness Benchmarks;
- I.5 Industry Analysis; and

- I.6 Caymanas Special Economic Zone Industry Analysis;

Part II

- II.1 Land Use Master Plan;
- II.2 Gap Analysis; and
- II.3 Development Strategy.

Chapter I.1: Vision Statement Formulation

Chapter I.1 addresses the formulation of a vision statement for the JLHI based on a workshop conducted with a range of both public and private sector stakeholders. Efforts were focused on generating a vision statement that is concise, unique and encompassing the service offerings to be provided by a logistics hub in Jamaica, aspirational yet achievable, and readily understandable by both Jamaican and global audiences. The workshop then elicited views from participants to determine what the LHI vision statement should connote given the participants' understanding both of Jamaica's current position as well as its anticipated future role in global trade and logistics.

The resulting vision statement generated by the workshop's participants – **JAMAICA, THE GLOBAL LOGISTICS GATEWAY INTERCONNECTING THE AMERICAS TO THE WORLD** – recognizes the unique advantages represented by the LHI, consists of sufficient agency to both inspire and sustain the actions that will be required to move from vision to reality, and provides to a diverse array of stakeholders the clear direction necessary to carry forward the vision in a way that is both innovative and creative.

Chapter I.2: Analysis and Forecasts of Cargo Flows

Chapter I.2 assesses both maritime and air cargo trade flows relevant to Jamaica as well as the prospects, including recommendations, for Jamaica to capture said trades. For maritime trade flows, transshipment terminals in the region are reviewed along with global and regional liner and feeder shipping service patterns in order to assess the potential to increase transshipment services in Kingston. Projected cargo volumes are then presented by industry cluster and for transshipment. Here, while estimates are made of the trade volumes that the Port of Kingston can potentially capture, it is important to view forecasts in the context of the overall economic impact tied to production inputs and outputs, which will have broader effect on the Jamaican economy than container handling at Jamaica's port facilities. For air cargo trade flows, the size of the potential air cargo market – global and regional – relevant to the LHI is assessed with a focus on countries where competitor airport facilities are located, air cargo integrators operating in the region, and the existing air cargo market in Jamaica.

Analysis conducted for this project indicates that Jamaica has the potential to process maritime trade flows of over 0.63 million TEUs and 1.01 million TEUs in cluster-related volumes by 2020 and 2035, respectively. Total container volumes could increase substantially with the addition of transshipment traffic, with 1.63 million TEUs and 2.0 million TEUs by 2020 and 2030, respectively. Analysis of air cargo trade flows indicate that 30 percent of projected transshipment air cargo from Latin America and Europe in the industry clusters relevant to the LHI that is currently transiting through Miami International Airport could be diverted by 2036 if the Vernamfield Air Cargo terminal begins its international operations in 2030. While we estimate Vernamfield air cargo terminal construction would begin by 2025, the Airports Authority of Jamaica (AAJ) plans to begin using the Vernamfield runway for small-scale local operations as early as 2018. Accordingly, the volume of

freight handled in Jamaica's air cargo facilities is projected to grow from 16,588 tons in 2016 to approximately 97,902 tons in 2021, 445,579 tons in 2035, and 570,654 in 2040. The air cargo forecasts also considered air cargo and passenger traffic statistics from AAJ and the International Finance Corporation for the period 2003 to 2016 as well as AAJ's most recent reported data for fiscal years 2016-2017 (April 1 – March 31).

An important underlying assumption of these forecasts is that the LHI will be successful in providing the global supply chains and the targeted clusters with competitive logistics services (fast, reliable, predictable and competitively priced), a business environment that supports the successful settlement of light industry and distribution centers (a flexible and empowering Special Economic Zone law and related regulation, improved education focusing on technical skills and technology, and lower cost of energy), and an enhanced trade facilitation approach by its customs agency.

The key is that the cargo reflected in the forecasts is already being served by other countries. In order for Jamaica to attract it, it needs to offer better conditions than the other countries. Related, in terms of infrastructure and transport services, the need for increased connectivity, a reduction in cost and time, and improved reliability and predictability through improved road, air, port, and logistics services are all emphasized in this chapter as critically important to the success of the LHI.

Chapter I.3: Review and Assessment of Existing and Pipeline Projects

Chapter I.3 assesses both Jamaica's existing logistics-related assets as well as initiatives that are currently being developed or underway. To do so, the analysis begins with a review of Jamaica's logistics infrastructure, including assessments of performance of Jamaica's ports and road and rail linkages in order to generate composite logistics scores for each, composed of time, cost, and variability factors. Also reviewed is Jamaica's other logistics assets, including warehousing, IT and telecommunications, and utility infrastructure.

While many of projects in Jamaica are conceptual, meaning no or few studies have been undertaken to assess their merits, there are a number of projects that are in progress, particularly those related to port infrastructure, roads, industrial and logistics parks, and logistics support facilities. Thus, it is clear from the analysis that Jamaica is already in the process of implementing the LHI. That being said, for any public investment, we recommend that the Government of Jamaica obtain and analyze independent market demand studies as well as formal feasibility studies to evaluate respective return on investment.

Based on review of both ongoing and pipeline projects², the analysis identified the following pipeline projects, which are classified as strategic, to be implemented within a five-year horizon and prioritized as follows:

- KCT concession-related improvements;
- KWL dredging, rehabilitation, expansion and equipment investment;
- German Ship Repair Jamaica Ltd dry dock project;
- Construction of Caymanas SEZ facilities;
- PAJ 80-hectare Port-Centric Logistics Park development with private sector;
- Conversion of the railway right of way from CSEZ to KCT to Customs-controlled dedicated truck-way;

² Does not include proposed JISCO Industrial Park and SEZ

- Conversion of the Caribbean Maritime Institute to a Maritime University;
- Provision of logistics services training at the HEART Trust NTA training agency;
- Construction of the KWL Total Logistics Facility;
- JP Cold Storage Facility infrastructure investment;
- NMIA privatization, including modifications to the capital structure; and
- Improvement to the north coast highway (A1; Ocho Rios to Montego Bay);
- North south link of the Highway 2000 Project;
- Investment in the south coast highway including Harbour View to Port Antonio; and
- Expansion of air cargo warehouses and cold storage facilities in Sangster International Airport.

The GoJ's SEZ strategy is leveraging the logistics infrastructure and market access arrangements and is resulting in several industrial clusters being developed, such as:

- JISCO Jamaica Industrial Park (JJIP), an Aluminium Cluster involved in downstream aluminium products processing, limestone products, clean energy industries (solar and wind), agro processing, logistics, LNG and other energy intensive heavy industries;
- Vernamfield Aerotropolis, an Aviation Cluster involving aviation and aviation-reliant industries, agro processing, and other perishables of time sensitive industries;
- Port Esquivel as a petrochemical cluster which a LNG hub, petrochemical industries, and other heavy industries;
- Caymanas Special Economic Zone as a light industry and logistics cluster focused on agro processing, pharmaceutical, assembly, distribution, automotive and logistics industries;
- Greater Kingston as a light industry and logistics cluster focused on agro processing, pharmaceutical, BPO, assembly, distribution, automotive, maritime, ship repair and logistics industries; and
- Other smaller industrial clusters spread across the island.

The supply of electricity to the SEZs will follow the provisions of Jamaica's electricity regime, namely the All Island Electric License and the recently enacted Electricity Act. As such, SEZ operators and occupants will be able to connect to the national grid for the purposes of receiving electricity at a unique and competitive tariff for SEZs and/or generate energy for their own specific use (the new JPS license issued in January 2016 allows net billing and wheeling between related facilities across the grid). The intention is for the electricity company to introduce a strategic "economic development tariff" which will result in SEZ developers, large industrial users or SEZ occupants benefitting from a wholesale electricity rate that is not only affordable, but also regionally competitive.

Jamaica is also introducing natural gas into the country's energy mix, as it is currently overly dependent on heavy fuel oil and diesel for electricity generation. LNG use started in November 2016 at the Bogue plant in Montego Bay. With the success of its Bogue conversion project and two additional projects in development (Old Harbour and Jamalco), Jamaica will benefit from over 400 megawatts of clean and modern natural gas power generation from American company New Fortress Energy LLC, which will invest more than US\$750 million to construct a Liquefied Natural Gas (LNG) terminal in Old Harbour.

JISCO has also proposed the construction of an LNG Terminal at Port Kaiser in St. Elizabeth to supply gas needed for the power plant serving the JISCO ALPART Alumina refinery and a proposed industrial park/SEZ. The supply of electricity to the SEZ will be affected by the JPS All Island License. An

alternative arrangement could be supplying LNG as fuel to individual generators or boilers in the JISCO SEZ.

The proposed LNG production facilities will deliver access to low cost fuel and environmental benefits to customers in the industrial park/ SEZ, transportation and power industries. The proposed LNG terminals will provide an alternative source of energy and cryogenic power for industry. The Port Esquivel facility is expected to generate more than 200,000 metric tons of LNG annually, which will initially be supplied to the domestic market. There are also plans to expand output for delivery to other Caribbean countries, thereby positioning Jamaica as a regional hub for the supply of LNG. New Fortress has indicated that they are willing to install LNG infrastructure in SEZs at their expense.

Chapter I.4: Logistics Hub Competitiveness Benchmarks

Chapter I.4 assesses Jamaica's standing relative to eight other countries in the region on the basis of 38 indicators that are categorized in four pillars, including infrastructure, business environment, human capital, and technology. Relying on a competitiveness benchmarking model prepared specifically for this project, the analysis indicates that Jamaica's competitive position is in the lower quarter of relative competitiveness. However, given ongoing logistics asset development in the country, particularly related to port expansion and warehousing development, it is highly likely that Jamaica will become more competitive in terms of provision of logistics-related services. As is demonstrated through the model's application, Jamaica can advance above the 75th percentile in the competitiveness rankings assuming improvements in infrastructure and technology categories.

Two critical areas in which Jamaica can advance its infrastructure ranking are by improving maritime and air connectivity as well as the logistics chain. Maritime liner connectivity will likely improve in the short term with the concession of Kingston Container Terminal (KCT) if CMA-CGM decides to change its deployment practices and combines its feeder services with main liner services in Kingston. Air connectivity levels for Jamaica are currently low when compared with regional competitors, but opportunities exist to improve connectivity given recent developments with Jamaica's bilateral air agreements.

That being said, to become a global logistics hub, Jamaica must rapidly improve all components of its logistics chain. While Jamaica will likely improve, its score in the Logistics Performance Index (LPI) 2018 report due in part to the port and warehousing improvements discussed above, related factors must also be improved. For instance, modern, efficient, and cost-effective customs is a prerequisite for global competitiveness. Further, it is also important to note that all of the competitor countries in the region are investing in modernizing and expanding port and airport capacity and have designated free trade zones. As a result, Jamaica must balance investment in making its own logistics infrastructure and networks more efficient and modernized, while not contributing to overcapacity that diminishes the return on its investment, especially when considering developments in the region.

Chapter I.5: Industry Analysis

Chapter I.5 identifies industry sectors and sub-sectors that offer the greatest potential to expand or locate to Jamaica. Through analysis of Jamaica's investment trends and requirements (bearing in mind the growth potential identified through the trade flow analysis and demand forecasts), survey results from local and international investors, and SWOT and multi-criteria analyses, industry sectors and sub-sectors along with industry clusters are recommended for prioritization by the LHI. Related, recommendations are made on how best to improve logistics hub competitiveness in Jamaica with a

focus on addressing institutional and regulatory improvements, industrial development, and promotion strategies that are in line with the LHI vision.

The commodities that may be of most interest to investors located in the JLHI are those with the highest trade flow volumes and values identified through this analysis (e.g., electric, water, space, and soil heaters; TV receivers; parts and accessory for motor vehicles) as well as intermediate products that may be imported to Jamaica for value-added activities (e.g., assembly of automobiles and motorcycles) and subsequently exported to the US and Latin American markets as finished products. Key industries that are most suited to take advantage of Jamaica's strategic position and capitalize on its comparative advantages include³:

Agro Processing Industry

Food processing involves the transformation of agricultural produce into a different physical or chemical state. It encompasses technical and mechanical processes that range from packaging to the transformation of raw material into final products. A key characteristic of agro-processing is its strong up- and downstream linkages. Upstream, the sector links to primary agriculture across a variety of farming models and products. Downstream, agro-processing outputs are both intermediate products to which further value is added and final goods that are marketed through wholesale and retail chains as well as through a diverse array of restaurants, bars, hotels and fast-food franchises, making it critical for employment creation and poverty alleviation.

Pharmaceutical Industry

The pharmaceutical industry discovers, develops, produces, and markets drugs or pharmaceutical drugs for use as medications. Pharmaceutical companies may deal in generic or brand medications and nutraceuticals.

Parts and Accessories for Motor Vehicles

The automotive aftermarket is the secondary market of the automotive industry, concerned with the manufacturing, remanufacturing, distribution, retailing, and installation of all vehicle parts, chemicals, equipment, and accessories, after the sale of the automobile by the original equipment manufacturer (OEM) to the consumer.

Electrical Products

Products include electrical motors, commercial and industrial lighting fixtures, heating, ventilation, and air conditioning systems and components and, among others, electrical power equipment.

Medical Devices

The medical equipment and device manufacturing industry (often referred to as the MedTech or medical devices industry) designs and manufactures a wide range of medical products that diagnose, monitor, and treat diseases and conditions that affect humans. These

³ Industries are displayed in terms used in Harmonized System (HS) Codes. As described by the United Nations International Trade Statistics Knowledge Base, HS is an international nomenclature for the classification of products. It allows participating countries to classify traded goods on a common basis for customs purposes.

products range from inexpensive tools, such as tongue depressors, to complex, multimillion-dollar systems, such as magnetic resonance imaging systems. Other examples include pacemakers, stethoscopes, replacement joints, hip implants, miniature robots that perform complex surgeries, synthetic skin, artificial hearts, scalpels, medical laboratory diagnostic instruments and test kits, patient management software, and software that is used as a component in a medical device.

Refrigerators, Freezers and Other Home Appliances

Home appliances are electrical/mechanical machines, which accomplish some household functions, such as cooling/heating, cooking or cleaning. Home appliances can be classified into:

- Major appliances, or white goods
- Small appliances,
- Consumer electronics

ICT and BPO

BPO is a subset of outsourcing that involves the contracting of the operations and responsibilities of a specific business process to a third-party service provider. Originally, this was associated with manufacturing firms, such as Coca-Cola that outsourced large segments of its supply chain. BPO is typically categorized into back office outsourcing, which includes internal business functions such as human resources or finance and accounting, and front office outsourcing, which includes customer-related services such as contact center services.

Logistics and Distribution

Logistics is the management of the flow of things between the point of origin and the point of consumption in order to meet requirements of customers or corporations. The resources managed in logistics can include physical items such as food, materials, animals, equipment, and liquids; as well as abstract items, such as time and information. The logistics of physical items usually involves the integration of information flow, material handling, production, packaging, inventory, transportation, warehousing, and often security.

Aluminum Industry

Aluminum is the essential element for products in the following sectors:

- Aerospace
- Aluminum Cans
- Automotive
- Building & Construction
- Electrical
- Electronics & Appliances
- Foil & Packaging
- Other Markets - As aluminum enters into its second century of widespread use, new scientific and production technologies continue to expand its market potential. Solar panel nanotechnology, transparent aluminum alloys and aluminum-air batteries will help lead the way toward the development of new and innovative markets this century.

The analysis finally identified three primary industry clusters – light manufacturing, business process outsourcing, and transportation and logistics – which should be prioritized when assigning space for industrial development in the LHI.

Chapter I.6: Caymanas Special Economic Zone Industry Analysis

Chapter I.6 assesses the market outlook for the CSEZ, relying on the demand forecasts conducted as part of the trade flow analysis along with the industry analysis discussed above. Structured as a pre-feasibility assessment designed to be complementary to the ongoing CSEZ feasibility study, the project’s analysis of the CSEZ first compared the results of the industry analysis with the sectors and clusters identified in other recent projects and studies from other sources, including the World Bank, MIIC, and UDC, all of which recommended light (clean) manufacturing as a potential industry to locate to the CSEZ. Biomedical equipment, transportation, and logistics, the latter of which is needed to support the other biomedical equipment and light manufacturing industries, were also considered as possible industries to relocate to the zone. Base and high cargo forecast scenarios within the 2035 planning horizon were then prepared for the CSEZ in order to estimate land area requirements.

While developing port-centric facilities is currently being prioritized given that new operators’ logistics and industrial facilities will naturally seek locations closest to port, outside locations for development of logistics and manufacturing zones, such as the CSEZ, also represent an important component of the LHI. With sufficient infrastructure investment and access to a competitively priced labor market, it is estimated that the CSEZ could capture up to five percent of cargo flows by 2035 in the base case and up to 11 percent of cargo flows by 2035 in the high case for the aforementioned industries. The development of an SEZ at Caymanas would satisfy requirements for both demand scenarios, providing the space needed (which is 32 hectares for the base case and up to 64 hectares for the high case, respectively, by 2035) to meet projected demand and a location near population centers from which labor could be sourced.

Development of the CSEZ thus represents the following value proposition and potential to be: a modern and sustainable port-centric facility at the heart of the Global Logistics Hub, with benefits including up to 524 hectares of greenfield land for industrial and other development, direct access to Kingston Container Terminal, modern, state of the art, and environmentally-friendly facilities suitable for light manufacturing and logistics industries, access to skilled and scalable labor, and state of the art residential, commercial, and recreational facilities.

Chapter II.1: Land Use Master Plan

Chapter II.1 details the proposed master plan for land use and infrastructure improvements for the LHI, considering requirements for both demand- and supply-driven development. Demand-driven requirements over a 20-year planning horizon are based on the demand forecasts generated as part of the project. Supply-driven development accounts for the cluster effects that can be generated by industrial development and rival firm location decisions spurred by “first mover” firms’ decisions to relocate to or expand in a new market.

While the land use detailed in the master plan is driven by market demand, it is assumed that as demand-driven development occurs (in fact, it is already underway in Jamaica), supply-driven projects will ramp up. In fact, although the traffic volumes associated with the pipeline projects identified in Part I were forecast to 2035, supply-driven development will initiate well before that time horizon. Thus, the planning concepts highlighted in detail in the master plan are contingency-based, with facilities recommended to accommodate projected demand, but with sufficient flexibility

so as to allow planners to respond to changing conditions as industry reacts to development in Jamaica.

The master plan then identifies locations for port and airport operations and facilities upgrades, logistics, industrial, institutional, and residential land uses as well as primary and secondary roadway networks, and railroad improvements.

The projects included within the master plan are presented in a LHI facilities connectivity map (Figure 1) which details the full build-out of all LHI projects that are planned along with phased layouts for all four phases of supply-driven development, subarea maps for LHI, concept plans for the Caymanas Estate Development Area and Vernamfield Airport City, and the phased land use Master Plan concept layouts for each.

For all key LHI projects identified in Chapter I.3., the four phases of supply-driven development estimate a 35% buildout in the first 10 years, 65% in the first 20 years, 85% in the first 25 years, and 100% in the first 30 years.

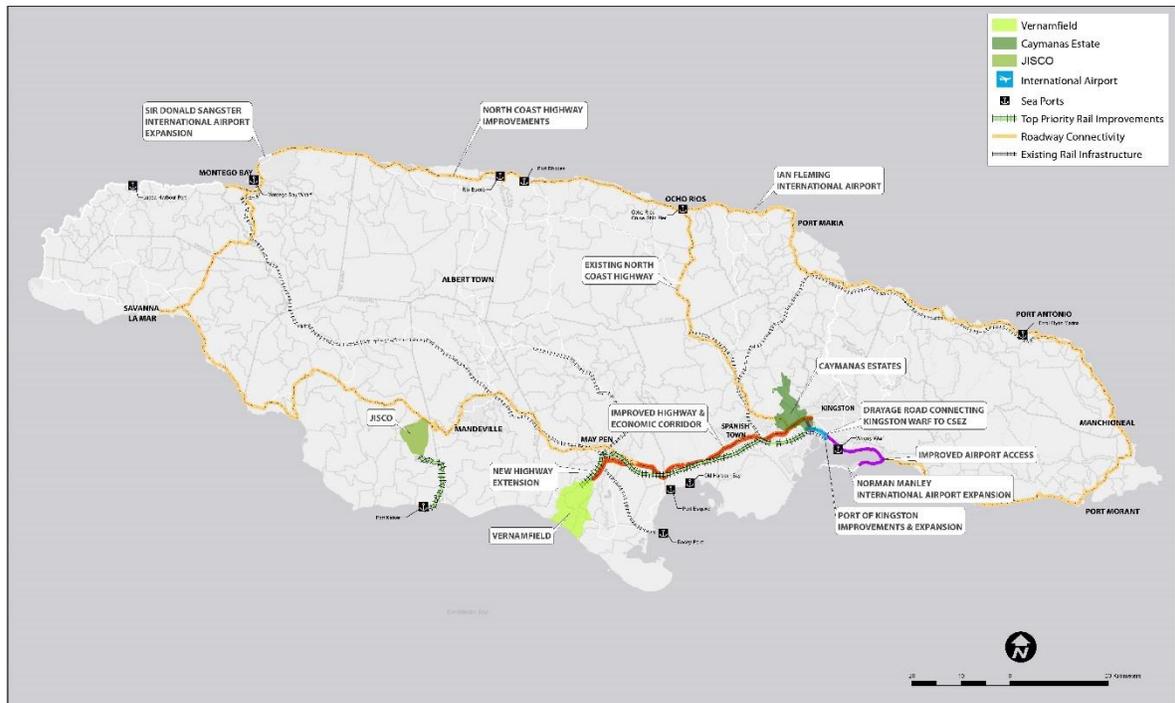
Once complete, Jamaica's LHI will offer strategic access and proximity to global markets, a skilled and scalable workforce, and Special Economic Zones (SEZ) to support industry clusters. The proposed transportation and logistics infrastructure as well as the proposed Caymanas and Vernamfield concept plans included within the master plan support the LHI's value proposition to offer an internationally competitive environment to connect businesses to world markets.

Chapter II.2: Gap Analysis

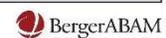
Considered an extension of the land use master planning exercise, Chapter II.2 identifies the structural and non-structural requirements that must be addressed in order to successfully implement the LHI. Structural and non-structural gaps were identified according to the following categories:

- Existing Ordinances and Planning Controls
- Legal, Policy, and Regulatory
- Maritime Infrastructure
- Aviation Infrastructure
- Industrial Infrastructure
- Utilities Infrastructure
- Road and Rail Infrastructure
- Education and Skills Preparation

Figure 1-1: Map of Critical Jamaica Logistics Hub facilities



JAMAICA LOGISTICS HUB FACILITIES CONNECTIVITY MAP



For each category, existing shortcomings are then addressed and mitigation strategies recommended. For structural gaps, land requirements are identified and order-of-magnitude cost estimates for development in accord with the noted land use master plan are provided.

Addressing the identified gaps offers transformative potential not only for the LHI, but for the Jamaican economy as well. Approximately 87,400 direct jobs will be created by the LHI at full build out. Each new high-tech manufacturing job creates five additional jobs in the service economy or 437,000 opportunities for employment. As the Jamaican economy shifts towards new industries attracted by LHI-induced opportunities, potential LHI workers will be equipped with skills and competencies through targeted training and certification to match respective job and career requirements.

Chapter II.3: Development Strategy

Chapter II.3 outlines the development strategy that Jamaica must pursue in order to achieve the LHI vision and fulfill the country's role in growing its economy and contributing to fiscal stability. The chapter then sets forth a strategy consisting of seven strategic enablers and associated goals and actions. The strategic enablers include:

1. Improving institutional effectiveness;
2. Ensuring supportive policies and legislative and regulatory frameworks;
3. Enhancing workforce capacity;
4. Developing efficient and productive infrastructure;
5. Providing efficient transport logistics systems;
6. Facilitating sustainable financing; and

7. Promoting the LHI.

The seven enablers as a whole constitute 65 strategies and 105 actions. Each enabler's goal, the strategies to be executed for each, and strategy rationale are provided. A detailed action plan identifying the specific implementing actions, parties responsible, timelines, and performance measures is also provided in order to ensure that Jamaica has a practical framework and guide from which to measure progress towards implementation of the LHI.

A 20-year planning horizon is provided for each of the seven enablers, with focused attention on the first five years and several strategies extending well beyond the initial five years. Where only one year for implementation is indicated, strategies are to commence and be completed in one year. While most actions are executed during the first five years, there are several that occur on a recurring basis and hence are also indicated for years 6-20. The development strategy reflects a strong focus on the first five years of implementation given the uncertainty of longer periods. Strategies in the charts are color-coded to reflect their degree of priority, with red being the mission critical top priority, green indicating mission critical high priority, and gray indicating mission critical lower priority.

The development strategy is put into effect through the aforementioned implementing actions. Some action responsibilities are assigned to a variety of stakeholders, reflecting the collaboration needed for strategy achievement. A set of metrics designed primarily to ensure strategies are achieved are also included for each enabler, which also provides the basis for evaluating course correction, as needed. Ultimately, the promise of this development strategy is that it focuses on providing logistics services and assets while aligning and strengthening finances, people, systems, policies, processes and administration. Strategy success also relies on an organizational culture committed to collaboration and innovation in all its activities. Through commitment to the development strategy, Jamaica will realize its highest potential as a global logistics hub for Jamaica and beyond.

Results and Looking Forward

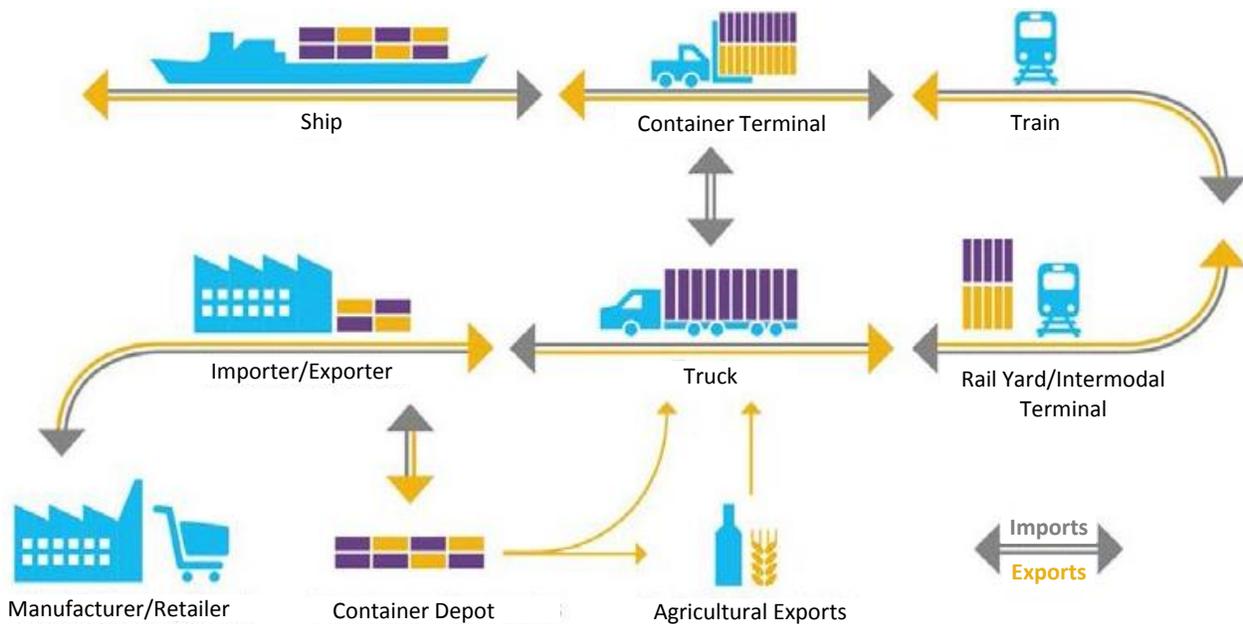
Key to Jamaica's success is the provision of efficient and reliable logistics services, which in turn will serve as the backbone for industrial development. Jamaica can expect an increase in connectivity by virtue of capturing additional transshipment activity. The continuing trend of production fragmentation, combined with Jamaica's strategic location and improved connectivity, bode well for Jamaica's outlook in its global logistics hub pursuits, though success cannot be fully realized without significant effort towards improving performance relative to the noted four pillars.

Part I.1 Vision Statement Formulation

Logistics can be defined as the integration of information and assets to allow for the efficient movement, processing, and storage of goods. There are, of course, variations of logistics definitions, but they all point to the same theme – getting the correct order to the customer at the right price to the right place and time. This involves the use of people, finance, information, transport carriers, and infrastructure assets, which in the “old” days of the 1960s and 1970s were considered separate and distinct. But beginning in the 1980s, firms realized there were benefits to integration of these logistics components and, more importantly, collaboration among producers, logistics intermediaries (e.g., freight forwarders), transportation service providers (e.g., ships, trucks, and airplanes), and infrastructure asset operators (e.g., marine terminals and airports). In addition, firms began to think they could exercise greater control over costs if they could bring upstream and downstream activities into the supply chain management fold in an effort to reduce costs and speed up product delivery. Supply chain management today involves procurement, production, inventory, and product delivery. So, logistics, which focuses on the delivery of goods, is now subsumed into supply chain activity.

Figure I.1-1 provides an overview of the way in which supply chains operate. It focuses on shipping container movements between the point of production and destination, which includes ports and distribution centers for retail and manufactured goods. The customer is also central to the evolution of different supply chains. In the grain supply chain, for instance, customers’ varying needs result in a number of different individual movement types. Domestic feed grain customers generally require smaller, more flexible and direct deliveries by road, whereas larger domestic and export customers make extensive use of rail through one or more consolidation points.

Figure I.1-1: Container Supply Chain

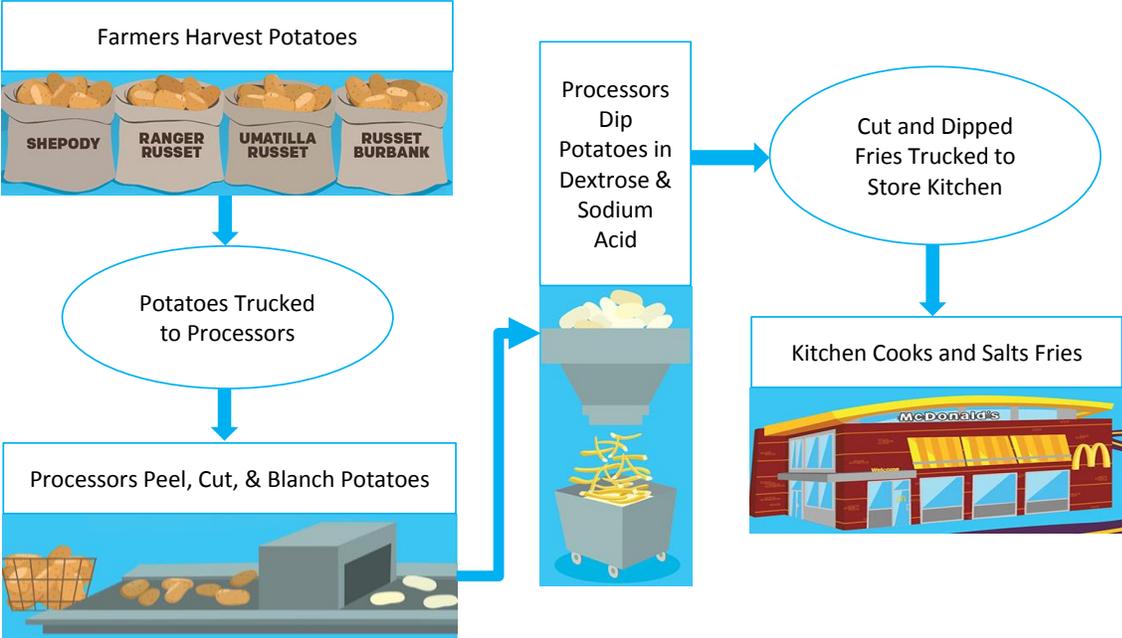


Source: Nathan Associates

and getting them distributed to retailers and consumers. Of course, a parallel requirement is to have the inputs received or goods delivered as scheduled; the consequences of not doing so means missing the production schedule and hence a shipment delay to the customer, or delaying the introduction of seasonal wares or fashions in department stores. Sticking to schedules, or “lead times”, has an effect on the bottom line if schedules are not met or lead times not reduced. As companies have come to optimize their production, business “thinkers”, among them Michael Porter, have pressed companies to focus on supply chains, arguing that supply chains today have become value chains. Some companies have gone further by creating their supply chains to enable distributed manufacturing; as a basic product moves through the supply chain, companies have added increasing value to them along the way as the good approaches its final destination.

Interestingly, the supply chain for McDonald’s French fries illustrates this principle of adding value en-route to the customer. As Figure I.1-2 shows, potatoes are harvested by farmers and sold to processors, who peel, cut, and blanch the potatoes. In so doing, value is added to the potatoes before the next step in the supply chain. Processors then dip the fries in dextrose and sodium acid for their golden color and prevent them from turning gray, further adding value to the product. The fries are then shipped to the McDonald’s store kitchen where they are cooked and salted (value added again) before being sold to the customer. So, as in the McDonald’s case, the customer is central to the evolution of different supply chains.

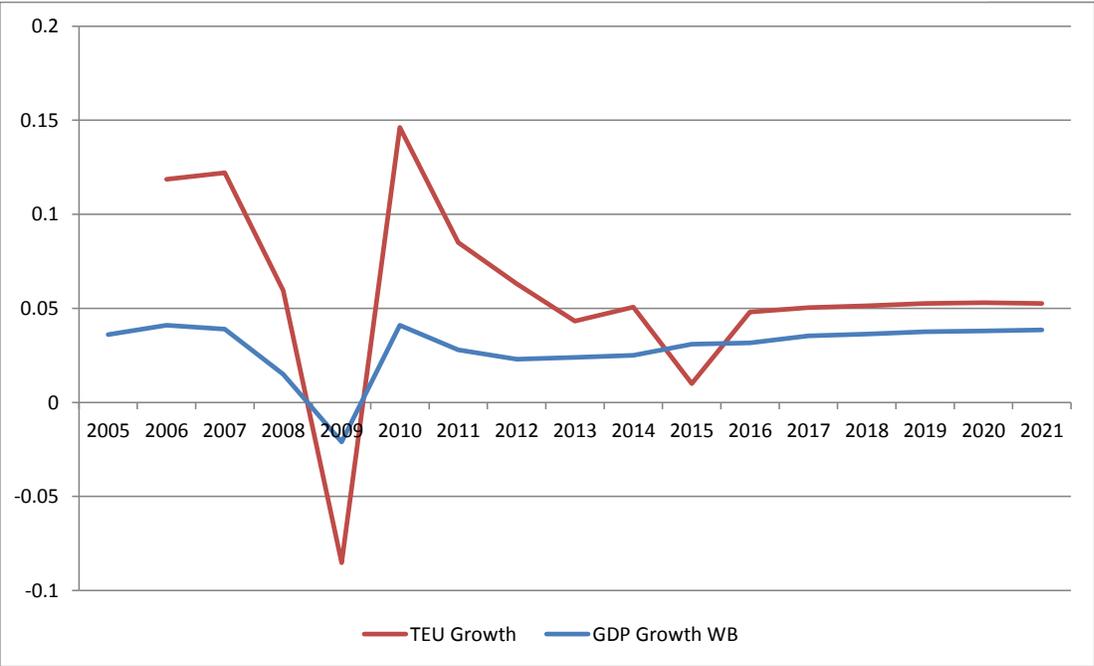
Figure I.1-2: Supply Chain for McDonald's French Fries



Source: Nathan Associates and McDonald’s Corporation

Jamaica is undertaking a concerted effort to establish itself as a global logistics hub, but it is doing so during a declining growth rate in global container trade volumes. Indeed, as Figure I.1-3 shows, we project a diminishing gap between GDP and container growth in the coming years, suggesting that global trade is reaching a pinnacle due to the waning effects of older trade agreements. This may portend a new norm in the long-term for global trade where container growth falls below GDP growth. In response, in a continuing age of excess fleet capacity, carriers are seeking more than ever ways to rationalize their calls while being responsive to customer preferences for high service frequency and low costs. Supply chain managers are undergoing a similar process for cutting transport logistics costs. Hence, to increase its relevancy in the global logistics context in the face of declining trade growth (relative to GDP), Jamaica must present a compelling argument as to why producers gain value by incorporating Jamaica into their supply chains – that is, there is comparative advantage for companies to integrate Jamaica into their supply chains.

Figure I.1-3: Global Trade and GDP Growth



Source: GDP Growth from International Monetary Fund, available at www.imf.org/external/pubs/ft/weo/2016/01/weodata/weorept.aspx?sy=2014&ey=2021&scsm=1&ssd=1&sort=country&ds=.&br=1&c=001&s=NGDP_RPCH&grp=1&a=1&pr1.x=34&pr1.y=6; TEU data available from World Bank Container Port Traffic, available at www.data.worldbank.org/indicator/IS.SHP.GOOD.TU; TEU projections prepared by Nathan Associates based on decreasing gap between GDP and TEU growth.

Successful integration relies in part on the direction established by a vision statement. In a classic business book, Bennis and Nanus⁴, based on interviews with ninety organizational leaders as different as Lever Brothers, a major metropolitan newspaper, a major symphony orchestra, a championship basketball team, and so on, concluded that a common characteristic among these

⁴ Bennis, W. G., and B. Nanus, *Leaders: The Strategies for Taking Charge*. New York: Harper & Row, 1985.

leaders was having a vision that focused the attention of members of the organization and shaped the organization’s development in unique, successful ways. The vision that these leaders were able to share with their members enabled those members to believe that extraordinary feats were possible and that through these feats a uniquely successful organization would emerge. And so, in the sections that follow, we describe the process that ultimately led to the formulation of the LHI vision statement.

II.3-1 Setting a Vision

A workshop was conducted early during the project’s Part I to prepare a vision statement. A range of stakeholders, both private and public, participated in the workshop designed to elicit views on what the vision statement should reflect given global events and Jamaica’s foreseen role and position in the world’s global trading system. As mentioned to the group, vision statements are intended to engender pride and purpose – a sense of uniqueness that instills an esprit du corp and a level of motivation that would allow Jamaica to function at a higher level than was previously thought possible. Further, the vision should be positive and inspiring to provide the clear sense that striving for the vision is worth the effort. As we know from experience, the acceptance of the final vision almost invariably leads to success.

In conducting the exercise, participants were presented with sample statements from other global logistics hubs as well as an indication of what activities are conducted in the hubs. Hub examples were selected for their range of activities, the number of years since their establishment, and for the vision statement merits or shortcomings. Table I.1-1 provides vision statements and hub characteristics presented to workshop participants.

Table I.1-1: Sample Hub Vision Statements and Characteristics

Hub	Vision Statement	Activities
Aqaba Special Economic Zone (Jordan)	<i>The Aqaba Special Economic Zone is a world class business hub and leisure destination on the Red Sea, acts as a development driving force for Jordan that improves the quality of life and prosperity for the community through sustainable development.</i>	<ul style="list-style-type: none"> • Industrial chemicals • Ports and logistics • Tourism destination • Hotels and marinas
Dubai Airport Free Zone	<i>Dubai Airport Freezone's steadfast motivation and ambition is to be a premier provider of business services for demanding international customers – the region's ultimate free zone destination.</i>	<ul style="list-style-type: none"> • Electronic and electrical supplies • IT and telecommunications • Pharmaceutical goods • Cosmetics • Engineering and building materials • Aerospace and aviation • Freight logistics • Food and beverage production • Jewelry and precious stones
Duqm (Oman) Special Economic Zone	<i>The Special Economic Zone at Duqm is a regional hub for maritime transportation and</i>	<ul style="list-style-type: none"> • Port, airport, and shipyard • Fishing harbor

Hub	Vision Statement	Activities
	<i>logistics services; a safe haven for investments in export processing industries based on petrochemicals, mineral resources and fisheries; and an attractive tourism destination on the Arabian Sea; thus acting as an important lever for the economic growth of Oman and the enhancement of the quality of life of the local communities of Al Wusta Governorate.</i>	<ul style="list-style-type: none"> Hotels and resorts New town Refining and petrochemicals Power and water generation/distribution
PHIVIDEC Industrial Estate – Economic Zone (Philippines)	<i>By 2024, a progressive and ecologically sustainable industrial community that contributes to the socio-economic development of the country and promotes the welfare and well-being of veterans and retirees of the Armed Forces of the Philippines.</i>	<ul style="list-style-type: none"> Steel manufacturing Food production Container terminal Hotels/housing IT Park
Suez Canal Special Economic Zone	<i>To become a premier international investment destination by creating a superior business environment for attracting investments to Egypt while ensuring maximum benefits to the local community that upgrades the quality of life over the coming 15 years.</i>	<ul style="list-style-type: none"> Container and bulk terminals ICT Renewable energy Pharmaceuticals Food processing Automotive assembly Electronics Textiles Petrochemicals.

Source: Websites for each of the logistics hubs.

Workshop participants were also provided guidelines for vision statement formulation. The workshop’s formulation exercise had to conform to the characteristics binding a vision statement, including that the vision statement should be 1) concise, 2) specific to the business constituting a unique outcome that only Jamaica could provide, 3) aspirational, but achievable, and 4) simply stated so that people both inside and outside Jamaica can understand it. Participants then convened in breakout groups during which, with varying backgrounds of group members, they were expected to formulate their own vision statements. Participants then reconvened in an open session where draft vision statements were presented by each group and the objectives and merits for each were discussed. It was during the open session where, through an iterative process, a consensus-built vision statement was formulated:

Jamaica, the global logistics gateway interconnecting the Americas to the world.

The vision statement clearly meets the characteristics set forth to the participants and elucidates the end state sought for the LHI. The vision statement also sets itself apart from the vision statement examples presented here, a uniqueness sought by workshop participants. Especially cognizant of Jamaica's locational advantage, participants expect that Jamaica will play a "connecting" role for merchandise between origins and destinations.

II.3-2 Conclusion

Recognizing its unique advantages, the vision statement generated by workshop participants is clear and powerful enough to arouse and sustain the actions necessary for that vision to become a reality. The vision statement sets the needed direction, allowing stakeholders to carry forward a unified approach to realize the vision while considering how things can be different from what they currently are, how things could be truly better, how to be innovative, and how to apply creativity for achieving the vision: *Jamaica, the global logistics gateway interconnecting the Americas to the world.*

These considerations are in fact reflected in the analyses that follow, exploring the opportunities denoted by relevant trade flows, identifying conditions constraining competitiveness, examining planned projects and implications for the LHI, and defining the economic clusters relevant to the LHI as well as the Caymanas special economic zone.

Part I.2 Analysis and Forecast of Cargo Flows

As earlier suggested with the Jamaica Logistics Hub Initiative (JLHI) vision statement, Jamaica aims to become a player in the global logistics arena. An efficient and effective logistics network is the cornerstone of economic productivity and growth. However, efficiency and effectiveness are not only associated with Jamaica's boundaries. Jamaica's role in international logistics networks will be governed by its contributions to logistics chain performance. Hence, if conditions warrant a freight layover, either for value added activity associated with the freight, or for transshipment, storage, and distribution, then Jamaica can expect to attract freight logistics activity and insert itself into the supply chains for freight originating in other countries. Under this scenario, Jamaica is not only a contributor to supply chain performance for global shippers, but also a contributor to its own economic growth as well as that of other economies that rely on good-performing logistics chains.

Assessing the prospects for Jamaica to realize its vision begins with an understanding of freight flows that can potentially be captured by Jamaica. So we begin this chapter with an assessment of cargo flows to, from, and through the region in relative proximity to Jamaica's geographic position in an effort to: 1) understand the characteristics and size of the international trade flows that currently are exchanged between countries, and 2) identify those trade flows that are susceptible to being attracted to Jamaica's Logistics Hub. The working assumption is that the JLHI will change the current conditions of the transport infrastructure and services, trade and customs environment, tax environment, industrial capacity and investment conditions in order to become more competitive in the face of regional and global competitors that are also vying for the same role.

The traffic forecasts presented in this chapter served as the basis for generating the demand-driven requirements for the land use and infrastructure improvements for the LHI in the concept-level master planning exercise undertaken in Part 2. Further, while we cannot forecast supply-driven demand, it is assumed that supply-driven projects will ramp up over the market demand planning horizon (to 2035) and contribute to the development of the LHI in addition to the quantifiable trade flows that could be attracted to Jamaica's Logistics Hub.

Our analysis of cargo flows to and from Jamaica addresses both maritime and air cargo, each of which has unique characteristics and conditions. Maritime cargo comprises over 90% of the global trade volume given its cost effective nature and ability to cover long distances. The analysis identifies the characteristics of the cargo being traded between major trade blocks that flow near Jamaica. Relevant trade flows, as determined by proximity and volume, include US and Asia (e.g. China), US and Europe, US and Latin America, Europe and Latin America, and Asia and Latin America as well as within the Caribbean region. We provide an overview of each global trade flow and then describe characteristics of specific exchanges between individual countries, including details of the commodities being traded. The focus in maritime cargo is centered on containerized goods, which have the greatest opportunity for value added and logistics activities in Jamaica. Currently Jamaica is primarily an exporter of bulk goods (alumina, bauxite, cement, etc.), however we found very little logistics opportunities in the bulk segment, and described our reasoning for this in this chapter. We found that Jamaica would not be competitive in providing bunkering services due to intense

competition from Panama and the US, consolidation trends, and low growth in the sector, among other reasons described in the section below.

Our commodity-specific orientation is necessary in order to determine Jamaica's competitive position with respect to the various global supply chains and to identify the flows that are subject to being attracted by Jamaica given conditions described in other chapters of Part I of this report. These conditions include extent of industrial development, natural resources, human resources (training and skills), size of internal market, and transport and utilities costs, among others. For instance, Jamaica could be attractive for assembly (light manufacture) of relatively simple products with most of the components being imported into a SEZ offering tax free re-exports. Then, these could be exported to countries in the Caribbean basin as Jamaica will have a privileged position, relatively low labor cost, and a more flexible customs environment as part of the JLHI. Similarly, for high tech or high value products, Jamaica could also be in the position to serve as a distribution hub for the Caribbean Basin as long as the environment is enabling.

Jamaica has achieved some success in expanding its role as a transshipment hub. Its ability to attract mainline carriers to establish their hubs in Kingston is testament to the Jamaican advantage in hosting transshipment activity. It also demonstrates the potential impact a single mainline carrier can have on cargo volumes, contributing more than one million TEUs to the total volumes handled, with promising prospects for increasing this volume substantially. The transshipment business has its own unique characteristics and is affected by carrier strategy decisions, so we provide a separate transshipment analysis in this chapter.

The chapter ends with a forecast of freight flows that Jamaica can expect for maritime, air and transshipment cargo in the near future. The trends and analysis of the current and potential cargo flows and forecasts are then used in a subsequent industry analysis chapter to identify potential industries that Jamaica can capture as it establishes its place as the fourth node of the global logistics chain. Appendix Chapter I.2 provides a full description of the methodology and identification of sources and additional data used in the analysis.

I.2.1 Demand

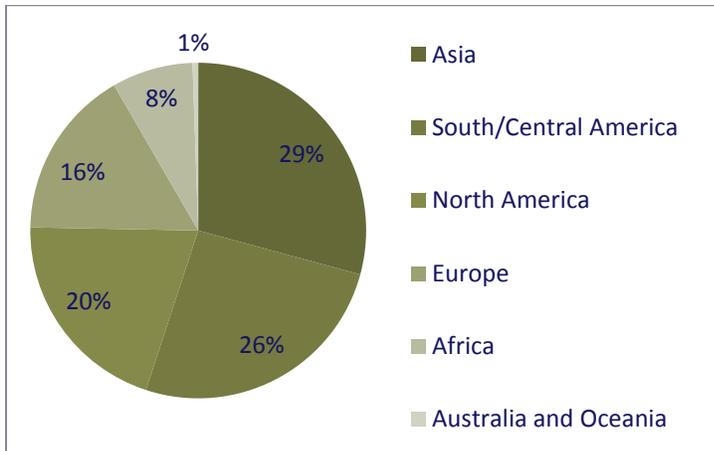
Maritime Global Trade

Imports

From 2013-2015, the United States imported slightly over one third of its maritime imports from Asia and almost one third from South and Central America. About 227 million tons arrive from Asia annually, while 175 million tons arrive from South and Central America. According to the US Census Bureau, US east coast ports (which include ports on the US Gulf coast) represent over 67% of total maritime imports in recent years. East coast ports receive almost 70% of South and Central American imports because of proximity advantages and about half of Asian imports, with the balance going to the west coast. South and Central American imports to the east coast account for 26% of the total, second only to Asian imports. Figure I.2-1 shows the distribution of US east coast imports by region.⁵

⁵ Detailed data supporting shares mentioned in this section is presented in the Appendix I.2.

Figure I.2-1: East Coast Imports Origin Distribution



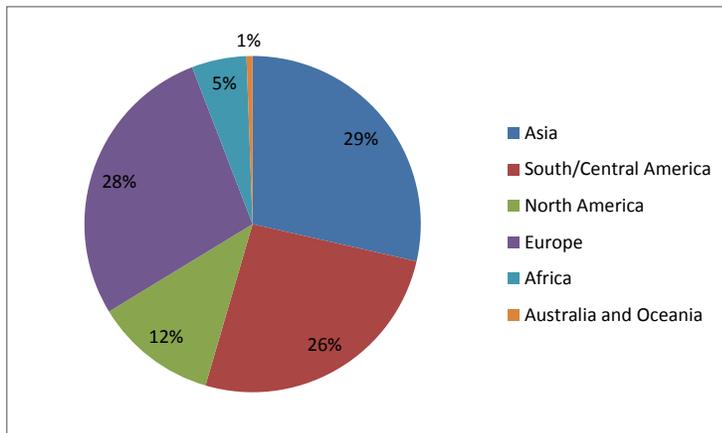
Source: Nathan Associates with data from USA Trade Online. United States Census Bureau.

If only containerized imports are considered, South and Central America's share of imports to the US falls to 19%, while Asia's share rises to 60%. However, many Asian containerized goods come through the US West Coast, because while South and Central America account for 28% of containerized maritime imports to the East Coast, Asia's share falls to 43%.

Exports

Asia and South and Central America are also the largest export partners for the United States, with 39% and 21% of the US total exported goods, respectively. While only half of total exports to Asia come from the US east coast ports, almost all exports with destinations in Africa, Europe, South, and Central America come from the US east coast. As seen in Figure I. 2-2, East coast ports export 29%, 28% and 26% of goods to Asia, Europe, and South and Central America, respectively, and 18% to the rest of the world.

Figure I. 2-2: East Coast Export Distribution by Destination



Source: Nathan Associates with data from USA Trade Online. United States Census Bureau.

Jamaica's location is ideal to intercept trade from the US to South and Central America and serve as a distribution center or provide value addition since 93% of all container shipping from the US to South and Central America comes from the US east coast. In fact, the US east coast is the primary

exporter for goods heading to Europe and Africa as well, although the capture opportunities for Jamaica are more limited on those trade routes as it would make the route less direct.

US Trade with Asia

Asia Exporting to the US

The top US import partners in Asia are China, South Korea, Japan, India, Indonesia, Taiwan, Vietnam, Thailand, and Malaysia. Almost all imports from China, Thailand, and Vietnam are containerized, meaning they are more likely to be manufactured goods and present potential capture opportunities for processing (value addition) as well as distribution in Jamaica, while the other Asian countries are likely exporting more items in liquid bulk, dry bulk form, vehicles, or general cargo.

The vehicle industry is a large part of US imports from Japan and South Korea, with only 55% of their vehicle imports to the East Coast containerized, and the remaining 45% transported on roll-on roll-off ships (Ro-ro). Other than vehicles and oil which are not containerized, the top imported commodities from the Asia region include phones and parts, machinery, iron and steel, and plastics.

The top east coast ports for maritime cargo imports from Asia are New York, Houston, Savannah, and New Orleans (cumulative 71% of total imports from Asia), and a breakdown of the top import commodities to these ports are shown in Table I.2-1. Those with the greatest opportunity for Jamaica include the articles of iron and steel, like pipes, wiring, and nails, in addition to vehicle parts and furniture assembly. Further recommendations on light manufacturing sectors are described in the Industry Analysis chapter of this report.

Table I.2-1: Asia to the East Coast of the US: Top Import Flows

Origin	Destination	Share of East Coast Imports from Asia	Average Annual Volume (Tons)	Detailed Products (HS Level 4 breakdown)
South Korea	Gulf Coast Ports	6%	3,193,385	Tubes and piping, structures, wiring, small articles of steel, Portland cement, granite Organic chemicals and acids, salts Passenger vehicles, parts and accessories, tractors, trucks
China	Gulf Coast Ports	10%	5,166,720	Fertilizers, salts, stones, clays, Portland cement, graphite Chairs and parts, lamps, mattresses, Tableware, flooring materials, tubes and piping, railway construction materials, chains, nails, screws, bolts

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov>).

Note: Oil (crude and petrol) has been removed from this level of analysis. It represents 1% of the east coast imports from Asia.

US Exporting to Asia

Our analysis found that the top US export partners in Asia are China, Japan, South Korea, India, Taiwan, Thailand, Vietnam, Indonesia, Singapore, and Hong Kong.

Just over 40% of US exports (containerized and general maritime cargo) are destined for China, and about 45% of that cargo comes from the east coast. A significant proportion of the export commodities are unprocessed (raw) commodities in bulk form destined for further processing in Asia. Jamaica could intercept some of them for intermediate processing but there is little competitive advantage in this for Jamaica against the Asian countries. Countries with a high proportion of containerized cargo include Vietnam, Indonesia, Taiwan, and Thailand. These containerized exports from the US to smaller Asian countries are likely manufactured or value added goods that Jamaica could intercept for some value addition or customization.

The main east coast ports that export to Asian countries are New Orleans, Houston, Norfolk, and New York, primarily sending goods to China and Japan. A breakdown of goods exported from US east coast ports can be seen in Table I.2-2 below.

Table I.2-2: Top Export Flows from East Coast of US to Asia

Destination	Origin	Commodity	Share of East Coast Exports to Asia	Average Tons/year	Detailed Products (HS Level 4 breakdown)
China	Gulf Coast Ports		40%	27,972,756	Soybeans, grain sorghum, wheat, paper scrap, starch and sugars, animal feed, alcohols, peroxides, chemical wood pulp
Japan	Gulf Coast Ports	Cereals	15%	10,942,670	Corn, grain, alcohols, soybeans, flour

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov>).

Note: Oil (crude and petrol) has been removed for this level of analysis. It represents 30% of the total exports.

US Trade with Europe

Europe Exporting to the US

The top partners in Europe exporting goods to the United States are Russia, the United Kingdom, Germany, the Netherlands, Spain, Italy, Belgium, France, and Turkey; however, it should be noted that oil represents 71% of Russia's exports to the US.

Other than fuels and oils, among the top European exports to the US include iron and steel, salt, stone, cement, beverages, fertilizers, and vehicles. Because of the diverse export commodities, this flow could present an opportunity for Jamaica, particularly those going to the southeast US and that could benefit from customization, packaging and other value additions where Jamaica has a competitive advantage. In 2014, 84% of European maritime exports arrived on the US east coast, mostly to Houston, New Orleans, New York, and Philadelphia. From Europe, the Bahamas have slightly better positioning on the route to Louisiana and Texas and appear to be capturing traffic coming out of Europe through the Strait of Gibraltar; however, Jamaica can potentially capture the commodities going to these ports that may need storage or value added activities. The top export commodities excluding oil are listed in Table I.2-3.

The table shows that iron and steel related products are the most popular export from Europe to the US. There is very little opportunity for Jamaica to capture these industries as they are accommodated in very well established logistics systems associated with manufacturing plants. Amongst the top commodities, the only trade with potential to be captured on this route is vehicle parts from Germany to the southern ports of Charleston and Savannah. Though representing a relatively small volume, vehicle parts could be part of a cluster strategy also targeting Europe to Latin America flows.

Table I.2-3: Europe to the East Coast: Top Export Flows

Origin	Destination	Share of Top European Exports to the US	Average Tons/year	Commodity
Russia	New Orleans, Philadelphia, Houston, Mobile	20%	5,232,087	Iron, alloys, bars and rods
Turkey	New Orleans, Houston	4%	1,041,707	Iron bars and rods
Russia	New Orleans	5.7%	1,580,620	Nitrogenous fertilizers
Germany	Charleston, Savannah	2.4%	682,006	Personal vehicles, parts, tractors

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov>).

US Exporting to Europe

The top partners importing US goods into Europe are the Netherlands, United Kingdom, Turkey, Italy, Germany, France, Belgium, and Spain, and most cargo departs New Orleans, Houston, and Savannah. Table I.2-4 shows that US exports a variety of chemicals, iron and steel, and scrap to Europe, in addition to nuts and seeds. Exports from southern ports in the US generally are ideal for Jamaica to capture; however, given the commodities on this route, there is likely very little need for storage or value added activities between the US and Europe. Some of the logistics value added activities that can be provided in Jamaica include customization, packaging, and labeling, among others.

Table I.2-4: Top Flows: US Exporting to Europe

Origin	Destination	Share of Top European Imports from the US	Average Tons/year	Commodity
New Orleans	Germany, Netherlands, Spain, Turkey	13%	3,504,092	Soybeans, peanuts, sunflower seeds
Houston	Belgium, Netherlands	7%	1,959,009	Hydrocarbons, alcohols, ethers
Norfolk, Tampa	United Kingdom	6.5%	1,742,949	Chemical wood pulp and fibers
New York City	Turkey	5.3%	578,592	Ferrous waste and scrap

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov>).

US Trade with Latin America

Latin America Exporting to the US

The Latin America to US east coast trade partners with the highest volumes are Colombia and Brazil, with Jamaica notably among the top five.⁶ It is important to note that only 1% of goods from Jamaica are containerized, likely due to the massive amount of aluminum ores and bauxite being sent to the US in bulk form. On the other hand, the majority of imports from Costa Rica and Guatemala, which tend to be more agricultural, are containerized. Of these top importers, Trinidad and Tobago has an economy and geography most similar to Jamaica, and as the third highest volume Latin American exporter to the east coast, could provide an opportunity for Jamaica to capture some of that trade through logistics value added services (packaging, customization, labeling) and aggregation with other similar flows from neighboring countries. The major competitors in the logistics segment for Latin America trade are located around the Miami region.

The top 15 containerized commodities imported to the US east coast include primarily agricultural products such as fruits and vegetables in various forms, coffee and spices, and wood products as shown in Table I.2-5. Geographically, almost all Latin American imports come through the US east coast ports, and Jamaica could, in theory, intercept them and add value or store them for transshipment, as discussed above. Unfortunately, other than chemicals and some wood products, the region primarily exports raw materials and agricultural goods to the US, which may have little opportunity for value added, unless they are tied to a large light manufacturing industry that offers cost effective competition through, among other things, efficient and low cost logistics services (including enabling customs clearance in Jamaica and trade access advantages in the US).⁷

In the regional trade section below, we briefly discuss Jamaica's aluminum exports, which are one of the top east coast imports from the Latin and South America region at almost 7% with the exception of oil and fuel (representing 27% of the total imports).

Table I.2-5: Top Export Flows: Latin America to the US East Coast

Origin	Destination	Share of East Coast Imports from L.A.	Average Tons/year	Commodity
Jamaica	New Orleans, Houston	11%	5,350,021	Aluminum, bauxite
Brazil	Gulf Coast Ports	8%	4,304,676	Iron ores
Chile	North East Coast Ports	10%	5,665,615	Sodium Chloride
Trinidad and Tobago	Gulf Coast Ports	10%	5,031,770	Chemicals, Alcohol and Halogen at, Ammonia, Nitrogenous fertilizer

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov>).

Note: Oil (crude and petrol) has been removed for this level of analysis.

⁶ We have eliminated Venezuela from this analysis because of the large quantities of oil in liquid bulk form, and have focused on the 70% of Latin American imports that enter east coast ports.

⁷ We discuss later Jamaica's aluminum exports, which are one of the top US east coast imports from the Latin and South America region, representing almost 7% of total export volumes to the US East Coast.

US Exporting to Latin America

Brazil and Colombia are also major export partners. With the notable exception of the Dominican Republic, all of the top ten regional export partners are on mainland South America. Jamaica will need to be strategic in diverting some of this trade for value addition, distribution and transshipment. As indicated above, within the context of the JLHI, the country needs to focus on improving its logistics services, including customs clearance, in order to have a competitive advantage that would encourage the diversion of these flows to Jamaica. US exports to Latin America have low containerized rates (around 18% of the total), indicating that many of these exports are in liquid or dry bulk form.

Generally, the top commodities exported to Latin American countries from the US east coast are similar to those exported to Asia: oil, cereal, fertilizers, chemicals, and plastics. Table I.2-6 presents a breakdown of volume by port. Jamaica should target the cargo coming from New Orleans and Houston for value-added or transshipment services.

Table I.2-6: East Coast to Latin America: Top Trade Flows

Origin	Destination	Share of East Coast Exports to L.A.	Avg. Tons/year	Commodity
New Orleans	Peru, Venezuela, Dominican Republic, Guatemala, Brazil, Colombia, Honduras, Panama	16%	6,239,976	Corn, wheat rice meslin, soy and starch residues
Houston	Brazil	4%	1,382,139	Wheat and meslin
Houston	Brazil, Colombia, Venezuela	11%	3,904,337	Chemicals and plastics, acid, alcohols, sulfur, ethylene, polyesters, petro-resins, hydrocarbons, Sodium Hydroxide, Peroxides
Tampa	Brazil	4%	1,303,505	Nitrogenous and organic fertilizers

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov/>)

Europe with Latin America Trade

Europe exporting to Latin America

In 2014, the Europe to Latin America trade route only comprised 2.34% of Europe's exports, which represents a relatively small opportunity for Jamaican industry to intercept trade⁸. The top exporters in Europe to the Latin American Region are Germany, France, Italy, and Spain, while the countries that import the highest value are Brazil, Argentina, Chile, and Colombia, as seen in Table I.2-7. Jamaica only imports about \$300 million in goods from all of Europe each year on average.

⁸ The World Bank. "World Integrated Trade Solution. Data," available at <http://wits.worldbank.org/>.

Table I.2-7: Top Partners: Europe to Latin America

		Exporters						Grand Total
		Germany	France	Italy	Spain	United Kingdom	All Other	
I m p o r t e r s	Brazil	16%	7%	7%	5%	4%	15%	54%
	Argentina	4%	2%	2%	1%	1%	4%	14%
	Chile	3%	2%	1%	2%	1%	0%	13%
	Colombia	2%	1%	1%	1%	0%	0%	7%
	Peru	2%	0%	1%	1%	0%	0%	6%
	Venezuela	1%	0%	0%	0%	0%	0%	2%
	All Other	1%	0%	1%	1%	0%	1%	4%
	Grand Total	28%	13%	13%	11%	7%	27%	100%

Source: Eurostat. Available at <http://ec.europa.eu/eurostat/web/international-trade-in-goods/statistics-illustrated>.

It is interesting to note that Germany exports a higher volume of parts than full vehicles to Brazil, so it may be worth exploring these flows to determine if there is an opportunity for Jamaica to capture some value added activities that occur in Brazil, and/or become a regional distributor of these parts. Table I.2-8 identifies top commodities from Europe to Latin American importers. Pharmaceuticals, vehicle, and aircraft are also top commodities due to their high value, but not necessarily high volumes. These can also be targeted by Jamaica through the aviation component of the JLHI (discussed later).

Table I.2-8: Top Export Flows: Europe to Latin America

Origin	Destination	Share of East Coast Exports to L.A.	Avg. Tons/year	Commodity
Germany	Brazil	5%	143,255	Engine parts, transmissions, appliances
		2%	133,033	Vehicle parts, personal vehicles, special purpose vehicles such as firetrucks and street cleaners
		2%	5,117	Retail pharmaceuticals
		2%	86,978	Alcohols, acids, ethers

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov/>)

Note: Oil (crude and petrol) has been removed for this level of analysis. It makes up 6% of European exports to Latin America

Latin America exporting to Europe

The largest economies in Latin America are also the top exporters to Europe, and Jamaica is again particularly low on this list with only \$300 million USD in exports to Europe each year. The distribution of trade between countries in the regions is shown in Table I.2-9.

The majority of the exports are low value raw commodities (minerals, foods and grains), with the exception of computer parts from Costa Rica. The best opportunity for Jamaica along these flows would be in the areas of consolidation, storage, packaging, and/or light processing of the less time sensitive agricultural goods like coffee, nuts, and seeds. However, given the significant competition in other locations, these activities need to be supported by world class logistics operations and

services that result in cost competitiveness. Further details about the commodities traded are in Table I.2-10.

Table I.2-9: Top Partners: Latin America to Europe

		Exporters						Grand Total
		Brazil	Chile	Colombia	Argentina	Peru	All Other	
I m p o r t e r s	Germany	11%	2%	2%	2%	1%	1%	20%
	Netherlands	6%	1%	1%	2%	1%	4%	15%
	France	4%	1%	1%	1%	0%	1%	8%
	United Kingdom	4%	1%	1%	1%	0%	1%	9%
	Italy	4%	2%	1%	1%	1%	1%	9%
	Spain	4%	2%	3%	2%	2%	3%	15%
	All Other	8%	3%	2%	2%	4%	1%	24%
	Grand Total	43%	12%	11%	10%	9%	15%	100%

Source: Eurostat. Available at <http://ec.europa.eu/eurostat/web/international-trade-in-goods/statistics-illustrated..>

Table I.2-10: Top Flows Latin America to Europe

Origin	Destination	Share of Latin American Exports to Europe	Avg. Annual Tons	Commodity
Brazil	Germany	3%	9,084,301	Iron, Copper, Aluminum
	Netherlands, Germany, Spain, France, Belgium	9%	10,244,953	Soybean and vegetable by-products in animal feed form, coffee, pimento, ground-nuts, fruit juices and vegetable juices, fruits and nuts, Melons, Dates, Pineapples, Avocados, Mangos, etc.
Costa Rica	Netherlands	2%	63,583	Computer processors, calculators and parts, word-processing machines, food prep machinery

Source: Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov/>)

Note: Oil (crude and petrol), representing 13.5% of the total trade from Latin America to Europe, has been removed for this analysis.

Asia with Latin America Trade

Asia exporting to Latin America

Of the trade flows from Asia to Latin America, China is the main exporter, followed by South Korea, Japan, and India. As seen in Table I.2-11, the dominant Asian exporter is China with 61% of total trade, while the dominant Latin American importer is Brazil, capturing 26% of all regional trade. All goods coming from China to Brazil are likely utilizing the Panama Canal. Other strong trade partnerships include Thailand with Argentina and Japan with Colombia. We note that some other flows, such as China to Chile and Peru, are unlikely to be captured by Jamaica since these trades do not transit the Panama Canal.

Table I.2-11: Top Partners: Asia to Latin America

		Exporters						
		China	South Korea	Japan	India	Thailand	All Other	Grand Total
I m p o r t e r s	Brazil	26%	6%	4%	4%	2%	5%	47%
	Chile	11%	2%	2%	1%	1%	1%	17%
	Argentina	8%	1%	1%	1%	1%	1%	12%
	Peru	6%	1%	1%	1%	0%	1%	10%
	Colombia	5%	1%	1%	1%	0%	1%	8%
	All Other	4%	1%	1%	0%	0%	0%	6%
	Grand Total	61%	11%	9%	7%	4%	8%	100%

Source: UN COMTRADE. Available at <http://comtrade.un.org/data/>.

Table I.2-12: Top Trade Flows: Asia to Latin America Involving China and Brazil

Origin	Destination	Average Annual Tons	Commodity
China	Brazil	266,913	Motors and generators, transformers and converters, water and space heaters, TVs, lamps, cable and wires
		458,044	Air pumps, air conditioners, engines and motors, furnaces, refrigerators
		424,590	Compounds and acids
		354,944	Poly ethers, styrenes, floor coverings, tableware and household goods
		1,712,487	Mineral and nitrogen fertilizers
		1,935,143	Flat-rolled plates of iron and steel
		598,997	Railway materials, parts of structures such as bridges, roofing, towers, doors, etc., screws and bolts

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov/>)

Note: Oil (crude and petrol) and ores have been removed for this level of analysis.

Latin America exporting to Asia

Brazil and China have the highest value export partnership on these trade exchanges capturing 33% (see Table I.2-13). Again, given its size these flows are very likely served through direct shipping services, which limit the possibility of intercept by Jamaica. However, the other trade partnerships in the top ten are very diverse, as seen in Table I.2-14. For example, the flow of cargo from Costa Rica to China was recognized in the top ten with highest value because of the high value and volume of ICT machinery manufacturing and value added services there. Venezuela has a high value export partnership with multiple Asian countries because of those countries' needs for oil and raw materials. As earlier noted, Jamaica is unlikely to capture trade from Chile to Asia because it does not flow through the Panama Canal.

The top commodities from Latin America to Asia are more diverse than those from Asia to Latin America (see Appendix Chapter I.2 for details); however, there are generally rawer goods such as ores, oil, and agricultural products. Given the generally low export volume involved of any particular commodity, Jamaica could position itself as consolidator for a few of these commodities and even add some light processing along with logistics services as value addition. The premise, as before, is that Jamaica would offer cost competitive light industry and logistics services through the different

elements of the JLHI. Computer machinery and electronics from Costa Rica are also high in value, even if not in volume. Argentina is one of the top exporters, which is unique considering the country's geographic location is the farthest from most Asian partners. If ships from Argentina are using the Panama Canal, Jamaica has an excellent opportunity to capture stop over traffic or conduct value added activities on these goods.

Table I.2-13: Top Partners: Latin America to Asia

		Exporters						
		Brazil	Venezuela	Argentina	Peru	Colombia	All Other	Grand Total
Imports	China	33%	7%	4%	5%	3%	3%	55%
	India	3%	8%	1%	0%	2%	0%	14%
	Japan	6%	0%	1%	1%	0%	1%	9%
	Singapore	1%	3%	0%	0%	0%	0%	5%
	Rep. of Korea	2%	0%	0%	1%	0%	1%	4%
	Malaysia	1%	0%	1%	0%	0%	1%	4%
	All Other	5%	0%	2%	0%	0%	1%	9%
	Grand Total	52%	18%	9%	8%	7%	7%	100%

Source: UN COMTRADE. Available at <http://comtrade.un.org/data/>.

Table I.2-14: Trade Flows: Latin America to Asia Involving China and Brazil

Origin	Destination	Average Annual Tons	Commodity
Brazil	China	34,646,710	Soya beans, seeds
		3,409,474	Chemical wood pulp
		2,281,636	Cane Sugar

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov/>)

Note: Oil (crude and petrol) and ores have been removed for this level of analysis

Maritime Regional Trade

Jamaica

Compared to the region, Jamaica exports a relatively low amount of goods and relatively high amount of services. In the past ten or so years, there was a 48% increase in imports, while exports remained nearly constant with only a 3% increase⁹.

Jamaica's top exports by volume in 2014 were bauxite, alumina (refined bauxite), non-crude petroleum oils, cement, and limestone, shown by volume and value in Table I.2-15. The top exports by value included bauxite, alumina, and oils, in addition to rum and yams¹⁰. While Jamaica is a hub

⁹ The World Bank Development Indicators 2014 Data.

¹⁰ UN COMTRADE. "2014 Data." 2014

for bauxite and alumina, Jamaica's share of world bauxite output was only approximately 7% in 2014. Three large ports that serve the aluminum industry in Jamaica include Port Rhoades, Rocky Point, and Port Esquivel. Jamaica primarily imports oils and alcohols in liquid bulk form, in addition to some food products.

Jamaica primarily trades with the United States, sending aluminum to Louisiana and other commodities to the port of New York. Jamaica has many trade agreements that can be used to export. In 2014, 30% of Jamaica's exports by value were types of aluminum going to the US, 13% were inorganic chemicals to Canada, and almost 5% consisted of sugar to Europe¹¹.

Table I.2-15: Jamaica's Annual Exports

Export	Weight (tons)	Value (USD)
Bauxite	9,625,082	\$130,349,791
Alumina	3,595,348	\$529,568,148
Non-crude petroleum oils	791,690	\$332,614,649
Cement	595,500	\$2,302,218
Limestone	331,590	\$10,603,348
Rum and other spirits obtained by distilling fermented sugar-cane products	28,659	\$88,170,660
Yams	21,203	\$17,543,978

Source: UN COMTRADE. Available at <http://comtrade.un.org/data/>.

Latin America and the Caribbean

As can be seen in the detailed analysis of trade flows between Latin America and other regions of the world above, top exports for the region are primarily non-agriculture commodities such as minerals, oils, fuels, and stone. Trade partners are also diverse, though the US is the dominant partner receiving more than 62% of total Latin American and Caribbean Trade¹². There are very few value addition opportunities. The imports are diverse between raw materials, food products, fuels, and vehicles, coming from Asia, North America, South America, and Europe. The Figures below summarize regional trade activities.

Bulk Commodity Processing

Jamaica's geographic position along key shipping routes in principle provides it a good location to intercept bulk cargoes along the routes between the U.S. Gulf and East Coasts and Asia and the West Coast of South America. However, there is little opportunity for value-added services in Jamaica for most liquid, dry, and other bulk commodities.

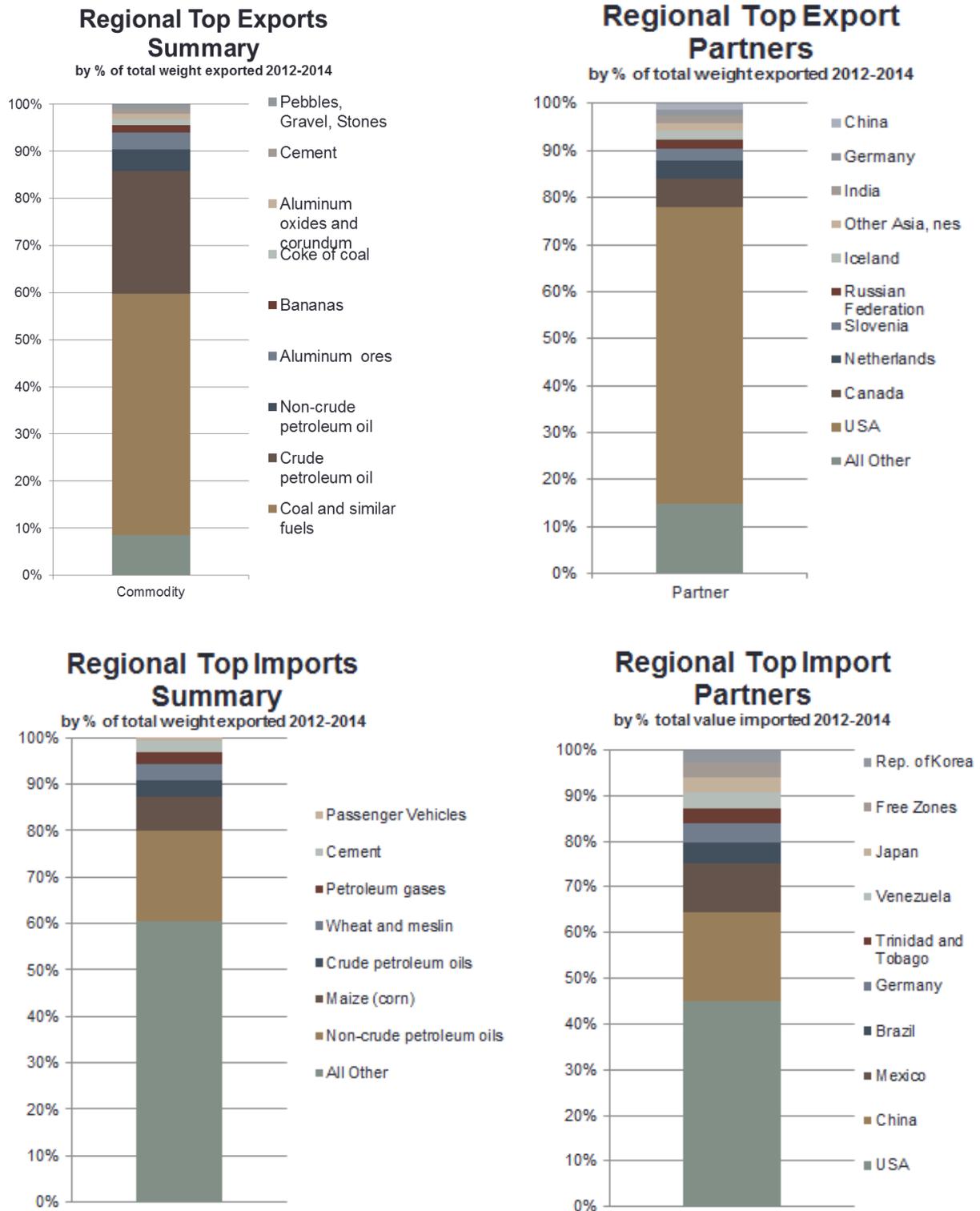
In the case of break-bulk and project cargoes, it may in fact be costlier to divert this cargo to Jamaica, offload it, and then ship the products by container than could be recouped by users from the cost savings gained from performing value added activities in Jamaica. Further, in recent years, the markets for breakbulk and project cargoes have been diminished as container and bulk

¹¹ UN COMTRADE.

¹² This regional sample includes Bahamas, Barbados, Belize, Dominican Republic, Panama, Colombia, and Jamaica. There are no data available for Trinidad and Tobago on UN COMTRADE.

operators attempt to grapple with oversupply issues by capturing market shares from multi-purpose operators.

Figure I.2-3: Regional Top Exports and Imports by Commodity and Partner



Source: UN COMTRADE. Available at <http://comtrade.un.org/data/>

The dry bulk sector is mostly market driven, and main logistics operations are for large mining and industrial activities. Supply chains in the dry bulk sector are well established, driven by port restrictions, inland handling, parcel size, etc., and unlikely to move. Additionally, we do not recommend these activities to the JLHI because major dry bulk commodities are not anticipated to have strong growth. In fact, prices of many bulk commodities have declined as demand has decreased. This is what has occurred in recent years in Jamaica in the case of bauxite, exports of which have declined along with total exports, and there is little value-added activity associated with bauxite that potentially could be integrated into the logistics hub.

In some cases, there could also be cost requirements that make investment in such bulk processing activities infeasible. For instance, smelters to process bauxite require considerable volumes of inexpensive energy among other conditions, which are not readily available in Jamaica. The smelters in the U.S. have been closing (down to five from 14) due to strong competition from China.

With respect to liquid bulk commodities, which include crude oil and petroleum products, liquefied natural gas, liquefied petroleum gas, and chemicals, including organic chemicals, the manufacture and transport of these commodities require specialized facilities and infrastructure, such as pipelines and specialized vessels, which typically are developed only when a port or region is already well established as a trade hub. Further, major production centers of liquid bulk commodities are fixed since they are based on natural resources such as oil and natural gas deposits in the case of fossil fuels. Trades in these commodities (and related supply chains) are hence well established, achieve economies of scale, and are unlikely to yield market share to new entrants.

Overall, it is our expert opinion that there is very little opportunity for Jamaica to capture bulk commodity or bunker logistics activities, primarily because the industry analysis and cargo forecast in this chapter reveal that greatest opportunities for Jamaica are found value-added manufacturing activities. In the global economy, it is relatively easier for manufacturers to move production centers, whereas in the bulk commodities industries, the routes between raw natural resources and consumption centers are well established and therefore unlikely for Jamaica to capture.

For bulk commodities originated in the Caribbean, Jamaica may offer the opportunity to consolidate production for transport to Asia or other regions using larger and cost competitive vessels. Unfortunately, the value added opportunities and job creation are limited to storage and a few potential jobs for port operations. There could be very long term opportunities for Jamaica in bulk logistics, but no viable options have been identified at this time.

Bunkering Services

While bunker fuel fits within the broad category of liquid bulk petroleum products, future application at port facilities is operationally distinct and merits specific consideration given the nature of the bunker market. Historically, the bunker market has been an easy outlet for major oil companies' fuel oil surplus. It is a market of over 375 million metric tons worldwide, in which the main hubs are located in Singapore, Rotterdam, and Fujairah (in the United Arab Emirates). Today, bunker selling is a capital-intensive mature business with tight margins and fierce competition; therefore, profitability depends on volumes sold. In addition, refineries are upgrading quickly worldwide, which reduces the availability of good quality bunker. Another factor that affects quality is the price cutting practice by bunker sellers, which leads to wide quality and availability swings. Some markets are import-dependent in a world dominated by large trader suppliers.

The trend toward consolidating major bunkering hubs in the world is the result of their being either located at busy ports, or very close to major trade routes. The requirements of international seaborne trade nowadays for reliability and timely arrivals put a lot of pressure on ships and limit their choice on volumes and places to refuel. Some transportation contracts impose restrictions in terms of deviations from the agreed route; another issue is the fuel used by the ship's engine and environmental regulations related to emissions to the air.

Bunker quality has become a very important issue as a result of continued developments in emissions control regulations, particularly MARPOL Annex VI. According to the International Energy Agency, the International Maritime Organization (IMO) has plans to expand implementation of Annex VI to include a new amendment that would establish a global sulphur cap for marine fuels of 0.5 percent beginning in January 2020. The desulphurization process to levels recommended by MARPOL is quite expensive, particularly when sour crudes are used, and could add \$35 - \$90 per ton to the price of bunker fuel. In an environment like this, flexibility and creativity are key elements to a successful operation.

Bunkering hubs located at busy ports where vessels make repeated calls during a year –such as liner services or vessels engaged in industrial trade carrying the same cargoes in the same route – usually have specific ports to bunker, perhaps with long-term contracts with a supplier to secure volumes, quality and price stability. Tramp vessels trading in the spot market, on the other hand, may have access to a wider variety of locations to replenish fuel, but they are also restricted by the terms and conditions of their charter contract and the type of cargo they carry on each voyage. Bunkering ports located very near major trading routes, in contrast, need to be in places that are convenient for ships to stop for a few hours without deviating from their voyage schedule. In this sense, pricing differences, product availability, political environment and geographical location are determinant factors that will influence the bunker port decision. In the end, changes in trading patterns and local government policies regarding this business can cause important changes to ship owners' decisions.

In comparison with major international bunkering centers as well as many in the region, Jamaica's bunker volumes are very low. Analysis of 2015 statistics reveals that Jamaica accounts for an estimated 0.3 million MT, while its main regional rivals, Panamá (3.7 million MT) and the US Gulf Coast (5.1 million MT), accounted for substantially more.¹³ According to the International Energy Agency (IEA), global demand for vessel bunkering is anticipated to increase slightly by an estimated 0.2 mb/d to 4.1 mb/d by 2020. This represents annual growth of 0.7 percent, which is below world GDP growth and well below historical growth in demand for bunker fuel over the past two decades. Therefore, we cannot recommend bunkering services as an activity of the JLHI. This decreased demand will also be tempered by efficiency improvements due to the introduction of larger ship sizes (and related increased economies of scale) as well as slow-steaming, which despite lower bunker prices, is likely to continue as shipping lines attempt to combat oversupply.¹⁴

¹³ Even though more than 220 ports in the world offer bunkering services, currently very few publish official statistics of their bunker sales volumes, such as Singapore and Rotterdam, compiled by the respective port authorities. Therefore, accurate statistics for bunker sales are a scarce commodity. Sources: Ventrin Petroleum Limited Presentation to the IBIA Conference November 2015; Panama Maritime Authority, U.S. Energy Information Agency.

¹⁴ International Energy Agency, "Oil: Medium-Term Market Report 2015."

There is a wide variety of traffic in the Caribbean basin, particularly in the triangle of Caribbean transshipment, shown in Figure I.2-4. The traffic in the region is dominated by tankers, containerships, and cruise ships. In this trade, the Panama Canal plays a major role, attracting vessels to Panama's ports, allowing them to shorten navigational distances.

Figure I.2-4: Caribbean Transshipment Triangle



Source: SPRC Presentation at Colfecar Congress

In spite of the high traffic of vessels in the Caribbean, it is important to state that the bunker business is an opportunistic one and the criteria used to decide when and where to purchase fuel are price, quality, speed of delivery, and convenience; vessels will buy fuel at the cheapest possible location along the trading route, which complies with the minimum standards required. Thus, while price is the most critical factor as bunker buyers continually compare the price at present and subsequent ports of call, location also becomes an essential determinant of bunker sales as it relates to the cost to ship owners. In addition, although Jamaica's geographical position is advantageous due its location near key trade routes that utilize the Panama Canal, it must not be overlooked that Panama is also its strongest competitor in bunkering in the Caribbean.

The expansion of the Panama Canal is expected to increase the number of vessels on longer transits, such as those to the East Coast of the U.S. It is anticipated that 10 percent of container traffic to the U.S. will be diverted from West Coast to U.S. East Coast ports via the Canal over the next four years. Such increases in vessel transits into the U.S. Gulf will necessarily change conditions for the bunker market globally and in the Caribbean. However, the growth that may be experienced from the expansion of the Canal in bunkering operations is very likely to be absorbed by Panama, the U.S. Gulf Coast, and the US East Coast, which are located near bunker fuel supplies and whose ports are positioning themselves to accept larger post-panamax vessels that will be making fewer stops along their trade routes.

While Caribbean ports with the capacity to service post-panamax ships, such as those found at Cartagena, Kingston, Caucedo, and Freeport may become interesting for shipping lines and charterers for vessel bunkering, this possibility is highly speculative given its dependence on fickle transshipment cargo. Complicating this further are plans by the Panama Canal Authority to position Panama as a global and regional transshipment hub. Given the presence of numerous global port operators in Panama and a varied and extensive customer base of shipping lines, Panamanian ports are particularly well positioned to capture transshipment cargo through the region. Panama also represents a well-established bunker market with numerous suppliers in Cristobal, Colon, and Balboa, competitive pricing and fuel availability, and supportive government policies and regulations. These factors, along with trends in global shipping and the competitive nature of the bunker market,

present substantive challenges for Jamaica to gain a competitive advantage and increase its market share in bunkering in the Caribbean.

Maritime Trade Conclusions

The US and Asia trade route is the main import route for small manufactured items in containers passing on their way to the US east coast. These commodities could be easily intercepted by Jamaica for customization and distribution. In the short term, Jamaica could be a regional distribution hub for vehicles from Japan and South Korea while in the medium to long term they can work on light manufacturing activities in this cluster. However, as shown later in the Industry Analysis, these industries would need to be captured for cluster activities to emerge. The US to Asia export flows are also important, but as there is a high concentration of unprocessed agricultural exports, likely in bulk form, there is very little opportunity for Jamaica to add value to these goods given the unfavorable competitive position between Jamaica and Asia (see Industry Analysis chapter).

The US and Europe route is a well-established trade between large advanced economies with high labor costs and high value goods. Given the routes used, and the geographical position of competitors, it would be difficult for Jamaica to intercept any transshipment cargo along these routes. However, the disparity in labor costs provides an opportunity to add value to goods exported from the US to Europe and vice versa by positioning Jamaica in such a way that it lowers the logistics costs of the respective exports through lower cost, efficient, and reliable logistics services that package shipments, customize and label other goods. The Customs Agency is a key stakeholder which needs to implement fast and reliable clearance processes, on par with the best in the world, that allow tax free status for cargo designated for re-export and medium term storage among other logistics industry friendly policies in line with the JLHI objectives and goals. It is important to also highlight that the most significant flows are agricultural goods or bulk scrap. Currently, the Bahamas seems to be the stopover for goods from Europe to gulf ports of the US, so Jamaica would need to become much more competitive to divert this trade as it would slightly extend the shipping route. This may be worth considering for small manufactured items or vehicle parts that require some value added.

The Latin America and US route tends to be agricultural and have very little opportunity for value added activities. There would be need for large light industry development with significant cost effective logistics services that provide a significant competitive advantage when compared to similar activities in the US. In terms of Latin America and Caribbean exporting, Trinidad and Tobago and the Dominican Republic have island economies similar to that of Jamaica, although larger in size and population, and have a high volume of import/export activity. Jamaica should aim to compete with these and has the opportunity to capture some of their trade. Notably on this trade route, there are very few US ports participating, so Jamaica should focus on capturing cargo associated with industries located in Houston, New Orleans, and Tampa.

On exports from the US to Latin America, Jamaica is in an ideal position to serve as a distribution center for high value goods at least in the Caribbean basin. The distribution services could be supplemented with additional logistics value addition activities such as customization, warehousing, etc. However, in order to be cost effective, the values captured need to be significant and tied to very efficient transport services including regional air coverage out of Jamaica.

Since Jamaica is hardly involved in European trade at the moment, it will be difficult to pursue value added activities along the routes serving the **Europe and Latin America** trades. At the same time,

most of this trade is food or agricultural products, and hence does not offer the same opportunities as light manufacturing does for the JLHI. The only potential opportunity is to intercept vehicle parts from Germany to Brazil, where presumably there are value added activities or distribution taking place.

The **Asia and Latin America** route provides some opportunity for Jamaica. Generally, the top commodities from Asia imported by the Latin American region include a variety of machinery and parts, vehicles, chemicals and plastics, iron and steel. These present an excellent opportunity for consolidation, “last mile” manufacturing, distribution and other logistics value added activities in Jamaica.

From Japan and South Korea, the majority of vehicles exported to Latin America are passenger and freight vehicles. These countries also export vehicle parts, which are the third largest category under “vehicle” exports, and these provide the opportunity for processing or value added activities in Jamaica including short to medium terms storage and/or distribution of the vehicles and parts, further described in the Industry Analysis chapter of this report. Japan actually exports 36 times more vehicle parts than assembled vehicles, so Jamaica has an opportunity for intermediate assembly or distribution of the vehicle parts coming from there, whereas South Korea is exporting more assembled vehicles. Thailand specializes in vehicle parts, especially the frames or bodies, and this industry could be captured through Jamaican assembly based on competitive advantages derived from JLHI implementation.

Contrary to the flow from Asia to Latin America, there is not a great opportunity for Jamaica to capture flows from Latin America to Asia. One reason is the characteristics of goods, which tend to be agricultural or raw materials. Secondly, Chile and Argentina are two of the top exporters, and substituting Jamaica would extend the trade route far more geographically than is economically rational. The only option we see for Jamaica is to consolidate some of the smaller flows and add value through light manufacturing and logistics services. The JLHI could provide the thrust for industries to locate in one of the SEZs in Jamaica; however, this will depend on the successful development of the initiatives starting with an enabling business environment based on customs reform and the SEZ regulation to follow.

It is our expert opinion that there is very little opportunity for Jamaica to capture bulk commodity or logistics activities. It is well positioned geographically to intercept bulk cargoes along the routes between U.S. East Coast and Asia and the West Coast of South America, however there is little opportunity for value added services. In the global economy, it is relatively easier for manufacturers to move production centers, whereas in the bulk commodities industries, the routes between raw natural resources and consumption centers are well-established (and with large economies of scale already in place) and therefore unlikely for Jamaica to capture.

The Air Cargo Market

Introduction

Air cargo is a crucial enabler of global trade, playing two major roles: 1) as part of a global distribution network that uses both maritime and air cargo responding to client requirements for on-time shipment arrivals and reasonable price, regardless of transport mode¹⁵; and 2) as an essential

¹⁵ Boeing (2014), World Air Cargo Forecast 2014–2015.

mode of transport for industries such as perishables, pharmaceuticals, electronic devices, retail and automotive. However, in 2014 air cargo represented 1% of world trade by volume and 35% of the world trade by value.¹⁶ Furthermore, in 2013, the Caribbean region only accounted for 5.5% of the Latin America to North America air cargo flow.¹⁷

The Government of Jamaica is working to position the country as a global logistics hub by capitalizing on its strategic location to serve major trade corridors in the region and to add value to the cargo handled by the hub. Several government interventions that include port expansion and modernization, development of state-of-the-art complementary logistics facilities, implementation of a Special Economic Zone strategy, and implementation of several legal and regulatory reforms that facilitate trade have taken or are taking place. These serve the intent to leverage the competitiveness of the hub to attract international cargo but at the same time attract foreign investment and world class logistics operators into Jamaica.

The analysis in this section is focused on the size of the relevant potential air cargo market and the importance of air connectivity to leverage the competitiveness of the logistics hub. In our analysis, we address the following questions:

- ▶ What is the size of the relevant potential market?
- ▶ Does the Jamaica global logistics hub strategy require an intentional air cargo hub as part of the success formula?
- ▶ What are the required conditions to establish or promote an international air cargo hub?
- ▶ What are the challenges, opportunities, and risks associated with an international long-haul air cargo transfer (transshipment) hub?
- ▶ Does the Jamaica global logistics hub require full intermodal air-sea connectivity? (see also the chapter on existing and pipeline infrastructure projects)
- ▶ What is achievable and what should be planned in the short, mid and long term to be able to attract private sector investors and bankable projects? (see the industry analysis chapter)

Important Considerations

Airports and airlines around the world handle two different classes: passenger and cargo origin/destination (O/D), and transfer and transit. O/D passengers and cargo generally are a direct function of trade and tourism between two countries. On the other hand, transfer and transit passengers and cargo depend on the airline operating network and competing strategy.

In the air cargo segment there are three types of services a) dedicated all freighters that serve scheduled routes between major air cargo hubs and non-scheduled charter service; b) cargo traveling on scheduled passengers' service; and c) courier/mail service handled by cargo integrators like UPS, FedEx, and DHL (also called International Express). Passenger and air cargo markets have to be evaluated in combination, since a relevant share of air cargo is transported in passenger aircraft as belly cargo.

¹⁶ IATA (2015), *IATA Cargo Strategy*. 2015.

¹⁷ Boeing (2014), *World Air Cargo Forecast 2014–2015*.

In some long-haul cargo markets, air cargo service is dominated by dedicated freighters. According to Boeing, freighters carry about 80% of all air cargo in the Asia–North America market, 72% of all air cargo carried between Europe and Asia, and 43% of all cargo carried between Europe and North America. On the other hand, in less robust cargo markets, including the Americas north-south market, most of the air cargo is handled in the bellies of scheduled passenger planes.

Cargo capacity on passenger flights has been expanding as airlines deploy new wide body jetliners, such as the B777-300ER and B787, which have large lower-hold cargo capacities, even with a full load of passenger luggage. On the other hand, dedicated freighter services offer significant advantages, including more predictable and reliable volumes and schedules, greater control over timing and routing, and a variety of services for outsize cargo, hazardous materials, and other types of cargo that cannot be accommodated in passenger airplanes. In addition, range restrictions on fully loaded passenger flights and the limited number of passenger frequencies serving high-demand cargo markets make freighters essential where both long-range and frequent service are required.¹⁸ This last consideration is fundamental; freighters require a significant volume of cargo to be able to make a scheduled route sustainable in the long term.

A major development that followed U.S. deregulation was the creation of hub-and-spoke networks at strategically located airports used as transfer and consolidation/deconsolidation points for passengers and cargo. The airport hub concept has expanded to airports around the world in the different modalities. International gateway hubs are now established in the major population centers or international crossroads, such as Miami (MIA), New York (JFK), Los Angeles (LAX), San Francisco (SFO), London (HDR), Paris (CDG), Amsterdam (AMS), Frankfurt (FRA), Tokyo (NRT), and Hong Kong (HKG). These hubs have a wide airline customer base and an important number of O/D passengers. Most gateway hubs in the US are highly congested and compete for new airlines or for additional transfer passengers.¹⁹

The strategy and financial performance of a regional hub is closely linked to its dominant airline. These hubs serve a relatively high number of domestic transfer passengers and they compete against other regional hubs/airlines to get market share. In the US, regional hub airports are located in cities with strategic geographic characteristics such as Atlanta (ATL)/Delta Air Lines, Dallas (DFW)/American Airlines, Minneapolis (MSP)/Delta, Houston (IAH)/United, and Denver (DEN)/United Airlines.

In Latin America there are mid-size hubs that serve as international gateway for the main countries in the region. The mid-size hubs most relevant to Jamaica are Panama City Tocumen/Copa with a new expanded Canal and a Special Economic Zone strategy, Bogota El Dorado/Taca controlling the flower market and other perishable exports in Latin America, El Salvador/Taca, Lima/LamTam, and several of the Brazilian airports (2 in Sao Paulo, Rio de Janeiro, Paraná and Rio Grande do Sul).

Boeing's baseline forecast for total world air cargo projects that traffic will more than double between 2013 and 2033. Worldwide traffic will grow from 207.8 billion revenue ton-kilometers (RTKs) in 2013 to more than 521.8 billion RTKs by the end of the forecast period. Sustained

¹⁸ Boeing World Air Cargo Forecast 2014-2015

¹⁹ Enriquez Andrade, Rafael Roberto. "From Government Management and Ownership to Professionally Managed and Publicly Traded Airport Organization." MIT. June, 2002.

economic growth, along with decreasing yields, contributes significantly to the growth of the air cargo industry.

According to Boeing, in 2013 air cargo between Latin America and Europe accounted for around 770,000 tons, where South America accounted for 70.6% of the market, followed by Central America with 21.7%, and the Caribbean with the remaining 7.7%. Europe to South America air cargo traffic is forecasted to grow 5.0% on average, while South America to Europe traffic is forecasted to grow 4.7%. The Central America to Europe market is projected to grow 5% on average over the next 20 years. Europe to Central America traffic is forecasted to grow at a rate of 5.2%, while Central America to Europe traffic is forecast to grow 4.2% per year through 2033. Air trade between Europe and the Caribbean Basin is forecast to grow 3.5% annually over the next 20 years. Air cargo traffic from Europe to the Caribbean is forecast to grow at an average annual rate of 2.8%. Air cargo traffic from the Caribbean to Europe is forecast to grow an average 4.1% annually.²⁰

Miami

In terms of aviation hubs relevant to Jamaica, the leader in the Americas in international freight and the largest gateway to Latin America & the Caribbean is Miami International Airport (MIA). Miami International Airport (MIA):²¹

- ▶ controls the north / south cargo flows in the Western Hemisphere, linking the Americas with the high growth markets in Asia, Europe, the Middle East/ Gulf Region and beyond;
- ▶ handles 84% of all air imports and 81% of all exports from the Latin American/Caribbean region;
- ▶ serves as the hub for distribution of perishable products, hi-tech commodities, telecommunications equipment, textiles, pharmaceuticals and industrial machinery;
- ▶ hosts over 100 airlines, including 84 scheduled and 17 charter air carriers, of which 40 are all-cargo carriers, and whose airlines offer service to approximately 150 cities on four continents, with dedicated freighter service operating to 99 global destinations;
- ▶ provides exceptional infrastructure and facilitation, new runway capacity with no slot restrictions or delays, and room for growth;
- ▶ handled 2.1 million tons of total airfreight in 2014, of which 88% was international freight, with 56% O/D cargo and the remainder shipped in-transit from one country to another;
- ▶ is ranked as the leading airport in the United States for international freight and 10th in international freight among world.

MIA's new generation cargo facilities comprise 18 warehouses amounting to over 3.4 million square feet of warehouse, office and support space. Cargo aircraft parking has grown to 4.4 million square feet, with 41 common-use and 31 leased cargo positions.

Despite frequent users' claims, some experts believe that Miami still has substantial expansion capacity before it starts losing significant market share.

Panama

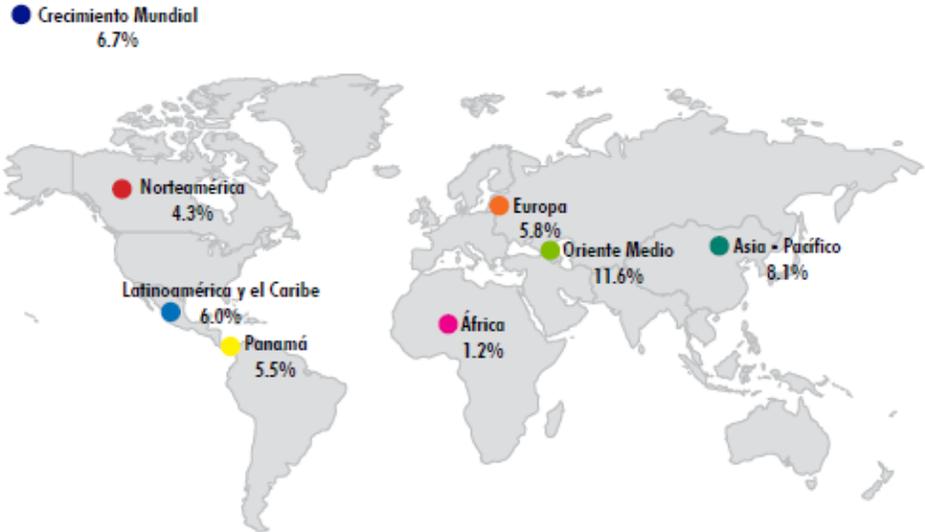
Tocumen International Airport is the regional hub for several commercial and cargo airlines. It connects passengers and moves cargo to more than 34 countries and 84 destinations worldwide. In

²⁰ Boeing World Air Cargo Forecast 2014-2015.

²¹ MIA Cargo Hub 2015-2016.

2015, total of 13.4 million passengers and about 110,000 tons of air cargo were handled at Tocumen Airport. Panama is a model for air cargo trade in Latin America, accounting for 9% of its total exports.²² The imports/exports ratio is balanced for international trade to North America, Latin America, Europe, and Asia. The annual growth in flights from Panama to various regions of the world is shown in Figure I.2-6. Top commodities exported by air include electronics, small instruments, tools and household items, cosmetics, footwear, and pharmaceuticals. The snapshots below of top commodities shipped by air to and from Panama demonstrate the way in which Panama acts as a regional distributor for most of these goods, in part due to the special economic zone and its overall high quality logistics infrastructure. Air cargo traffic of cosmetics goods is especially interesting in Panama, as these originate from all regions (Asia, Europe, and North America) and have a much higher air export share than imports. It is possible that Panama is adding value, repackaging, and re-exporting these goods as they ship, and then re-export these goods as air cargo. Another reason for low air imports, but high air exports is the regional distribution to landlocked or nearby countries, as is seen in the case of footwear in Table I.2-28.

Figure I.2-5: Destinations and Annual Percentage Growth in Passenger Flights from Panama in 2015



Source: Tocumen International Airport Annual Report 2015. Available at <http://tocumenpanama.aero/transparencia/pdf/memoriasaitsaverfinal5-4-16.pdf>

Table I.2-16: Top Air Exports from Panama

Electronics
▶ 13% of electronics imports and 9% of electronics exports are via air cargo.
▶ Imports origins are China, United States, Malaysia, China, and Hong Kong.
▶ Export destinations are mostly regional: Venezuela, Colombia, Ecuador, Brazil, Cuba, United States, and Costa Rica.
Pharmaceuticals
▶ 19% of pharmaceutical exports are via air cargo.
▶ Export destinations are Colombia, Venezuela, Hong Kong, and Peru.

²² ALG Transportation Infrastructure and Logistics. “Implementation of Panama maritime & logistics strategy – Phase II: Air logistics strategy for Panama.” May 30, 2014.

Machinery

- ▶ Only 4.4% of machinery imports are by air cargo. 7% of machinery exports are by air.
- ▶ Import origins are China, the United States, Japan, Indonesia, Hong Kong, and South Korea.
- ▶ Top export destinations are Venezuela, Colombia, and Mexico.

Perfumes and Cosmetics

- ▶ 6% of cosmetic imports are via air cargo. 21% of cosmetic exports are by air cargo.
- ▶ Import origins are United States, France, Belgium, Spain, Mexico, and China.
- ▶ Export origins are United States Colombia, Venezuela, Uruguay, Brazil, and Chile.

Footwear

- ▶ A mere 0.7% of footwear is imported by air cargo.
- ▶ 10% of footwear is exported by air cargo.

Source: ALG Transportation Infrastructure and Logistics. Implementation of Panama maritime & logistics strategy – Phase II: Air logistics strategy for Panama.30 May 2014.

US Global Air Freight Trade

US imports by air only account for half a percent of the total imports by weight, and most air cargo has destinations in Asia and Europe. The majority of imports by air also come from Asia, and these account for a mere 1% of global imports to the US. Note the vast difference in the US import-export ratios by region in Table I.2-17.

Table I.2-17: US Total Air Trade (2015)

Destination	US Air Exports		Origin	US Air Imports		Import-Export Ratio
	Average Annual Volume (tons)	Distribution		Average Annual Volume (tons)	Distribution	
Asia	1,396,749	43%	Asia	2,080,583	51%	1.5
Europe	1,065,340	33%	Europe	1,190,508	29%	1.1
South/Central America	386,422	12%	South/Central America	645,522	16%	1.7
North America	239,989	7%	North America	88,165	2%	0.4
Australia and Oceania	115,610	4%	Australia and Oceania	31,615	1%	0.3
Africa	71,070	2%	Africa	25,284	1%	0.4
Total	3,275,180	100%	Total	4,061,677	100%	

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov/>)

Asia Exporting to the US by Air

Table I.2-18 shows the countries, which send the most cargo by air to the US from Asia, and these are not surprising: China, Japan, and India. South Korea stands out because unlike other Asian exporters, it sends much more air cargo to Miami than New York, making its industries attractive for Jamaica to capture and take some business from Miami airport. Singapore, Hong Kong, and Indonesia also send very little cargo by air to the US, which is interesting as Singapore has one of the top airport systems in the world, as seen in the benchmarking task in later sections of this report. Similar to the case for maritime trade, China is the dominant Asian exporter by air to the US, sending most cargo to New York, which is the dominant importing airport for Asian goods. Top commodities

transported from Asia to the US by air listed in Table I.2-19 includes small electronics and apparel, which tends to be lightweight and of high value.

Table I.2-18: Main Asian Countries Exporting to the US (2015)

Country	Average (tons)	Share of Total Volume
China	1,158,979	56%
Japan	239,984	12%
India	116,418	6%

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov/>)

Table I.2-19: Top Asia Exports to the US by Air

Origin	Destination	Average Annual Tons	Commodity
China	New York	66,841	Automatic Data Process Machines, Parts For Typewriters & Other Office Machines; Printers
		44,021	Electric Apparatus Telephony, Power Supply, etc.
		5,341	Apparel and Footwear
			Plastic containers, Tableware, household items

Source: Nathan Associates with data from UN COMTRADE (comtrade.un.org) and USA Trade Online, US Census Bureau (<https://usatrade.census.gov/>)

A list of Asian countries exporting to the US and main products exported are presented in Appendix I.2 (page 24 et seq.). Although this is a very attractive air cargo market in terms of volume and value, we believe it would be difficult for Jamaica to compete for a significant and permanent share of this market. Most cargo in this market is shipped as belly cargo in direct long-haul service (wide-bodies with considerable cargo space i.e. B-777 or similar) between major gateway hubs at both continents and mainly using dedicated freighters using large midway cargo hubs like Anchorage in Alaska or Dubai.

US Exporting to Asia by Air

Table I.2-20 shows US air exports to Asia, with China and Japan together accounting for nearly 50% of total volumes. Primary US exports include types of nuclear reactors, boilers, machinery, and parts, which make up 42% of all air exports and mainly go to China, Japan, South Korea, and Singapore. An astounding 51% of all air exports to Asia depart one of the airports in the New York district. Although destinations are diverse, commodities are much more concentrated in just a few industries, as seen in Table I.2-21. The US exports mainly high value electronics (“data processing machines”) as well as lightweight plastics by air to Asia.

Table I.2-20: US Exporting to Asia

Country	Average Annual Volume (Tons)	Share
China	284,941	25%
Japan	241,227	21%
Korea, South	155,240	13%
Hong Kong	121,390	10%
Singapore	119,315	10%

Source: USA Trade Online. United States Census Bureau

Table I.2-21: Top US Exports to Asia by Air

Origin	Destination	Average Annual Tons	Commodity
New York	China, South Korea, Taiwan, Singapore, Japan, India	31,045	Semiconductors, data processing machines, film, strips, tanks, valves, pumps, vacuums, fans, lab equipment, chemical elements

Source: USA Trade Online. United States Census Bureau

Asian countries importing from the US and the main imported products are presented in Appendix I.2 (page 25).

As mentioned before, in our opinion, it would be difficult for Jamaica to compete for a significant and permanent share of this market. Most cargo in this market is shipped as belly cargo in direct long-haul service (wide-bodies with considerable cargo space i.e. B-777 or similar) between major gateway hubs in both continents and using dedicated freight service stopping at large midway-cargo-hubs like Anchorage or Dubai.

Air Freight US and Latin America

Latin America Exporting to the US

Not surprisingly, the United States' highest imports from Latin America are perishables with 85% of the total, since these goods require short transit times to avoid ripening and rotting before arriving at the final destination. Top country sources for US air freight imports are reflected in Table I.2-21. Miami's airport brings 93% of these goods to the US east coast because of its close proximity to source markets, with New York as the secondary airport. In 2015, air cargo from Jamaica accounted for less than 1% of US air imports. Colombia to Miami is the dominant trade pattern for air exports, with live plants and cut flowers making up almost 30% of the total imports from Latin America. Note all of the top commodities are fresh food and agricultural products, as Table I. 2-22 shows for a few select countries.

Table I.2-22: Top US Air Freight Import Volume from Latin America

Exporter	Average Annual Volume 2013-2015 (tons)	Distribution
Colombia	165,040	26%
Chile	150,576	23%
Peru	106,252	17%

Source: USA Trade Online. United States Census Bureau

To the Caribbean only, the Dominican Republic processes 17,700 tons of air cargo each year, while Jamaica processes 4,620.²³ Jamaica could capture some of this air trade to the Dominican Republic.

²³ "World Air Cargo Forecast." Boeing 2014-2015.

Mexico saw 149,632 tons of air cargo in 2013, and could be an opportunity for Jamaica’s airports to intercept some air trade to and from the Gulf region.²⁴

Table I.2-23: Top Flows: Latin America Exporting to the US

Origin	Destination	Average Annual Tons	Commodity
Colombia, Ecuador, Costa Rica, Chile	Miami	316,411	Cut flowers, fish fillets, crustaceans, mushrooms, fresh and frozen fruits, apricots, cherries, peaches, plums, corn

Source: USA Trade Online. United States Census Bureau

US Exporting to Latin America

Once again the top Latin American countries for US exports are the largest, as shown in Table I.2-24: Brazil, Colombia, and Chile. The Dominican Republic is in the top ten, while Jamaica currently is not. Paraguay receives a significant amount of US exports by air compared to maritime because it is a land-locked country and hence has greater reliance on air transport. Currently, there are no direct flights from Jamaica to Paraguay, and it is served from the hub in Panama City. If Jamaica operated a hub with direct connectivity to Paraguay, it could be in a position to capture these flows. This opportunity aligns with the LHI because currently 65% of goods exported from the US to Paraguay are the target manufactured goods that Jamaica will be able to intercept and add value to once the logistics hub is established (electric machinery, electronic devices, cell phones and parts, appliances, etc.).²⁵ On the other hand, Paraguay’s exports are primarily leather goods and animal products, which could be transported and redistributed in the region by Jamaica, but would have little value added opportunity. As of August 2016, no US carrier offered non-stop service between the United States and Paraguay, with stops in Argentina, Uruguay, Brazil, Peru, Chile, Bolivia, and Panama.²⁶ These are the air routes Jamaica would compete with to capture the US-Paraguay market for manufactured goods.

Table I.2-24: US Exports to Latin America (Top Importers)

Importers	Average Annual Volume 2013-2015 (tons)	Distribution
Brazil	113,041	30%
Colombia	60,685	16%
Chile	35,959	9%

Source: USA Trade Online. United States Census Bureau

Miami is the epicenter of air exports to Latin America responsible for 87% of air cargo. This reflects the high concentration of LAC-related businesses in Miami as well as its role as a major maritime and air hub. Products exported from the US to Latin America are similar and just as concentrated as

²⁴ World Air Cargo Forecast.” Boeing 2014-2015.

²⁵ United States Census Bureau. 2015 data.

²⁶ Export.gov. “Paraguay Country Commercial Guide.” August, 2016. <https://www.export.gov/article?id=Paraguay-Transportation>.

those it exports to Asia, with manufactured goods and machinery accounting for 58% of all exports. Vehicles and parts are also exported from the US to Latin America, but are not among the top commodities shown in Table I.2-25.

Table I.2-25: Top Flows: US Exports to Latin America

Origin	Destination	Average Annual Tons	Specific Commodity
Miami	Brazil, Chile, Colombia, Ecuador, Peru, Venezuela	64,724	Data Processing Machines, typewriters, printers, and parts of office machines, valves and tanks, transmissions, pumps

Source: USA Trade Online. United States Census Bureau.

Although the US-Latin America market is very attractive, it would be difficult for Jamaica to compete for a significant and permanent share of this market. Most cargo in this market is shipped as belly cargo in direct service from the Latin America main airports into the main hubs in the US, such as Houston, Atlanta, Miami, Los Angeles and Dallas. However, Jamaica, with its excellent location and with the planned enhanced competitive logistics services, could serve in the mid to long term as a regional distribution center for Latin America if airport infrastructure is expanded and modernized and air connectivity with the rest of the Caribbean destinations is substantially enhanced.

Air Freight Europe with Latin America Trade

Europe exporting to Latin America

Europe sends the most air cargo to Brazil, and the products are similar to those that the US exports by air: Reactors, boilers, machinery, parts, pharmaceuticals, vehicle parts, instruments, and plastics. For goods on this route that stop in Miami first, Jamaica could position itself as a similarly well located air hub that would allow shippers to avoid the strict customs and immigration regulations in the US. Similar to air cargo flows from the US, most of the high value electronics such as cell phones and car accessories are exported by air in addition to small, lightweight manufactured goods, listed in Table I.2-26.

Table I.2-26: Top Flows: Europe to Latin America

Origin	Destination	Share of Total Euro Exports to Latin America	Estimate Annual Tons*	Specific Commodity
Netherlands	Brazil, Argentina, Colombia	13%	12,060	Pulley, tackle, hoists, jacks, furnaces, telephone sets
Belgium, Germany, France	Brazil	12%	11,640	Vehicle Parts and Accessories

Source: Eurostat. *Extrapolated from monthly 2015 Eurostat data sets.

Latin America Exporting to Europe

Latin America exports much more to Europe than Europe sends to Latin America by plane, and almost all of the top products are agricultural goods that need to be refrigerated or have short

transport times. Table I. 2-27 shows that the cut flowers industry is the primary one for Latin America to Europe, and could hold potential for Jamaica if it becomes a hub with direct connections to cities near Amsterdam, for instance. The current goods exported by air from Jamaica to Europe include tubers like sweet potatoes, melons, legumes, and citrus fruit, although these only comprise approximately 3,000 tons.

Table I.2-27: Top Flows Latin America to Europe

Exporter	Importer	Share of Total Exports from Latin America	Euro from Latin America	Estimate Annual Tons*	Specific Commodity
Peru	Netherlands, Spain, United Kingdom, France, Germany	17%		38,028	Asparagus and other vegetables, Dates, figs, pineapples, avocados, guavas, mangoes
Chile	Germany, Netherlands, United Kingdom	16%		37,932	Fresh berries
Ecuador, Colombia	Netherlands, Spain, United Kingdom	17%		38,256	Cut flowers for bouquets

Source: Eurostat.

The most interesting air cargo transfer market possibility for Jamaica is the cargo flows from Central and South America going to Europe and vice versa. With the proper airport infrastructure and the support of a world-class private sector airport operator, Jamaica can in the mid- and long-term capture some of the transfer air cargo that might avoid MIA due to congestion or/and a highly regulated environment. Obviously, the passenger and cargo origin and destination in Jamaica has to be developed substantially based on the maritime connectivity and the industrial strategy been promoted by the government of Jamaica.

Asia with Latin America Trade

There is no volume or value data available on the databases consulted regarding air cargo from Asia to Latin America. From secondary sources, we note that the main Latin American airports for air cargo traveling between Asia and Latin America are San Jose (Costa Rica), Lima (Peru), Bogota (Colombia), and Buenos Aires (Argentina), and Hong Kong is the major Asian airport for these trade flows. However there are no direct flights from Asia to South America (except Sydney to Santiago) and cargo is usually routed through airports in California or Miami.²⁷ There is a trade flow imbalance, as cargo from South America to Asia is approximately 35% of that from Asia into South America.²⁸ This is likely because primary South American exports are raw materials or agricultural and therefore low in value (and not viable by air). In fact, in 2014, 33% of the South American air cargo exports were temperature controlled shipments for perishable items.²⁹ The head of the air product capacity management unit at DHL cited asparagus from Peru, flowers from Colombia and Ecuador, and fruit from Chile and Argentina as main exports to Asia, noting that these can be seasonal.

²⁷ Asia Cargo News. Carriers find significant demand in Asia-Latin America air market. December 1, 2014. <http://www.asiacargonews.com/en/news/detail?id=68>.

²⁸ Ibid

²⁹ Air Cargo World. "Cross Pollination: Asian demand rises for Latin American trade." 1 April, 2015. <http://aircargoworld.com/cross-pollination/>.

Regional Air Market

To assess the regional competitiveness for Jamaica, we focused on Atlanta, Miami, and Puerto Rico airports in the US and Panama as a fourth regional competitor. These US airports combined export 19% of total volume and 16% of the total value of US exports by air. Miami alone exported 14% of all US exports and 81% of all air cargo to Latin America in the period 2013-2015.³⁰ Notably, while Miami has a monopoly on the exports to South and Central America, Atlanta captures all other regions, with an especially high 10% of all air exports to Africa. Table I.2-28 below indicates that San Juan is not very competitive. New York could also be considered, but because only 4% of total air cargo from there has destinations to South or Central America, this analysis does not place emphasis on those airports. This section provides a cargo flow analysis, as we consider Jamaica’s potential role in global air flows, including external institutional factors such as potential desire for simpler customs requirements (as opposed to US Customs).

Table I.2-28: Distribution of Air Exports by Regional Competitors

	Africa	Asia	Australia and Oceania	Europe	North America	South/Central America
Atlanta	10%	5%	3%	6%	0%	1%
Miami	2%	1%	1%	2%	2%	80%
San Juan	0%	0%	0%	0%	0%	0%
Total All US Airports	100%	100%	100%	100%	100%	100%

Source: USA Trade Online. United States Census Bureau.

Most commodities exported by air from the US are small high value machinery such as video game consoles, pharmaceuticals, eggs, and aircrafts themselves, which can be seen in the Appendix I.2..

Air cargo Integrators in the Region

The “small parcels and courier” market in the Caribbean is thin and currently there are no major air cargo hubs in the Caribbean region established by air cargo integrators. Rather, main air cargo integrator hubs in the US are Memphis (FedEx), Cincinnati (DHL), Louisville (UPS). This “small parcels and courier” market in the Caribbean is served mainly from other regional hubs in the US and sub-regional hubs outside of the US. Regional hubs in US serving the Latin America & Caribbean market are based in Miami (Fedex, UPS and DHL), Indianapolis (FedEx), and Newark (FedEx) and the main sub-regional hubs (out of the US) are based in Panama, Queretaro in Mexico (DHL), as well as in San Juan in Puerto Rico (FedEx). We interviewed representatives of the region’s main integrators to gauge their interest in moving or establishing distribution operations in the Caribbean to Jamaica, with the following findings:

FedEx

The FedEx Caribbean cargo is managed mainly in Miami, complemented by its regional hub in Puerto Rico using a combination of belly cargo in commercial aircraft and using own freighters to specific destinations. FedEx’s current network set up is not going to change in the near future and they do not view Jamaica as a potential place to operate.

³⁰ United States Census Bureau. “USA Trade Online.”

UPS

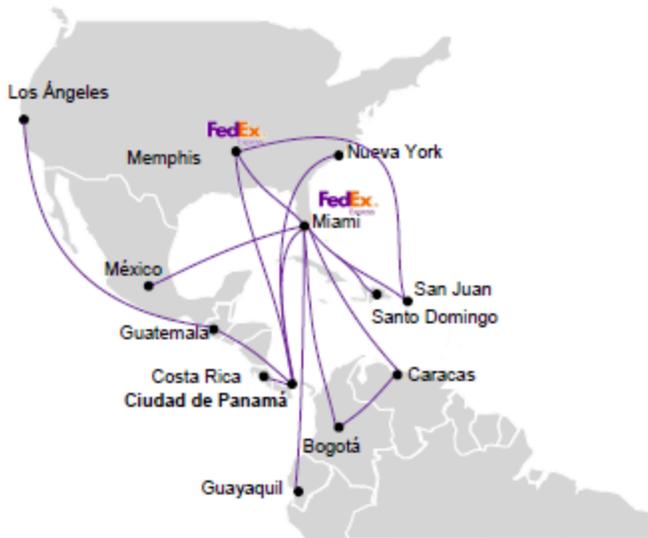
UPS is serving the Caribbean from Miami. There is no change in their current network settings to serve the Caribbean market in the short to mid term. UPS has interest in Panama but nothing has materialized to date.

DHL

DHL air operations in the Caribbean are very thin with no headquarters offices in the region. Currently, DHL has a presence in Jamaica for parcel delivery and shipping, but does not serve the market directly, nor does it engage in logistics activities there. DHL serves Jamaica indirectly through General Sales Agents (Port of Spain, Bridgetown, Aruba, Curacao and Dominican Republic). DHL's network in the Caribbean operates from Maiquetia in Venezuela through Vensecar.

Figure I.2-6: Air Freight Networks to Latin America and the Caribbean





Source: ALG Transportation Infrastructure and Logistics. Implementation of Panama maritime & logistics strategy – Phase II: Air logistics strategy for Panama. 30 May 2014.

Current Air Cargo Market in Jamaica

The top 32 items that Jamaica currently exports to Europe by air are agricultural food products, in accordance with regional trends, however the country could easily use air transport for small, lightweight manufactured items as well. Jamaica is currently exporting a few tons of textiles, cosmetics, and small machinery to the US via air cargo.

Jamaica’s Vision 2030 Plan prioritizes expansion and modernization of air transport to meet the increasing demand for air travel services. Jamaica’s economy heavily depends on international tourism and trade. Air connectivity is a fundamental element for Jamaica to compete effectively in these two markets.

To make airports more efficient and competitive, the Government of Jamaica has implemented an effective Public-Private-Partnership (PPP) policy to attract private-sector innovation, efficiency, and capital investments into the management and operation of the two major international airports in Jamaica. This policy aims to expedite the modernization and expansion of the airports by way of private sector capital and efficiencies to satisfy demands by users and support the JLHI vision statement. This policy is underpinned by the Airports Economic Regulations Act (2002), various regulations and the establishment of an economic regulator to regulate airport charges for airports designated as Scheduled Airports under the Act.

In 2003, Sangster International Airport (SIA) was concessioned to a private operator under a 30-year PPP agreement. A similar process for the Norman Manley International Airport (NMIA) is currently in progress.

Jamaica Airport System

Jamaica has an airport system of six airports that are publicly operated or owned. This system includes three international airports Norman Manley International Airport (NMIA), Sangster International Airport (SIA) and Ian Fleming International Airport and three domestic aerodromes: Tinson Pen, Ken Jones, and Negril.

Norman Manley and Sangster International Airports serve as the gateways for passengers and air cargo in and out of the country. NMIA Master Plan 2004, which guided the implementation of two phases of a defined three-phase “Capital Development Programme” was revised in 2013. This is being used to guide the capital development works, which are to be included in the proposed PPP.

The development of Sangster International Airports was guided by a master plan commissioned by the Airports Authority of Jamaica in the 1990s. MBJ Airports Limited, the private operator of SIA, commissioned a master plan study, which was completed in 2010. That master plan is currently being revised and is being used to guide the future development of SIA. A fully functional private aircraft center is situated at SIA.

Ian Fleming International Airport was officially opened in January 2011 and has the primary objective of attracting medium to small private aircraft operations, stimulating growth in the general aviation market in Jamaica, and attracting ‘high end’ tourism clientele to the north coast. Currently, the Jamaican government is implementing an expansion of the airport runway to promote direct service from selected international markets. The Tinson Pen Aerodrome (domestic operations) is situated in Kingston and caters primarily to domestic general aviation and to a lesser extent commercial traffic. There has not been any major development of this aerodrome in recent years except for the construction of several private hangars. There is considerable uncertainty about the future of this aerodrome as there are plans for its relocation to make way for a commercial distribution center associated with the Kingston Transshipment Port. No suitable alternative relocation site has been identified despite some mention of its inclusion in the development of the Caymanas Special Economic Zone.

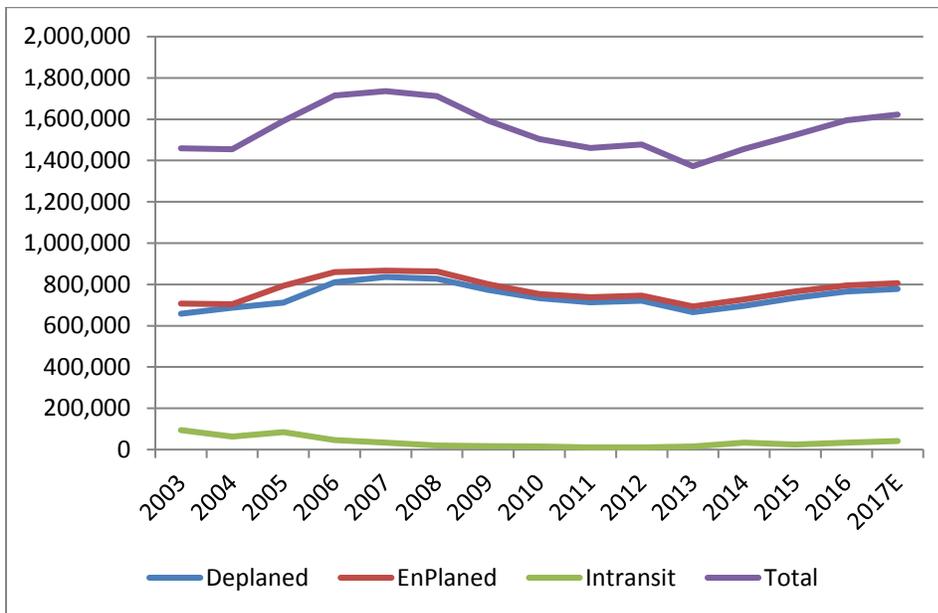
The Negril Aerodrome also has not undergone any major recent development, except for the extension and grading of the western end of the runway to provide a safety area. This aerodrome is dominated by domestic private aircraft operations with minimal commercial traffic. No master plan has been prepared for this aerodrome. The airfield is very restricted and there have been discussions about its possible relocation. Ken Jones Aerodrome experiences the lowest number of aircraft operations and passenger throughput of all the aerodromes. No master plan or significant capital works have been undertaken for this aerodrome, which handles small itinerant aircraft.

In addition, different studies for the development of Vernamfield, a former United States Air force base used during WW II, have been conducted. The Government of Jamaica has announced plans to develop a second logistics hub at Vernamfield. The principal proposal is for the development of a major cargo hub; the establishment of an aircraft Maintenance and Repair Operation (MRO) facility; and other related air cargo facilities.

Norman Manley International Airport (NMIA)

Norman Manley International Airport serves the Kingston metropolitan area and has a passenger profile that includes business travelers and “family and friends” travelers. During 2016, passenger traffic at NMIA was 1,622,530 passengers arriving or departing. Passenger traffic has grown quite modestly at a compound annual growth rate (CAGR) of 0.7 percent during the last 13 years. As we mentioned earlier in this chapter, passenger and air cargo markets must be evaluated in combination, since a relevant share of air cargo is transported in passenger aircraft as belly cargo.

Figure I.2-7: Historical Passenger Traffic at NMIA (2003-2017)



During 2016, air cargo and mail at NMIA was 12,624,074 tons, both import and export cargo. Air cargo traffic has steadily declined at a CAGR of -2.5 percent during the last 13 years. The split between cargo that is imported (deplaned) and cargo that is exported (enplaned) is balanced. In the same year, NMIA’s aircraft movements totaled 20,695, arriving or departing. Aircraft movements have steadily declined at a CAGR of -0.6 percent during the last 13 years.

Figure I.2-8: Historical Air Cargo Traffic at NMIA (2003-2017)

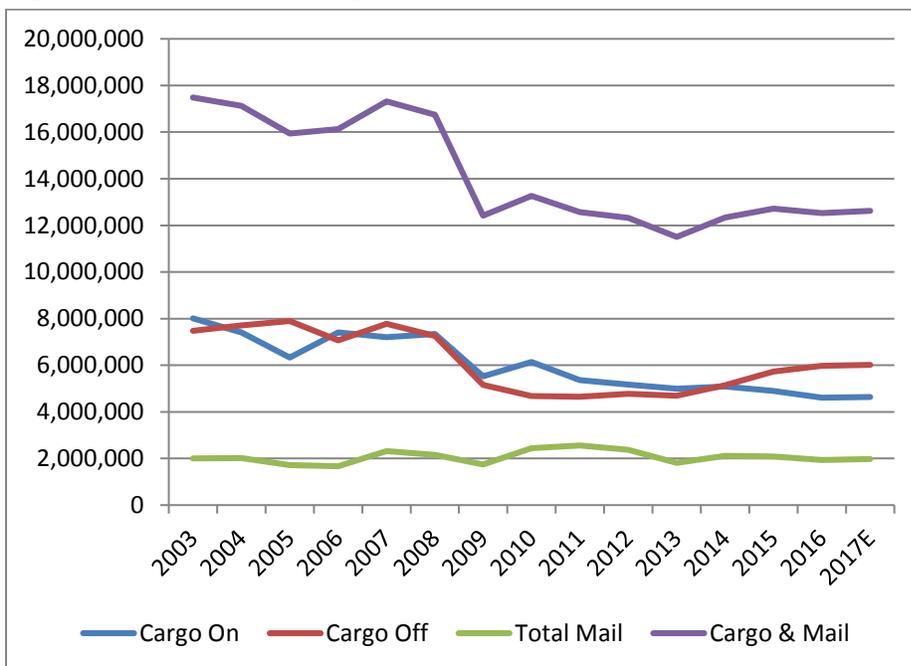
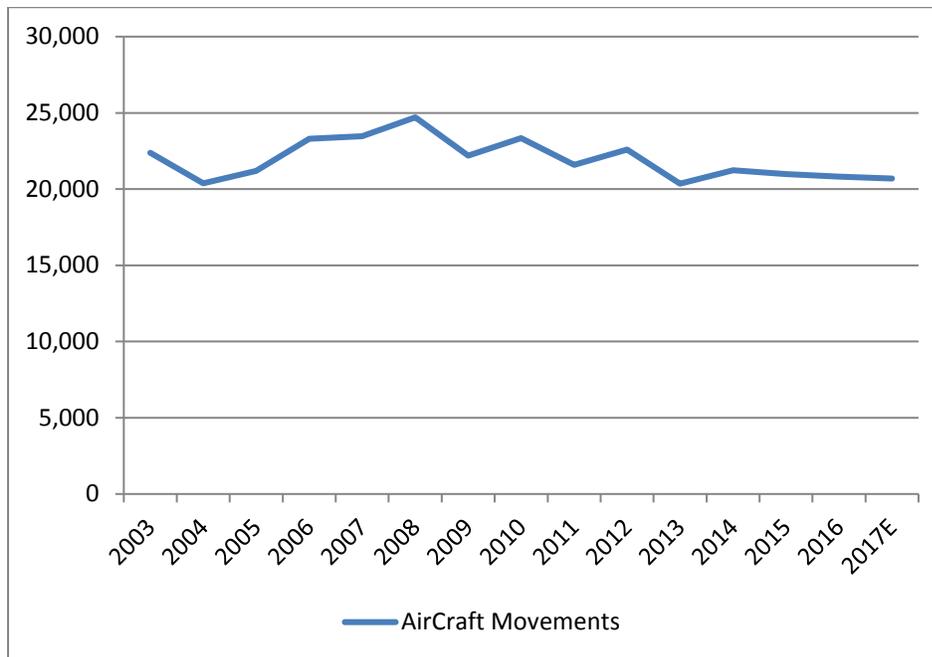


Figure I.2-9: Historical Aircraft Movements at NMIA (2003-2017)



During 2016, the most important origin/destination at NMIA was Miami with 321,894 passengers, followed by Fort Lauderdale with 321,548, and New York with 314,735 (Figure 1.2-10). These three destinations represent around 60 percent of the total traffic. The US and Canada accounted for more than 75 percent of the total traffic. The United Kingdom (London) accounted for around five percent of the total traffic. During 2016 the most dominant airline at NMIA was Jet Blue with 383,763 passengers, or around 24 percent of the total traffic, followed by Caribbean Airlines and American Airlines with 23 percent and 20 percent of the market, respectively (Figure 1.2-11).

Sangster International Airport (SIA)

Sangster International Airport serves mainly the tourism market in the northwest of Jamaica. During 2016, passenger traffic at SIA was 3,952,698 passengers, both arriving and departing. Passenger traffic has grown a CAGR of 1.63 percent during the last 13 years (Figure 1.2-12). Currently, international traffic accounts for 99 percent of total traffic.

During 2016, air cargo imports and exports (including mail) at SIA totaled 6,906,383 tons (Figure 1.2-13). Air cargo traffic has steadily grown at a CAGR of 2.2 percent during the last 13 years. Currently 90 percent of SIA exports are agricultural products, such as papaya, jams, sweet potatoes, citrus fruits, and spices, with majority of this cargo destined for US markets.³¹ While SIA is only exporting approximately 7,000 tons in 2016, a 200 percent increase is expected within the next four years according to officials in Jamaica. Part of this growth is expected to result from an expansion of the airport's 1,250 square foot cold storage facilities.

³¹ Interview of MJB Limited officials by Nathan Associates, May 19, 2017.

Figure I.2-10: Passenger Traffic Mix at NMIA by Destination (2016)

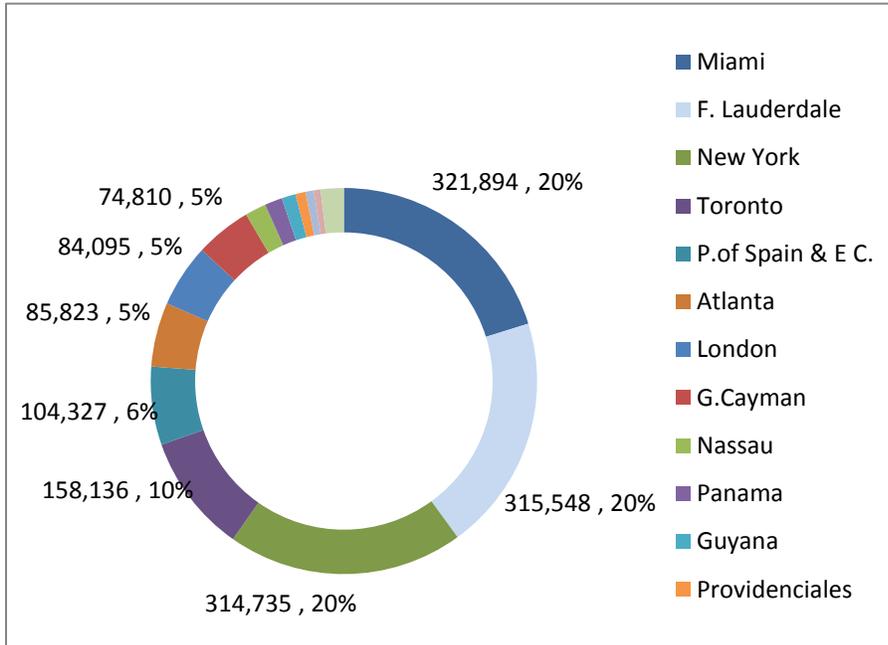


Figure I.2-11: Passenger Traffic Mix at NMIA by Air Carrier (2016)

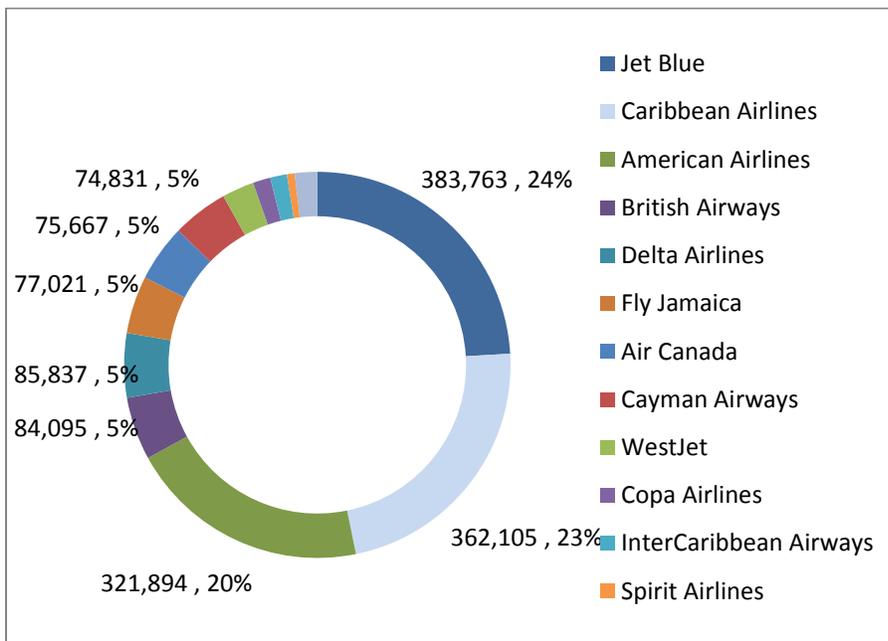


Figure I.2-12: Historical Passenger Traffic at SIA (2003-2017)

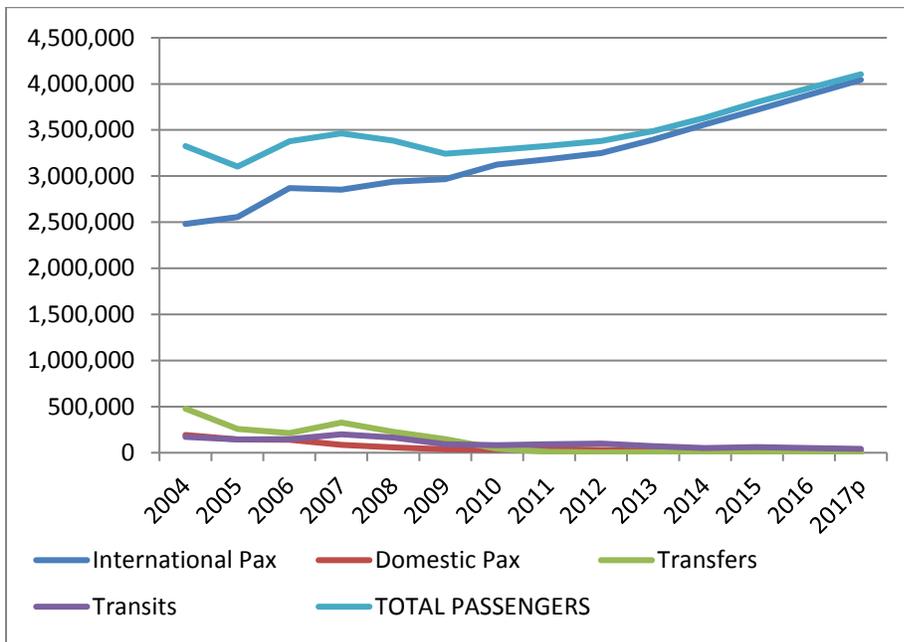
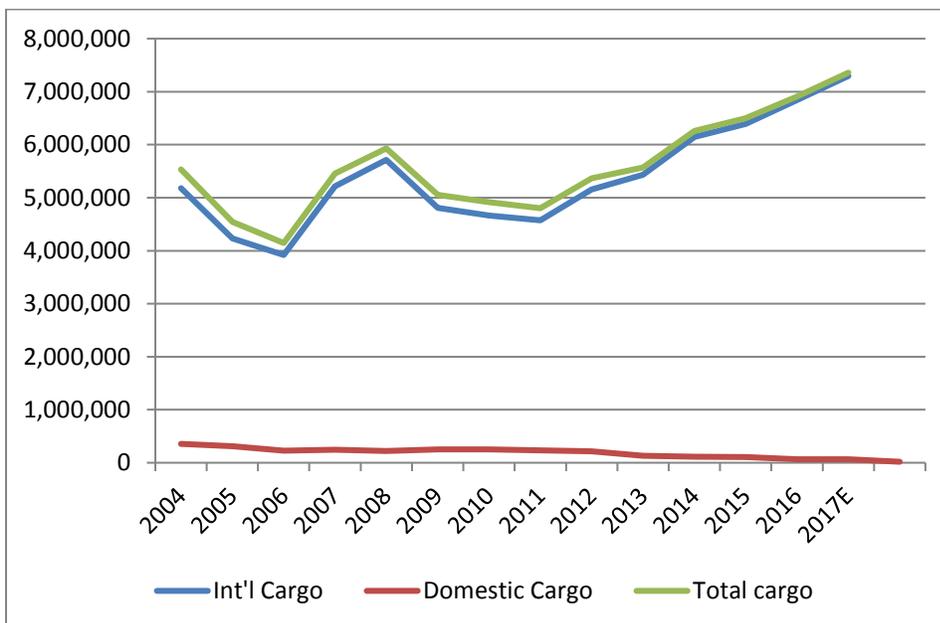
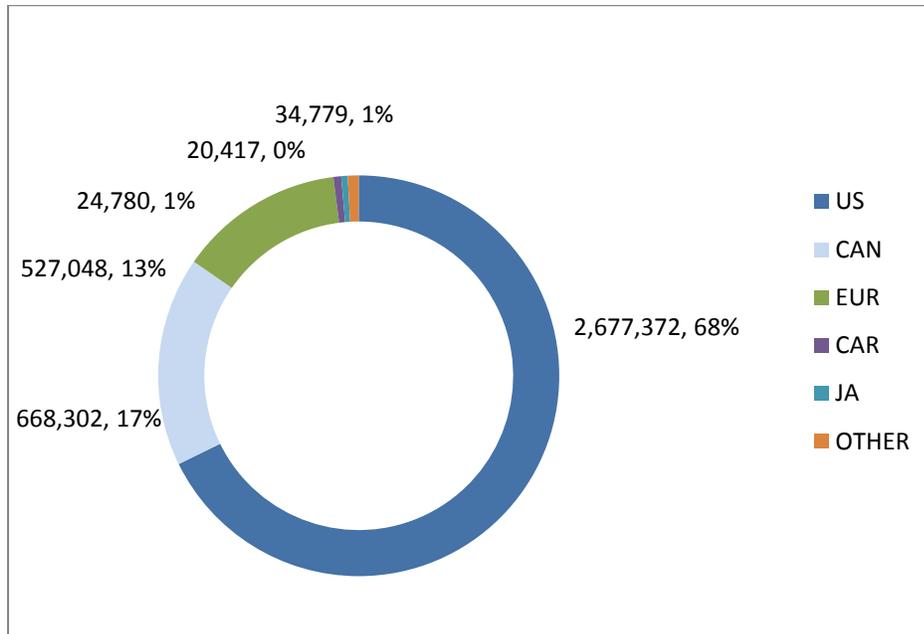


Figure I.2-13: Historical Air Cargo Traffic at SIA (2003-2017E)



As shown in Figure 1.2-14, the U.S. most important origin/destination in 2016 for SIA was the U.S. with 2,677,372 passengers, followed by Canada with 668,302. These two destinations represent around 85 percent of the total traffic. Europe accounted for around 13 percent of the total traffic.

Figure I.2-14: Passenger Traffic Mix at SIA by Destination (2016)



Air Cargo Trade Conclusions

Jamaica currently exports mostly agricultural goods by air and could in the long term intercept some light manufactured goods from Asia and Europe to distribute to the Latin American and Caribbean region (especially since there are currently very few or even no direct flights from Asia to the region). The air cargo route that should be of the most interest to Jamaica is the cargo flow from Central and South America to and from Europe. With the proper airport infrastructure and the support of a world-class private sector airport operator, Jamaica could, in the mid and long term, capture some of the transfer air cargo that might avoid Miami due to congestion and/or a highly regulated environment. Obviously, the passenger and cargo origin and destination in Jamaica has to be developed substantially based on the maritime connectivity and the industrial strategy being promoted by the government of Jamaica. In parallel, the air connectivity of Jamaica in the region has to be enhanced.

Jamaica should view Panama, Trinidad and Tobago and the Dominican Republic as models (or competitors) for air cargo services in the region. In the long term, Jamaica could become a regional distributor, but currently there are not many or any direct flights from Asia, so first Jamaica would need to attract those carriers, or at least establish a good regional connectivity to redistribute by air after receiving goods by sea. In terms of cargo routes, Jamaica is perfectly located to intercept some shipments through the region, especially those currently utilizing Miami with cumbersome US customs. However, it must be noted that air cargo is such a small volume of global and regional trade, and there are connectivity and competitiveness barriers mentioned in other sections of this report.

Jamaica is very well located to serve as a transshipment cargo hub for the air cargo moving between Latin America and Europe, avoiding the congestion and cumbersome US customs requirements at the Miami airport. With the right customs and SEZ regulations, a new air cargo hub in Vernamfield and with other LHI strategic projects and strategies implemented, Jamaica potentially can attract approximately 10 to 15% of the air cargo that moves through Miami (an additional 210,000 to

315,000 metric tons), which is equivalent to 30-45 percent of the 700,000 tons of cargo between Latin America and Europe.

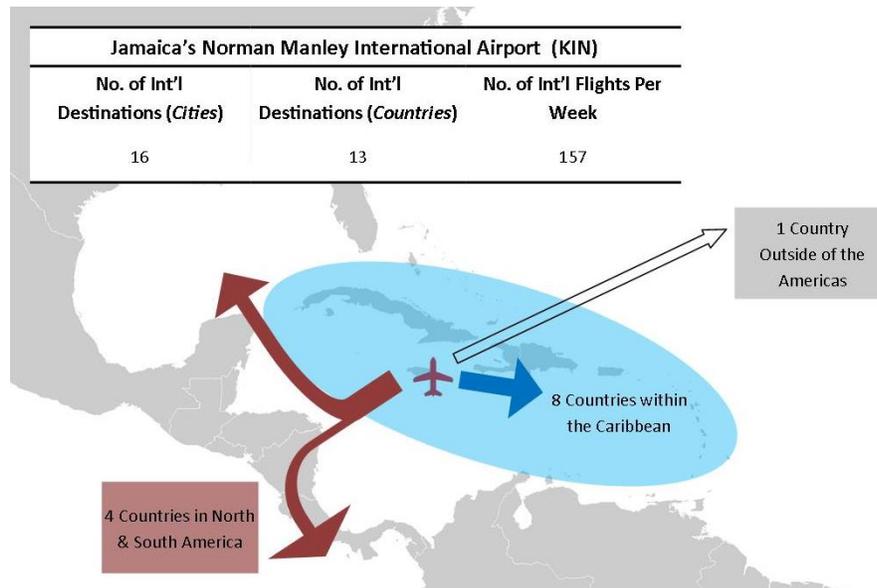
Current Air Connectivity

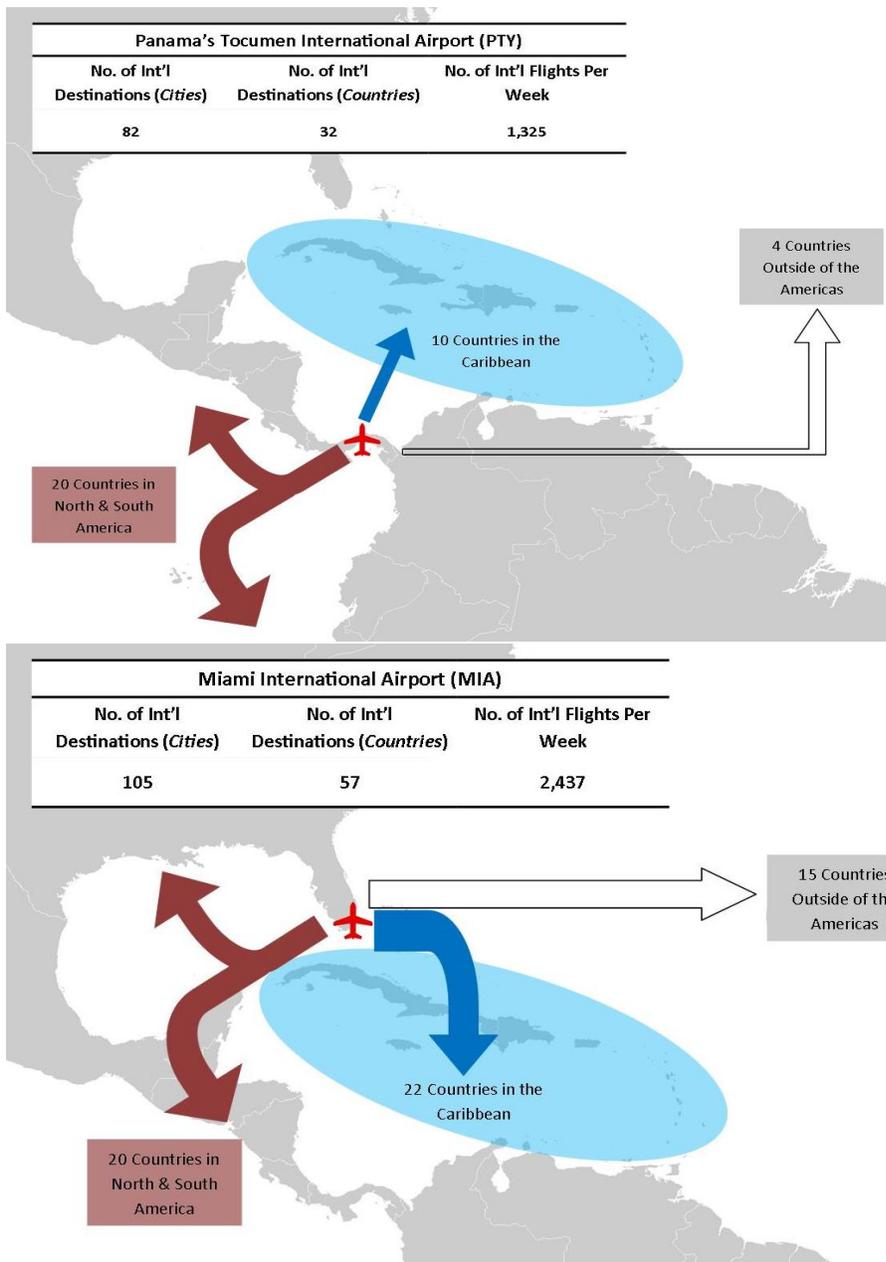
Air cargo can travel as either belly cargo using the spare area in a commercial flight’s baggage hold, or on dedicated cargo aircrafts. Therefore, commercial and cargo flight connectivity to the rest of the world is an indicator of its potential reach for air cargo. Air connectivity can be measured both by the number of flights per week from an international airport as well as the number of direct destinations from said airport.

Based on information gathered from FlightStats.com, Norman Manley, the main air cargo airport of Jamaica, has about 157 flights per week to international destinations. Those flights travel to 16 unique destinations (cities) in 13 countries. However, 8 of those countries are within the Caribbean. Compared to Panama’s Tocumen International Airport, Jamaica’s air connectivity is quite low. Panama has more than 8 times as many weekly international flights at 1,325 flights per week, to 82 unique destinations in 34 countries. Less than one third of those countries are within the Caribbean, while another 10 are within the Americas. Panama also has direct flights to four European countries: France, Germany, the Netherlands, and Spain.

Miami’s connectivity is even greater than Panama’s Tocumen Airport. There are almost twice as many international flights per week, with 2,437 flights to 105 cities across 57 countries. Miami serves as an international hub for many Latin American and Caribbean countries to connect to Europe as well as providing direct flights to Russia, Turkey, and Qatar. As seen in the Figure I.2-7, the current air connectivity in Jamaica is weak compared to its main competitors.

Figure I.2-15: Air Connectivity for Jamaica’s NMIA; Panama’s PTY; and Miami’s MIA





Source: Nathan Associates Inc. with data from Flight Stats.

The main problem is that Jamaica does not have a national flag carrier to implement a more aggressive aviation policy and, the O/D market (passenger and cargo) does not have the required economies of scale to establish a regional distribution by a non-flag carrier.

Recently, Northern Air Cargo announced four new weekly freighter charter services from the Miami International Airport to several destinations in the Caribbean using a 737-300F aircraft. Two of these flights will serve San Juan, Puerto Rico, and the island of Saint Martin in a triangular route. Another flight will serve Port-au-Prince and Santo Domingo. Another flight will serve Santo Domingo as the main airport in the Dominican Republic.³²

³² Woods, Randy. *Air Cargo World*. October 25, 2016.

Conclusion and Recommendations to Improve Air Connectivity

The Miami airport is and will be a leader in the Americas in international freight and the largest gateway to Latin America and the Caribbean for the foreseeable future. Therefore, Jamaica should not aim to compete with Miami, but instead should leverage the proximity of Jamaica to complement this important business and logistics center.

Jamaica's global logistics hub strategy relies on an efficient, reliable, and cost competitive maritime hub. A full international air cargo hub is not necessary in the short term. However, Jamaica's industrial development strategy requires efficient, reliable and cost competitive air connectivity that leverages Jamaica as a competitive location to conduct international business.

Jamaica has a very favorable and liberal set of international air service agreements; Jamaica's International Civil Aviation Organization (ICAO) ICAO Level of Effective Implementation is above the world average and is Cat 1 with the FAA.³³ From a regulatory and safety perspective Jamaica is in line or above other major airports in the region. To improve air connectivity, the government of Jamaica should expand, rehabilitate, and modernize NMIA through a BOT and sign an operating contract with a world-class airport operator/investor in the short and medium term.

Additionally, Jamaica should reserve the land at Vernamfield for future airport capacity in the long run and start a master plan that assesses the financial feasibility of the project and defines the different development phases, support planning, and promotion of the Jamaica Logistics Hub. In the long run, with Vernamfield as an air cargo hub and with the right conditions and LHI strategies in place, Jamaica can attract approximately 10 to 15% of the air cargo that moves through Miami (an additional 210,000 to 315,000 metric tons)³⁴, which is equivalent to 30-45 percent of the 700,000 tons of cargo between Latin America and Europe.

Finally, the development of a new airport should be presented as an opportunity and not as a threat to the private sector operator of the NMIA.

1.2-1 Supply of Services

Regional Port Competitors

The regional supply of container and shipping services can have an impact on the prospects for Jamaica to establish itself as a logistics hub. Below we present a brief analysis of relevant Caribbean ports that may be considered to be in either direct or indirect competition with Jamaica's ports for transshipment traffic. For the purpose of our analysis, these ports are predominantly Caribbean hub ports, which are ports through which most of the Caribbean transshipment traffic is presently handled. Our analysis includes Caribbean hub ports such as Freeport, Bahamas; Bridgeport, Barbados; Cartagena, Colombia; Caucedo, Dominican Republic; Colon, Panama; and Port of Spain, Trinidad and Tobago. Additionally, though Mariel, Cuba is not yet a transshipment hub, many in the industry expect Mariel is ideally suited to become one. Additionally, Puerto Limon, Costa Rica will have a fully functioning modernized container terminal in the near future with the completion of the

³³ "USOAP Continuous Monitoring Approach." ICAO USOAP. 2016.

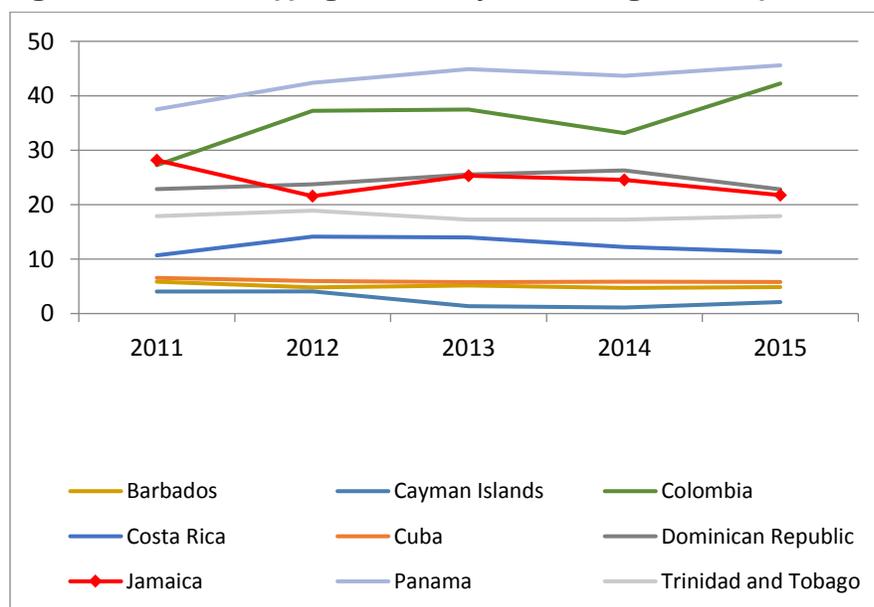
³⁴ Nathan Associates estimates.

APMT terminal there. Though this terminal is not specifically targeting transshipment trades, and in fact is prohibited from providing transshipment services, there is an effort underway to establish another terminal in Puerto Limon targeting transshipment trades. Hence, we include Mariel and Puerto Limon in the discussion below. Altogether, the review includes 15 terminals.

Liner Connectivity

A country's access to global trade is directly affected by its connectivity to other countries. The UNCTAD Liner Shipping Connectivity Index (LSCI) provides such an indicator that measures a country's access to the global liner shipping network from a scale of 0-100. The index provides an indication of the network of regular maritime transport services for containerized cargo of a country by incorporating the following measurements (a) the number of ships; (b) their total container-carrying capacity; (c) the number of companies providing services with their own operated ships; (d) the number of services provided; and (e) the size (in TEUs) of the largest ship deployed.³⁵ Figure I.2-16 shows how the LSCI has changed for the regional competitor countries in the past 5 years.

Figure I.2-16: Liner Shipping Connectivity Index of Regional Competitors



Source: UNCTAD Liner shipping connectivity index

Jamaica's index has declined slightly over the past 5 years, whereas the ranking for Colombia and Panama have both increased and surpassed Jamaica's connectivity. Currently, Jamaica and the Dominican Republic both score very closely, making it a close competitor to Jamaica for maritime services. Both countries have continued to have greater connectivity than Trinidad and Tobago, Costa Rica, Cuba, and Barbados, though Costa Rica's may expect an increase in its connectivity after the ongoing terminal development project is completed.

³⁵ UNCTAD. "Review of Maritime Transport 2015. UNCTAD/RMT/2015. Geneva, 2015.

Table I.2-29 provides some basic port characteristics and capacity details for the regional competitor ports. The data are compiled from various sources, especially port authority websites and previous consultant studies.

Table I.2-29: Regional Port Characteristics at a Glance

Port	Terminal	Berth Length Total (m)	# of Berths	Draft (m)	#STS	#RTGs	#MHC	Total Terminal Area (h)	Current Capacity (m TEU)
Freeport, Bahamas	Freeport Harbour Company	2,501	6	9.14 - 16	10		2	49	1.5
	Freeport Container Port (FCP)	1,036	3	16	10		1	57	1.5
Bridgetown, Barbados	Bridgetown	767	5	11	1		1		
Cartagena, Colombia	Manga Terminal	540		13.1	7		5	45	1.5
	Contecar Terminal	970		16.5	12	60		86	2.5
	Compas (El Bosque) Terminal	330		10.7	1		2	22	0.75
	Puerto Bahia	300		20				155	0.60
Moin/Limon, Costa Rica	Terminal Limon	1,662	3	10				27	
	Terminal Moin	993	3	11.5				16	
Mariel, Cuba	TC Mariel	702		15	4	12		54.9	0.82
Caucedo, Dominican Republic	Caucedo DPW	922	3	15.2	7	24	2	50	1.25
Kingston, Jamaica	KCT	2,310	3	13.5 - 15.2	14			194	4
	KWL	1,655	9	9.0-13			4	35	1.5
Colon, Panama	Colon Container Terminal	982	3	14-15	10	30		160	1.3
	Cristobal-Panama Ports Company (PCC)	1,846	7	13.5 - 15.8	11	36		143	1.5
	MIT	2,500	9	14 - 16.5	19	24		52	4
Port of Spain, Trinidad & Tobago	Port of POS	1,500	8	11.5	4	14	1	142	

Source: Nathan Associates Inc., gathered from various sources

Freeport, Bahamas

Freeport, Bahamas is the closest Caribbean port to the US, located about 105 km from Palm Beach and 170 km from Miami Florida. The port includes two port terminals in the dredged harbor: the Freeport Container Port (FCP), which is a major transshipment terminal, and the Freeport Harbour

Company, a small domestic and cruise terminal. Freeport, with its deep draft, is already handling Post II ships.

FCP is part of the Grand Bahamas Port Authority Limited (GBPA), a private corporation that acts as a municipal authority for the 526 square kilometer free port area, including the City of Freeport, an international airport and a free trade zone. GBPA was established in 1955, and the agreement required the dredging of a deep-water harbor at Hawksbill Creek in the western sector of the port area. FCP was originally planned as a pure transshipment hub since there is almost no domestic cargo due to the Bahamas' small population.

The agreement also conveys to the port area the status of a "free port" with substantial tax concessions for financial, commercial and industrial enterprises, including exemptions from:

- ▶ Customs duties for the import of goods into the port area other than for personal use;
- ▶ personal property taxes or rates, capital levies or gains taxes, and real property (land) taxes until 2015 (and have since expired); and
- ▶ income taxes, excise taxes, certain export taxes and stamp duties on certain transactions.

Recent news from May 2016 reports that Mediterranean Shipping Company (MSC) is in talks to acquire the GBPA.³⁶

Bridgetown, Barbados

The Port of Bridgetown in Barbados is a deep water harbor located on the southwest coast of Barbados. It is a popular mega cruise ship destination and serves as the home port for many British-based cruise ship lines, although recent investments in equipment have also increased the port's cargo handling capabilities.

In 1998, Barbados commissioned a new port master plan, which included the recommendation for the construction of a new cruise pier to separate cruise and cargo operations. Currently, of the 5 berths at the port, 3 of them are equipped to handle containers.

Cartagena, Colombia

Cartagena Bay is a large harbor, fully protected from the sea, with more than 18 meters of natural depth. There are several terminals operating in the area, including four terminals that handle containers.

The Port of Cartagena's main operator is the Sociedad Portuaria Regional de Cartagena (SPRC). SPRC is a private company, which operates two container terminals in Cartagena Bay, the Magna Terminal and the Contecar Terminal, along with distribution centers, and other maritime-related businesses.

SPRC was created by a group of local business people who, in 1993, won a 40-year concession from the National Port Authority to operate the Manga Terminal, an old, general-cargo facility with a finger pier later expanded and converted to an integrated container terminal. In 2005, SPRC purchased its

³⁶ Container News. "NSC to Buy Grand Bahama Part." <http://container-news.com/msc-to-buy-grand-bahama-port/>

second terminal, Contecar, located about 10 kilometers from Manga. Cartagena serves both a regional transshipment hub as well as handling a substantial domestic volume. Cartagena is the regional hub for Hamburg Sud (HSD) and to a lesser extent CMA-CGM and HLD. These three lines account for more than 80 percent of SPRC's volume, with the remainder split among Maersk, MSC, Evergreen, Marfret, King Ocean and others. Although original development plans were slated to be completed in 2016, SPRC has slowed investment due to the potential for weakening demand in the future, despite the pending expansion of the Canal. Apparently, they do not expect a game changing scenario following the Panama Canal's expansion.

The Compas Terminal in Cartagena (formerly known as Muelles El Bosque) is a small multi-purpose terminal located on an island across the bay from Manga, and is connected to land via a short causeway. The concession to the site is held by Compas, a Colombian company also involved in marine terminals in the US and Panama. In 2015, Compas and APMT, a sister company of Maersk Line, signed a joint venture agreement to invest US \$200 million in upgrading and expanding the terminal. The main shipping line calling Compas El Bosque is Seaboard Marine.

The Puerto Bahia Multimodal Terminal began operation in 2015. It is owned by the Colombian-based Pacific Infrastructure Ventures, in which the Canadian Pacific Exploration & Production Corp owns a large stake. The present site includes an oil terminal and a multipurpose terminal with a total terminal area of 155 hectares, although only a small portion of it is currently developed. While as a multipurpose port it will have container handling capacity, the focus of the port is on liquid bulk operations. The 20-meter deep access channel provides the capacity to handle Suezmax tanker ships.

Moin/Limon, Costa Rica

Costa Rica's port area, located on the Atlantic, includes the two terminals of Limon and Moin and serves as the country's main export gateway. Unlike Costa Rica's port on the Pacific (Caldera), which handles mostly imports, the main cargo at Moin and Limon is Costa Rican exports, especially containerized fruit to the US and Europe.

In 2011, APM Terminals Moin S.A. signed a contract with the Government of Costa Rica to design, finance, construct, operate and maintain the Moin Container Terminal (Terminal de Contenedores de Moin - TCM) on a greenfield site located on the Caribbean coast, close to the existing Limon-Moin port complex. This project is currently under construction and expected to be completed by 2018. The APMT contract allows only the handling of domestic cargo and bars APMT from handling transshipment. The transshipment traffic is targeted by another group, America's Gateway Development Corporation (AMEGA), which is proposing the construction of a "pure transshipment port" (PTP) at a different site in the Moin area.

Mariel, Cuba

The container terminal in Mariel, located on a small city 45 kilometers west of Havana, was inaugurated in January 2014. The development of this terminal was the result of a recent change in Cuba's law to allow foreign private investments. Accordingly, the terminal was constructed by Grupo Odebrecht, a large Brazilian consortium, which is also involved in the construction and ownership of Embraport, a large container terminal in Santos, Brazil. The construction of Mariel is financed by a \$680 million loan of the government of Brazil given through its development bank (BNDES), and operated by Singapore's PSA International.

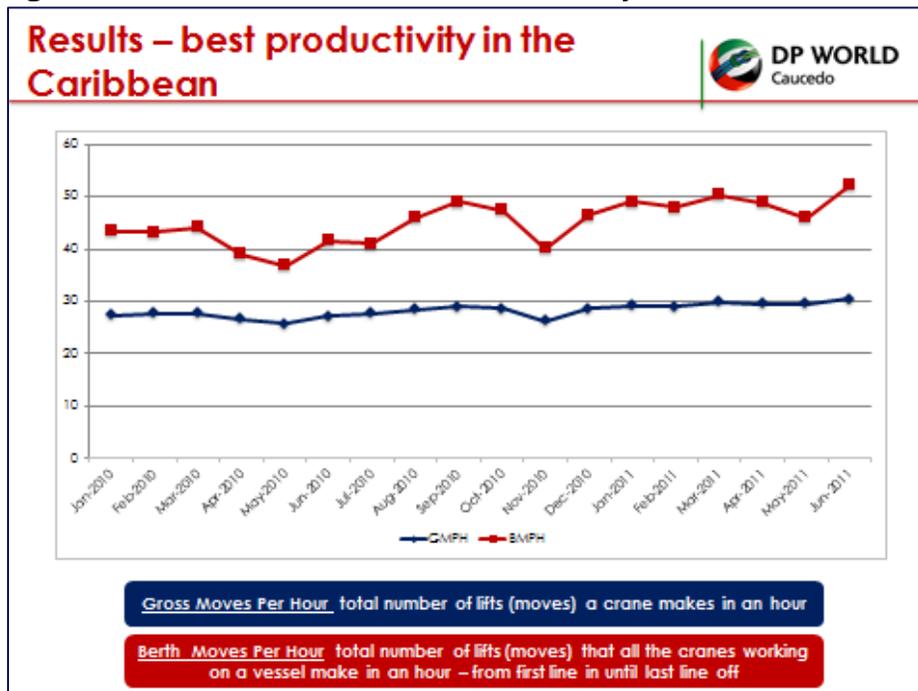
The first phase of the new port includes a 700-meter terminal, 15-meter channel, and a handling capacity of 1 million TEUs. The port is part of a larger \$900-million, 466 square kilometer Mariel Special Development Zone.

Thawing commercial and political relations between the US and Cuba in recent years provides TC Mariel an opportunity to realize its potential as a regional transshipment hub, that until recently was restricted due to embargo-related restrictions on vessels that called Cuban ports.

Caucedo, Dominican Republic

Caucedo is a private container terminal operated by Dubai Port World (DPW). The terminal is located 25 kilometers east of Santo Domingo near the international airport and adjacent to a large Free Trade Zone. It is a modern, well-planned terminal, which began operations in December 2003. It has an international reputation as one of the most efficient ports in the Caribbean. JOC Port Productivity 2012 listed Caucedo with berth productivity of 41 moves per hour (Figure I.2-17).³⁷

Figure I.2-17: Caucedo's Crane and Berth Productivity



Source: DP World

Potential expansion plans include extension of the main dock, adding a 300 m dock and resulting in a total berthage of 900 m. The depth alongside the new extension will be 16 m, sufficient for handling Post II ships. Although no official plans have been drawn yet, a second 300-m extension can be developed, bringing the total berth length to 1,200 m.

³⁷ JOC Port Productivity ranking is based on shipping lines reports and it is an average of all ship and call size.

Colon, Panama

In Colon, off Panama's Caribbean coast, there are several container and multipurpose port terminals. The Manzanillo International Terminal (MIT) (Figure I.2-18), owned and operated by Stevedore Services of America (SSA), is the largest terminal on Panama's Atlantic Coast located near the Panama Canal's north entrance. Built on a former US Naval base and began operations in 1995, it was originally designed as a storage facility and distribution center of primarily Russian vehicles for Latin America and hence focused on ro-ro shipments.

The terminal has since grown to handle mostly transshipment traffic, complementing the public Port of Cristobal, which focuses on domestic traffic. The terminal is adjacent to the Colon Free Zone and connected to it via a special gate. MIT also is located nearby an intermodal rail yard, serving the double-stack rail service for containers between Colon and Balboa. Future expansion plans for MIT include the construction of a new north dock estimated to be about 700 meters and a west dock estimated to be 200 meters with a 16.5-meter depth alongside. No details are available yet about this terminal although it is understood that the north dock is designed for handling NPX ships. MIT is presently serving as a regional hub port for Maersk Line, HLD, CMA-CGM, Zim, Seaboard and other lines.

Figure I.2-18: MIT



Source: <http://logistics.gatech.pa/en/assets/seaports/manzanillo-international-terminal>

The Colon Container Terminal (CCT) (Figure I.2-19), like MIT, is a private terminal operated by Evergreen Group, a group of companies that also includes Evergreen Line, the world's fourth largest shipping line. The concession was granted in 1996 and the terminal began operation in 1997 after an initial investment of \$110 million.

Figure I.2-19: Colon Container Terminal



Source: <http://logistics.gatech.pa/en/assets/seaports/colon-container-terminal>

The Cristobal-Panama Ports Company (PCC) terminal (Figure I.2-20) is located at the site of the historic Cristobal Port, adjacent to the entrance to the Canal. The concession to operate Cristobal and Balboa was granted in 1997 to Hutchison Port Holding (HPH), the second largest port operator worldwide. There are several possible expansion plans that are being considered, including new terminals on the east and south side, or to fill the water areas between the finger piers and create a

Figure I.2-20: Cristobal-Panama Ports Company (PCC) Terminal



Source: <http://logistics.gatech.pa/en/assets/seaports/cristobal>

large terminal. Cristobal is currently serving MSC almost exclusively, although it also handles HSD, which has joint services with MSC.

Port of Spain, Trinidad and Tobago

The Port of Port of Spain (POS) is essentially government run as a business unit of the Port Authority of Trinidad and Tobago. The port is accessed via Grier Channel, which creates certain restrictions on ship size due to navigation restraints on ship turns. The road access to the port is through the main access road to the capital city of Port of Spain, creating traffic and congestion delays for trucks entering and exiting the port during rush hours. The total marginal berth length of the port is about 2,000 meters, but part of this length is already taken by the Hyatt Hotel and the Water Taxi Service, leaving about 1,500 meters for cargo handling. Of the 8 berths at the port, only three are able to handle containers.

Recently, the POS completed an upgrade and maintenance project to improve the reliability of its crane equipment. In 2015, the port also began to call ships from the Hyndau Glovis Line, a ro-ro line taking advantage of POS's 3,300 vehicle storage area.

1.2-2 Recommendation to Leverage a Transshipment Hub

Background and Methodology

Transshipment traffic is highly competitive and notoriously volatile. Forecasting transshipment traffic triggered by the Canal's expansion is especially difficult because transshipment traffic is generated by restructuring of shipping services. For the more traditional transshipment hub and spoke pattern, transshipment traffic is commonly forecasted as a fraction (incidence) of the gateway traffic. In the case of restructuring shipping services, each shipping line has its own service network and its own strategy regarding future developments, which lines usually keep confidential. Hence, the main analytical tool we employ here is the definition and analysis of a series of future hypothetical service restructuring schemes which, based on our experience, appear the most likely.

The main data source is a comprehensive compilation of data on the shipping lines involved in the Caribbean Basin, their various services, service route maps and ports of calls, and capacity of ships deployed on them. The compilation, mainly based on lines' published schedules, was a difficult undertaking, since the same services were listed by several lines under different names. Additionally, shipping services are constantly changing, especially now as the expanded Canal becomes operational. A secondary data source is a series of interviews with shipping lines and port operators, some on a confidential basis, exploring insight underlying shipping lines' decisions related to deploying new services and, especially, selecting hub ports. Appendix 1.2 (page 30) describes the primary carrier service patterns relevant to the Caribbean and the expected, the likely feeder service patterns relative to transshipment, the potential for expanding hub and spoke services, and the possibility of service consolidation in view of the Panama Canal expansion.

Present Caribbean Services

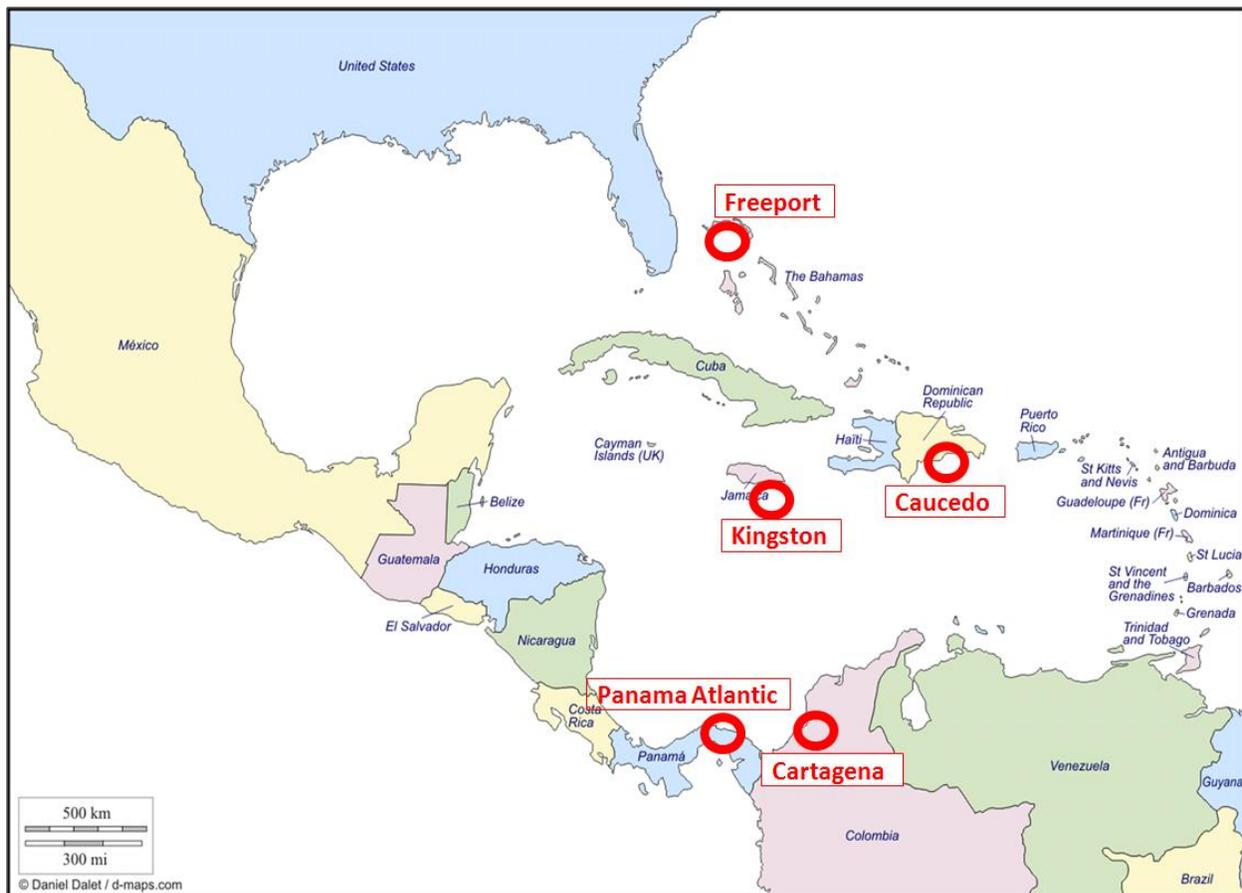
Caribbean Specialist, Cross-Caribbean and Feeder Services

Figure 1.2-21 identifies the location of the Caribbean region's five main transshipment hub ports. The shipping services that handle the Basin's various maritime trades, the focus of this study, can be categorized into three groups:

- ▶ **Through-Caribbean** – Global services connecting world regions *outside* the Caribbean, but since their route passes through the Caribbean they also can serve the Caribbean trades via way-port calls;
- ▶ **Caribbean Specialist** – Services connecting the Caribbean Region and regions outside it; and
- ▶ **Intra-Caribbean Feeders** – Shorter services within the Caribbean Region mainly supporting the Through-Caribbean services but also handling the trades among the Caribbean countries.

The difference between the three groups can be shown by a simple example. The Asia/Caribbean trade is currently handled by: (a) an Asia/ECNA service via Panama (All-Water Panama) stopping en-route at a Caribbean way-port and, if necessary, using Intra-Caribbean Feeder; or (b) a Caribbean Specialist long-range service between Asia and the Caribbean Basin that calls directly at several ports in the Basin Region and, if necessary, also using a Feeder. The relationship between these two alternative service patterns is one of the most critical issues in our analysis.

Figure I.2-21: The Caribbean Basin and its Major Hub Ports



Overall Capacity, Market Share and Caribbean Hubs

East/West through Caribbean Services

Figure I.2-22 shows a comprehensive list of all the Asia/ECNA and Asia/GCNA, also defined as All-Water Panama (AWP), including the name(s) of services, ships deployed and ports of call in the Caribbean Basin. These services account for the largest traffic flow through the Canal and the

Caribbean Basin. All AWP services, with the exception of Zim, are provided by shipping line alliances. Accordingly, the Figure is divided first by alliance and, within each, according to the two main patterns: Asia/ECNA and Asia/GCNA (shaded in grey). It should be note that not all the services follow precisely these two patterns; some services combine both coasts in a single Asia/GCNA/ECNA pattern and others also include extension to WCNA and North Europe. The latter are sometimes called "pendulum" because of the shape of their route.

As seen in Figure I.2-22, there are 14 services that transit the Panama Canal on their way to NAEC and NAGC, with a total nominal capacity of about 85,000 TEUs/week. The Asia/NAEC services dominate, with a total of 11 services and 71,000 TEUs/week (83%). Only 5 of the services are already provided by post-Panamax vessels, the largest of which is 10,000 TEUs.

Figure I.2-22: East/West Through-Caribbean Services

	Alliance	Route	Service Name	Ships	Caribbean Ports						
					Mnz	Chrs	Cln	Ctg	King	Cau	Fpt
1	CKYHE	Asia/ECNA	AWE1	10 x 6,500							
2		Asia/ECNA	AWE3	10 x 8,500			1				
3		Asia/ECNA	AWE4	11 x 8,500							
4		Asia/ECNA	NUE	10 x 8,500			1, 3				
5		Asia/GCNA	GME/AWT	9 x 4,375		1					
6	G6	Asia/WCNA/ECNA/Eur	PA1	14 x 4,887	1						
7		Asia/ECNA	PA2	10 x 4,847	1, 3						
8		Asia/ECNA	NYX	10 x 10,000	1, 3						
9	Ocean Three	Asia/ECNA	AAE3, Manhattan, AUC2	10 x 4,152							
10		Asia/GCNA	PEX3	11 x 5,064	1						
11		Asia/ECNA	Vespucci, APNE, NEU1	15 x 4,225			1, 3				
12	2M	Asia/ECNA	TP10, Amberjack	10 x 4,432							1
13		Asia/GCNA/ECNA	TP18, Lone Star	10 x 4,700							
14	Zim	Asia/ECNA	ZCP	11 x 4,989					1, 3		

Mnz = Manzanillo, Chrs = Christobal, Ctg = Cartagena, King = Kingston, Cau = Caucedo, Fpt = Freeport, Cln = Colon

CKYHE = Cosco, K-Line, Yang Ming, Hanjin, Evergreen

G6 = APL, Hapag-Lloyd, HMM, NYK, OOCL

Ocean Three = CMA-CGM, Cosco, UASC

2M = Maersk, MSC

Way-Port Calls at Caribbean Hubs

By definition, all the 14 AWP vessels sail through the Caribbean Basin. However, only ten out of the 14 services also stop in the Caribbean Basin, of which 7 stop at Panama's Atlantic hubs, including 3 services that stop in Panama both eastbound and westbound. Cartagena has one AWP service, Freeport one and Kingston one – by Zim. CMA-CGM is calling at Kingston and four additional Caribbean ports with its Asia/Caribbean Specialist service (see below), but not with its AWP. It is interesting to note that all AWP services stop only at a single port in the Caribbean Basin. Our conclusion is that there is a strong preference among lines to use as their Caribbean hubs the Canal or near-Canal location (Cartagena).

Shipping Lines Alliances

Figure I.2-23 provides a breakdown of AWP services by four multi-line alliances. As seen there, the CKYHE has most of the services and account for about 40% of the slots; the G6 is second, with

about 23%, followed by Ocean Three with 16% and 2M with 11%. The Figure also demonstrates that Zim's³⁸ AWP service is not controlled by shipping alliances. However, these alliances control all the East/West shipping services, including the Asia/North America, Asia/Europe and Europe/North America. Figure I.2-23 provides a schematic illustration of the present and future composition of these alliances. As seen there, the number of alliances starting April 2017 will be reduced from 4 to 3 following an extensive reshuffling of shipping lines. A similar effect, driven by the slowdown in the shipping market, can occur from further mergers and acquisitions, with the smaller lines folding into the larger ones. CMA-CGM, the shipping line at the center of this study, has recently completed its purchase of APL and will be the dominant line in the Ocean Alliance. Cosco also completed its

Figure I.2-23: Restructuring of Shipping Line Alliances of East/West Trades

TODAY			
2M	OCEAN 3	G6	CKYHE
Maersk	CMA CGM	APL	COSCO
MSC	China Shipping	Hapag Lloyd	"K" Line
	UASC	Hyundai	Yang Ming
		MOL	Hanjin
		NYK	Evergreen
		OOCL	

STARTING APRIL 2017			
2M	OCEAN Alliance	THE Alliance	Possible THE Alliance members
Maersk	CMA CGM+APL	Hapag Lloyd	UASC
MSC	China Shipping+COSCO	MOL	
	Evergreen	NYK	
	OOCL	Hanjin	Hyundai
		Yang Ming	
		"K" Line	

merger with China Shipping, with the combined line adopting the name Cosco, though Cosco has limited involvement in the Caribbean Basin trades. Evergreen is involved in the Caribbean Basin trades, including having its own, recently-expanded Panama Atlantic terminal, CCT. OOCL is much smaller than the other 3 alliance members and has almost no involvement in the Caribbean trades.

Another recent shipping change is that HSD, the main customer of Cartagena, was purchased by Maersk (part of the 2M alliance). CMA-CGM is the main member of the Ocean Alliance with the other members include China Cosco Shipping, Evergreen Line and Orient Overseas Container Line. The Ocean Alliance is the largest alliance in the transpacific trade and the main generator of transshipment for Kingston. Another change is the announcement of service network of the alliances incorporating the expansion of Panama Canal. The line compositions of the alliances that control the East/West trade lanes are different than that of the vessel sharing agreements or joint-

³⁸ The recent rumor is that Zim is considering joining the 2M alliance.

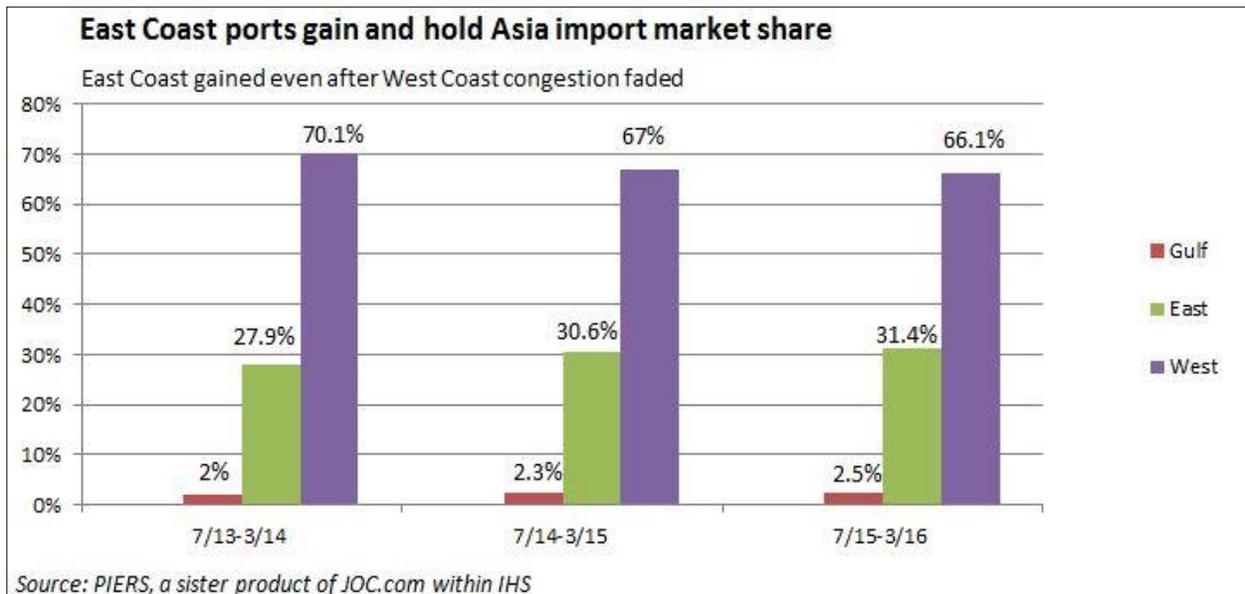
service arrangements controlling the North/South trades. This is a major obstacle for the integration and intersection of East/West and North/South services which, in turn, could create massive transshipment traffic at the respective hubs. Such integration should not be ruled out in the long term. It is quite likely that following further merger and acquisition of shipping lines, the alliances will be expanded to include the main East/West and North/South trade lanes. An in-depth review of the structural change in the worldwide shipping market is beyond the scope of this study; suffice it to note the overall trend of further concentration which, as discussed later, will also lead to further concentration in the choice of regional hubs.

Canal Expansion Impact: All-Water vs. Intermodal Routes

The AWP, as noted above, is the largest service pattern that sails through the Caribbean in terms of ship capacity. As the Asia/Caribbean trade, handled by the AWP services, is the largest generator of transshipment in the Caribbean hubs, especially Kingston, this service pattern warrants a more elaborate assessment. The AWP is primarily designed to handle the trade between Asia and North America, mainly the US East and Gulf Coasts. The Asia/Caribbean portion of the trade is estimated to only account for about 7 - 8,000 TEUs/week or about 10% of the total service capacity. Accordingly, the Asia/Caribbean trade has little impact on the future deployment of AWP services. The future development of the AWP will mainly be influenced by the competition it faces from the two other service patterns that serve the Asia/ECNA trade: All-Water service through the Suez Canal (AWS) and the water/rail service through North America's Pacific Coast, defined as "Intermodal" because of its use of rail transportation. This section addresses the competition between the two all-water service patterns and the Intermodal; the next section addresses the competition between the two all water options, including AWP and AWS.

Figure I.2-24 illustrates the market share of the two All-Water services handling Asian trade through the East and Gulf Coasts vs. the Intermodal option, noted in the figure as West Coast. As the figure shows, there was a slight shift away from Intermodal to All-Water following last year's labor unrest. However, more recent data from the same source suggests that US import market shares have returned to their pre-labor unrest normal. It is logical to assume that this normal, meaning 2/3 Intermodal vs. 1/3 for the All-Waters, will be maintained in the future. The Intermodal route has a much shorter transit time (7 - 10 days, depending on gateway port and hinterland destination point) and higher cost; it is geared toward handling time sensitive cargoes, for which its market share is secured. Moreover, the reduction in cost on the All-Water Asia/ECNA route following the increase in ship size enable by the Panama Canal expansion will be offset by an increase in ship size on the Asia/WCNA and the related Intermodal route as indicated by CMA-CGM's recent effort to deploy 18,000-TEU ships calling Los Angeles and Oakland. Another change favoring the Intermodal pattern is the increase in tolls in both the Panama and Suez canals following their expansions.

Figure I.2-24: The Market Share of US West, East and Gulf Coast of Asian Import



Canal Expansion Impact: All-Water Panama vs. Suez

The main competition and the main shift in market share following the Panama Canal expansion is likely to be between the two All Water service patterns. This shift, already begun, is triggered by the larger dimensions of the third locks allowing the deployment of post-Panamax ships on the AWP, matching those already deployed on the AWS. It seems though that the change in ships deployed on AWP will take an additional 1 - 2 years to complete.

The previous Figure I.2-21 provided an updated list of all the AWP services. As shown there, only one alliance has already completed the deployment of post-Panamax ships on all its AWP service, namely the CKYHE. Figure I.2-25 presents the results of our analysis of CKYHE Asia/ECNA All Water services pre- and post-expansion. As seen in this figure, the Panamax, averaging 4,500 TEUs of the Panama have already been replaced with post-Panamax ships of mainly 8,500 TEUs. Ships of 8,500 - 10,000 TEUs are commonly defined as Second Generation or PPX2. The increase in ship size was accompanied by a reduction in the overall number of the alliance services from 6 to 5, the result of reducing the number of AWP services from 3 to 2.

More interesting perhaps is the change in the relative Panama/Suez shares of slot capacity. The AWP pre-expansion weekly capacity of 18,272 TEUs increased to 23,500 TEUs in the post-expansion, or by about 28%, while the AWS remained unchanged. Accordingly, the share of AWS rose from 52% to 58%. The increase in market share of 6% is meaningful, but not the dramatic "game changer" that many experts predicted following Suez Canal expansion.

Figure I.2-25: Impact of Panama Canal Expansion on CKYHE Services

Service Name	Pre-Expansion			Post-Expansion			Comments
AWE1	Pan	9	4,954	Pan	10	6,500	Wilmington
AWE2	Pan	10	4,489	Terminated			Boston
AWE3	Pan	10	4,412	Pan	10	8,500	Colon EB, Cape Return
NUE	Pan	10	4,417	Pan	10	8,500	Colon EB+Wb
Total Weekly Capacity			18,272				23,500
Share			0.52				0.58
AWE4	Suez	10	8,500	Suez	10	8,500	Boston, Cape Return
AWE8	Suez	10	8,500	Suez	10	8,500	Panama Return
Total Weekly Capacity			17,000				17,000
Share			0.48				0.42

Among other alliances, only the G6 has announced a modification of its All Water services, limited to only one AWP service. The Ocean Three alliance, where CMA-CGM is its main member, seems to be taking a wait-and-see attitude, which can be partially explained by the pending integration of CMA-CGM services with APL and the pending reshuffling of its alliance affiliation as illustrated in Figure I.2-23. The 2M and Zim still operate Panamax vessels on all their AWP services. Most recently, Maersk announced its intention to re-direct one of its AWS, TP 11 or TP 12, to AWP.³⁹ Based on discussions with alliance representatives, it seems that all are likely to follow the steps of CKYHE, but at a slower pace.

Change in Ship Cost

There are two reasons that seem to hold back the deployment of post-Panamax on AWP and the shift from AWS to AWP: (a) overall slowdown in Asia/North America trade; and (b) change in ship cost, offsetting the scale economies of PPX2. The slump in the Asia/North-America trade makes it hard to increase ship size and hence exacerbate the excess supply of ship capacity and the respective extremely low freight rates. Since the number of services is small, even a change in one service may have a meaningful impact on capacity. For example, the 2M has only two AWP services: the TP10, focusing on USEC and TP18, focusing on USGC, both provided by ships of 4,500 TEUs. Deploying 8,500-TEU ships on any of these services would result in almost doubling capacity. Accordingly, Maersk's announcement on the shifting of existing AWS to AWP will not result in an overall capacity increase.

The second obstacle to a rapid redeployment of post-Panamax ships is the change in ship cost, namely the reduction in the cost of Panamax vessels, partially attributed to Canal expansion. The main components of ship cost are the capital cost (charter cost) and operating cost, mainly fuel cost. Due to the glut of Panamax vessels, the capital cost of a Panamax vessel per slot is almost the same as the much larger post-Panamax vessel; due to the reduction in fuel cost, the difference in operating costs between the two has narrowed to the extent that overall slot cost between Panamax and post-Panamax is negligible.

³⁹ *American Shipper*. June 24,-2016

The cost differential is the main driver of substituting Panamax with post-Panamax ships. The reduction in the overall ship cost following the dramatic change in bunker cost also diffuses the geographic advantage of the shorter AWP over the AWS. The largest trading ports on the Asia/NAEC trade lane are Shanghai and New York. Shanghai is 10,600 nautical miles from New York via the Panama Canal and 12,400 nautical miles via the Suez Canal. Still, it seems that this difference in distance has little effect on service deployment. This is evident by the same number of ships (ten) deployed on both AWP and AWS services in Figure I.2-24. Other evidence on the impact of low fuel cost is the recent trend whereby both the AWP and AWS return to Asia through the much longer route around Cape of Good Hope to save on Canal tolls.

Future Ship Size on All-Water Services

The largest ships that can transit through the expanded Panama Canal are defined as New Panamax (NPX), with capacity of 14,000 TEUs. However, as seen in Figure I.2-24 the future deployment of the AWP and AWS services of the CKYHE alliance is based on post-Panamax ships of 6,500 and 8,500 TEUs. The G6 single service includes the deployment of post-Panamax 10,000-TEU ships.

The current AWS services also employ similar-size ships, the largest of which has capacity of 9,300 TEUs. Ships of 8-10,000 TEUs are categorized as PPX2 (post-Panamax second generation). The largest ships deployed on the Asia/Europe trade are of 19,000 TEUs and the largest ships on order are of about 21,000 TEUs. To facilitate the discussion, Figure I.2-26 shows the dimensions, capacity, stowage arrangement and notation used for containerships in this report.

Figure I.2-26: Post-Panamax Ship Dimensions

Ship Category	Notation	dwt	TEU	Dimensions (m)			Arrangement (boxes)		
				LOA	Beam	Draft	Bays	Rows	Tiers above Deck
Panamax-Max	PXX	60,000	5,000	292	32	12.5	17	13	6
Post Panamax 1	PPX1	70,000	6,000	300	37	14	17	15	6
Post Panamax 2	PPX2	100,000	8,500	340	42	15	20	17	8
New Panamax	NPX	130,000	14,000	366	49	15.2	22	19	8
Ultra-Large Containership	ULCC	180,000	20,000	400	60	16	24	23	10

Source: Ashar 2016.

Feederling US Ports

Deployment of NPX on either the AWP or the AWS seems unlikely in the near future since none of the NAEC and GC ports are designed to handle this size ship. The main problem is port access channels, which in the US are the responsibility of the federal government under the direct control of the US Army Corps of Engineers (USACE).

The design ship used in a recent channel improvement project sponsored by USACE and a local port authority were PPX2 ships of 8,500-TEUs. Hence, even upon completion of these projects, the two largest ports, New York and Savannah, will face serious physical constraints in handling the larger NPX. In the case of New York, after completing the 50-ft (15.2 m) channel and the raising of Bayonne Bridge, the turning basin will have to be dredged wider and deeper. In the case of Savannah, the improved channel will only be 47-ft (14.3 m) deep. It should be noted that even a 50-ft channel cannot handle a fully loaded (design draft) NPX, so these vessels will have to arrive partially loaded, or resort to "tide riding" -- as they do now.

The main USEC ports have already begun preparing for the NPX. New York began studying the above-mentioned channel improvement, Norfolk is already pursuing a 55-ft (16.8 m) channel, the USACE has already approved a 52-ft (15.8 m) channel for Charleston, and Savannah is pursuing a new terminal at the mouth of the Savannah River. Hence, massive feeder/shipment of the main USEC ports seems unlikely. Some feeder could be expected for the secondary ports. In this respect, it is noted that partial loading is expected to allow future AWP services employing PPX2 to serve USEC secondary ports: Jacksonville (40-foot channel); Wilmington (42 foot channel); and Boston (40 foot channel).

The channel constraints will not result in terminating direct calls by AWP and AWS services and substituting them with feeder calls, generating shipment traffic in Caribbean hubs. As seen in the CKYHE post-expansion network, presented in Figure I.2-25, Boston and Wilmington are included as direct calls. Likewise, Jacksonville is included in a AWS service of the G6 employing 6,500-TEU ships. USGC ports are more limited than USEC ports:

Mobile and New Orleans have 45-ft channels; Houston still has 40-ft, but soon will have a 45-ft channel. Hence, deployment of PPX2 on Asia/NAGC may be delayed or, alternatively, will require partial loading. As would be the case with USEC ports, there is limited potential for feeder secondary ports such as Tampa from Caribbean hubs. Altogether, it seems that the potential for feeder US ports is limited to secondary ports.

Long-Term Shift of AWP to AWS

While the increase in ship size will be a gradual process, to facilitate the analysis, the process can be divided into three, five-year phases:

- ▶ **Post-Expansion I** – Replacement of 4-5,000-TEU Panamax with 8-10,000-TEUs of post-Panamax (PPX2) within the next 5 years;
- ▶ **Post-Expansion II** – Replacement of the PPX2 by 14,000-TEU NPX on AWP and, perhaps, slightly larger on AWS during years 5 to 10; and
- ▶ **Post-Expansion III** – Replacement of NPX by 18-22,000-TEU Ultra Large Containerships (ULCC), but only on AWS in about 10 years.

Phase III assumes that a fourth set of locks is not constructed in the Panama Canal in the next 10-15 years. This seems to be a safe assumption, in light of the huge cost (\$15 billion) and the shortage of fresh water. Hence, the difference in ship size between the AWP and AWS in the pre-expansion era may recur in Phase III, partially reversing the shift from AWS to AWP in Phase I.

North/South Services

Europe/WCSA

Figure I.2-27 shows a detailed list of the Through-Caribbean and Caribbean Specialist services with the general North/South orientation. The list excludes short-sea and feeder services, which are not

Figure I.2-27: Through-Caribbean and Caribbean Specialist North/South Services

		Pattern	Service Names	Ships (TEU)	Participating Lines
I	1	Asia/Carib	PEX2	12 x 5,050	8 CMA, 2 HLD, 2 CSCL, HSD slots
II	1	Eur/WCSA	WCC, Eurosal1	8 x 4,200	2 CMA, 3 HLD, 3 HSD
	2	Eur/WCSA	WCV, Eurosal2	8 x 3,800	2 CMA, 3 HLD, 3 HSD
	3	Eur/WCSA	EW1	9 x 4,500	HLD+MSC
	4	Eur/WCSA (Ecuador)	EW2	7 x 4,500	HLD+MSC
	5	Eur/WCSA	NWC/WCSA String I		MSC
	6	Eur/WCSA	Ecubex	5 x 2,500	MSK
III	1	Eur/Carib	ECS	6 x 2,300	5 CMA, 1 HLD
	2	Eur/Carib/NESA	MEFGUI	6 x 2,000	4 CMA, 2 Marfret
	3	Eur/GCNA/Carib	NEFWI	4 x 2,800	CMA
	4	Eur/ECNA/GCNA	Victory	6 x 4,200	CMA
	5	Eur/Carib	EMC	6 x 2,600	HSD
	6	Eur/Carib	ColExp	6 x 2,600	MSK
IV	1	Med/Carib/GCNA	MBE	9 x 2,500	CMA
	2	Med/Carib	MEDCARIB	6 x 2,700	4 CMA, 2 Marfret
	3	Med/WCNA	MPS, MCP	11 x 4,200	HLD+HSD
	4	Med/WCSA	MSW, CCWM	10 x 1,700	HLD+HSD
	5	Med/Carib/GCNA	MGX	7 x 3,800	HLD, Zim/HSD slots
	6	Med/WCSA	Ecumed	8 x 2,500	MSK
V	1	Eur/ECNA/Oceania	RTWPAN	7 x 2,800	CMA
	2	ECNA/Oceania/Eur	Panama2, Trident	10 x 3,400	5 Mrsk, 5 HSD, CMA/MSC slots
	3	ECNA/Oceania	ANP	10 x 3,400	HLD+MSK+HSD
VI	1	GCNA/ECSA	GS1, String I	8 x 5,500	HLD+MSC+NYK
	2	GCNA/ECSA	UCLA	7 x 5,600	MSC+HSD
	3	GCNA/ECSA	SCS, String II	7 x 4,500	HLD+MSC+HSD
	4	ECSA/Carib	Brasex	7 x 2,800	CMA
VII	1	ECNA/WCSA	USW, AGAS	6 x 4,000	HLD+HSD
	2	ECNA/WCSA	Atlanta	7 x 4,800	MSC, CMA slots
VIII	1	ECNA/ECSA	ABUS, Tango, SEC	6 x 5,600	HSD, HLD, YML
	2	ECNA/ECSA	USA/SAEC String 1, XNS	8 x 5,600	MSC, Zim/CMA slots

Intra-Caribbean, South Atlantic/Caribbean and Amazon/Caribbean are excluded.

Rotation: North/South or Out-of-Caribbean Region/Carib

expected to generated transshipment traffic. The figure defines eight service patterns based on the main regions served. Within each pattern, the figure lists the various services⁴⁰, the size and

⁴⁰The same service has different names by the various participating shipping lines.

number of ships, and the participating shipping lines, which either provide ships or just charter slots on the service.

The Europe/WCSA is the largest service pattern in the North/South category; it includes six different services with a total weekly capacity of about 29,000 TEUs (for comparison, the AWP's weekly capacity is 85,000 TEUs). The participating lines belong to different alliances. It also can be observed that none of the CKYHE members participate in the Europe/WCSA. This trade is controlled by four shipping lines: Hamburg Sud (HSD), Hapag Lloyd (HLD), CNA-CGM (CMA), and Mediterranean Shipping Company (MSC). Maersk (MSK) has limited involvement; its Ecubex is essentially a "banana" service.

The Panama Canal expansion has not yet impacted this service pattern. As Figure I.2-26 shows, all cross-Canal services still employ Panamax ships. This is not the case with non-Canal services, especially the ECNA/ECSA, whereby the largest ships are already reaching 7,000 TEUs. However, MSC has recently announced a new service system involving 10,000-TEU ships. Likewise, HLD and HSD have new orders of 10,500-TEU ships destined for deployment on this service pattern.

Caribbean Specialists

There are three Caribbean Specialist service patterns:

- ▶ **Asia/Caribbean** – A single service, PEX2, provided by 12 x 5,000-TEU ships, of which eight are provided by CMA-CGM and the rest by HLD and CSCL (now Cosco);
- ▶ **Europe/Caribbean** – six services provided by mostly smaller ships, some of which focus on GCNA and others are essentially "banana" services;⁴¹ and
- ▶ **Mediterranean/Caribbean** – six services provided by smaller ships.

For convenience, CMA-CGM's Victory, although focusing on GCNA, was included as Europe/Caribbean. This was also the case for Mediterranean services.

The Europe and Mediterranean/Caribbean are not Cross-Canal services and therefore will not be affected by the Canal expansion. Likewise, most of these services are provided by smaller ships around 2,500 TEUs. The exception is the Asia/Caribbean PEX2 service, which already employs Panamax (see the above figure) vessels. Modification of this service, as elaborated later, could generate massive transshipment traffic in Kingston, the selected regional hub port of CMA-CGM, the main provider of this service.

ECNA/WCSA and ECNA/Oceania Services

The ECNA/WCSA and ECNA/Oceania are both "diagonal", Cross-Canal services. Both patterns involve long routes with parallel legs and are prone to future consolidation following the deployment of post-Panamax ships.

GCNA/ECSA and ECNA/ECSA Services

The GCNA/ECSA and ECNA/ECSA are not Cross-Canal services and therefore are not affected by the expansion. These services are already provided by post-Panamax ships. One of the GCNA/ECSA services, operated by MSC and Zim, is also calling Kingston.

⁴¹ For convenience, CMA-CGM Victory service, although focusing on GCNA, is included in this pattern.

Parallel Consolidation: East/West Services

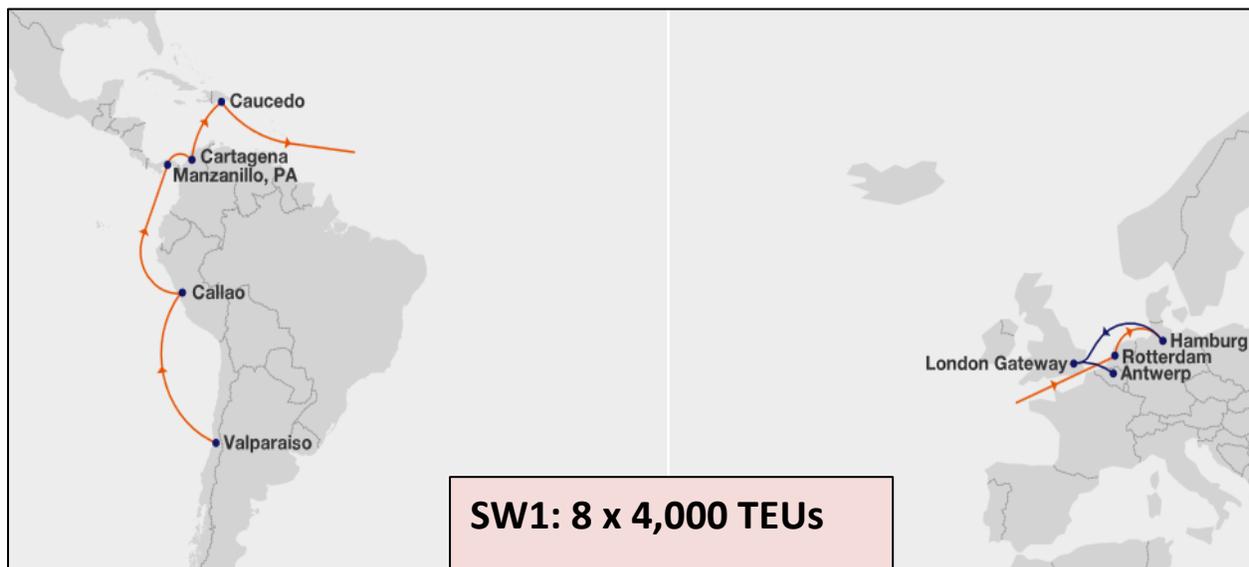
The East/West services of interest here include the Asia/ECNA and Asia/GCNA, both of which are also defined as All Water Panama (AWP). As noted before, the process of restructuring of these services is triggered by the expansion of the Canal and comprises of both shifting of traffic from All Water Suez (AWS) to AWP, deployment of post-Panamax ships, and changes in rotation.

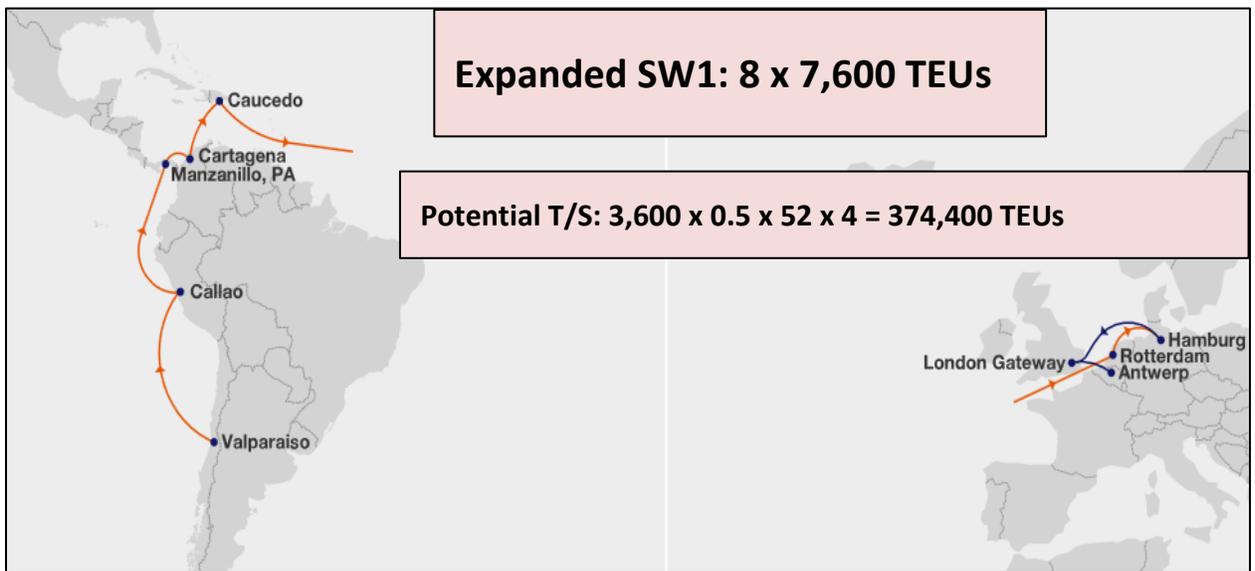
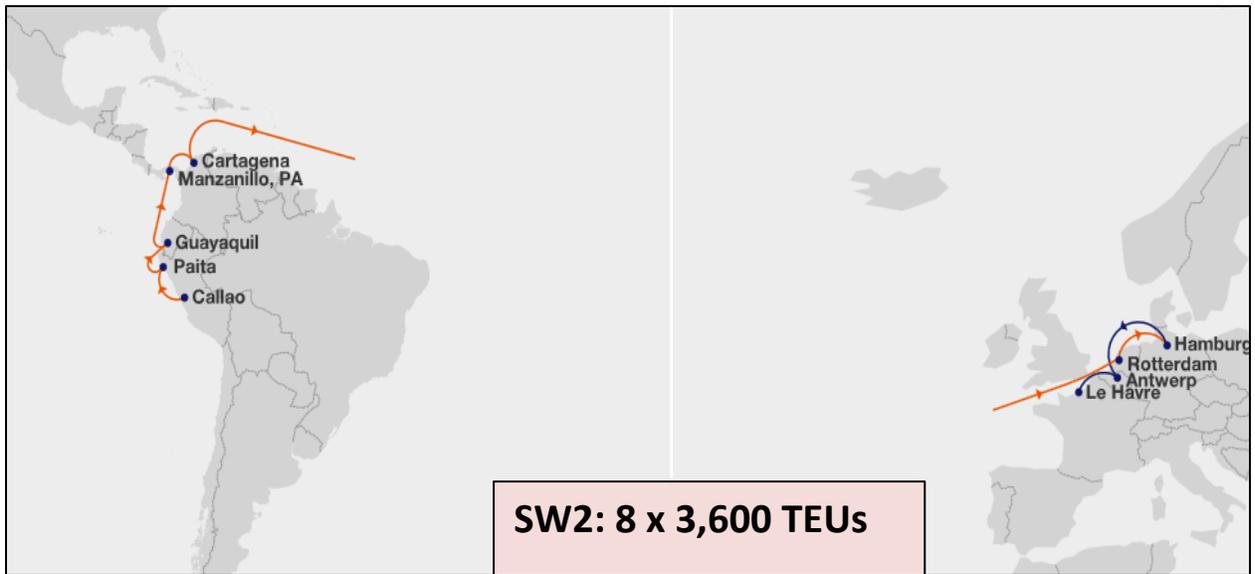
All East/West services, including AWP, are provided by alliances. The only alliance that seems to have completed the restructuring of its AWP and AWS services (although for only one year), is CKYHE. Figure I.2-23 provided a comparison of the pre- and post-expansion AWP and AWS services of this alliance. As noted there, except for terminating one service, the main change was the deployment of PPX2 ships on the AWP and increasing the service capacity by 38%. As already discussed in the section "Future Ship Size on All Water Services", CKYHE's post-expansion services includes direct calls at ALL the ports included in the pre-expansion. Therefore, the restructuring of this alliance, which has the largest number of AWP services, is not expected to generate transshipment traffic. It is reasonable to assume that the restructuring of the other alliances' East/West services will not generate transshipment traffic.

Parallel Consolidation: North/South

Figure I.2-28 shows a likely consolidation of the so-called Eurosal services connecting North Europe with WCSA, using Hapag Lloyd (HLD) service maps. These services have been provided for many years by a consortium of three European lines: HLD, Hamburg Sud (HSD) and CMA-CGM. The upper panels show the existing services, SW1 and SW2 (HLD's names), currently provided by smaller Panamax ships of 4,000 and 3,600 TEU capacity. The lower panel shows a theoretical consolidated service provided by 7,600-TEU ships (4,000 + 3,600). Based on discussions with the shipping lines considering such consolidation, the employment of larger ships will mandate termination of direct calls at Guayaquil and Pieta due to terminal constraints. It is assumed that about half of the SW2 service capacity is allocated to these ports – which will have to be transshipped. Accordingly, as seen in the lower panel presenting the expanded SW1, the consolidation will have the potential to generate 374,000 TEUs of transshipment annually.

Figure I.2-28: Eurosal Consolidation





The substantial volume of transshipment can be assigned by the participating lines to any of the hub ports marked by the red circle, although desirably, the closest one to the eliminated ports should be selected. The expanded service could also add another regional port, such as Buenaventura, that can be used as a hub. The main drawback for this consolidation is the longer transit times that the expanded SW1 will provide to the feedered ports, especially Guayaquil. In this respect, we note that it seems that Eurosal competitors, Maersk and MSC, prefer to continue with their present lines, based on smaller ships and direct calling Guayaquil. For example, Maersk is likely to continue its Ecubex service, provided by 2,500-TEU geared ships. The Ecubex is a "banana" service with a rotation also including a direct call at Santa Marta, another banana port and, on the European side, a direct call in St. Petersburg. Finally, it is reasonable to expect that most of the transshipment will disappear once the new, modern DPW terminal in Posorja is operational.

Intersection Consolidation: North/South

Figure I.29 shows MSC's new service structure. The new service, based on 10,000-TEU ships, consolidates ECNA/WCSA and Europe/WCSA pre-expansion services provided by 4,500-TEU ships. As seen in the figure, only Philadelphia, a major reefer port, is called directly in the USEC. Charleston,

New York, and Port Everglades are feedered from Freeport, MSC's transshipment hub. The feedering will probably be conducted by other MSC mainline services following the intersection transshipment pattern. MSC is usually very secretive regarding its services; hence, it is difficult to estimate the amount of additional transshipment traffic that this restructuring will create at Freeport, but it would probably be in in the 300-400,000 TEUs/year range.

Figure I.2-29: MSC Consolidated Service



Global Consolidation: North/South

The only line presently practicing global consolidation in the Caribbean Basin is Hamburg Sud. Figure I.2-30 shows a schematic representation of HSD mainlines that use Cartagena as their Caribbean hub. The list includes six service patterns: Europe/WCSA, ECNA/WCSA, GCNA/ECSA, ECNA/Oceania, Europe/GCNA/NCSA and Europe/WCNA. There are some patterns whereby HSD deploys two services. Accordingly, in previous work we found that HSD has a total of 19 services based in Cartagena, 12 mainlines and 7 feeders. Since most mainlines double-call Cartagena, the total number of weekly calls of HSD is 27, including four services in which HSD is slot charterer. We estimate that HSD generates about 1 million TEUs of transshipment traffic in Cartagena. In our discussion with HSD we learned that none of the interline transfers accounts for most of the transshipment traffic. The transfer is "from all to all services", with the metaphor of a central bus station given for illustration.

Transshipment Hubs and Transshipment Activity

Present Hubs and Transshipment Activity

The Caribbean Basin has five major hub ports and five shipping lines that are responsible for most of the transshipment activity. Figure I.2-31 shows a summary list of the main shipping lines involved in transshipment activities in the Caribbean Basin, their estimated traffic, and the hub in which it is concentrated. As seen in this figure, the traffic amounts to about 7.05 million TEUs annually. Once MSC consolidates its WCSA services, traffic is likely to increase to 7.35 million TEUs, and to much more when other lines will follow through as presented in the above sections.

Figure I.2-30: Hamburg Sud Services in Cartagena



Figure I.2-31: Caribbean Basin Transshipment Traffic

Shipping Line	Transship. (TEU)	Main Hubs
MSC	1,800,000	Evenly divided between Freeport and PPC
CMA	1,400,000	Mostly in Kingston; some in Cartagena and MIT
Hamburg Sud	1,000,000	Almost all of it in Cartagena
Maersk	750,000	Almost all in MIT
Evergreen	750,000	All in CCT
Hapag Lloyd	650,000	Mostly in Cartagena; some in MIT and Caucedo
Zim	700,000	All in Kingston
Total	7,050,000	

As seen in Figure I.2-31, most of the lines have already selected their Caribbean hubs. MSC's main hub is in Freeport where it is part owner. Hamburg Sud has a long-term arrangement with Cartagena and it seems that Hapag Lloyd, which has many joint services with Hamburg Sud, will follow. Maersk seems to settle at MIT, where it is the main customer and Evergreen has its own terminal in CCT. There is no apparent reason why any of these lines would change their selection from the pre-

expansion era. Accordingly, it is reasonable to assume that Kingston will remain with its two major lines, CMA-CGM and Zim. The following sections include a brief comparative analysis of the locations of the various Caribbean hubs.

Hub Location

As earlier noted, the Caribbean Basin comprises various ranges and covering the Basin requires several feeding services. In the Hub and Spoke feeding pattern, the hub closer to a feeding range has a natural advantage. Hence, presumably, each hub should specialize in the range adjacent to it.

The post-expansion consolidation of shipping services, especially the intersection of future interline shipping services, raises different considerations for locating future hubs. The preferred location for intersection transshipment is Panama's Atlantic coast since the Canal naturally funnels all Canal-Crossing services. The near-Panama location of Cartagena is a disadvantage because even a small deviation could count when so many services are involved. Cartagena also is far from the ECNA/ECSA services. However, as seen in the case of HSD, this deviation is not critical.

The disadvantage of the Canal is its distance from the ECNA/ECSA services. Caucedo and especially Freeport have the preferable location for intersecting with these services. Kingston's main advantage is its central location, almost equidistant from all of the feeding ranges. Kingston's main disadvantage is that, like Cartagena, it is far away from ECNA/ECSA services.

Another consideration for hub selection is domestic cargo. In fact, the availability of domestic cargo was the initial drawing point for both Cartagena and Caucedo. However, in the case of Cartagena, transshipment traffic already accounts for 70% of the activities and probably more in the near future. This also is the case in the rest of the Caribbean Basin hubs, some of which, like Freeport and Canal Atlantic are above 90% transshipment. The increase in interline transshipment following the expansion may further increase the incidence of transshipment, with almost all Caribbean hub ports becoming Pure-Transshipment-Ports (PTP). It seems, therefore, that although having a substantial volume of domestic cargo is desirable, lack of it, as is the case with Kingston, is not a critical disadvantage.

Shipping Line Concentration in a Single Regional Hub

Presumably, to minimize cost, shipping lines should use multiple hubs, each geared to handling the feeding ranges closer to it. However, our discussion with shipping lines reveals that the most critical decision factor in selecting hub ports is having all their services concentrated in a single hub, even at the expense of increasing the risk of network collapse in case of hub problems. The reasons for the emphasis on concentration are:

- 1) Having all regional mainlines at one port creates superior connectivity and multiplies the options for port-pair combinations;
- 2) Accumulating large traffic volumes at the hub port provides leverage in gaining favorable rates and, most importantly, controlling the operations such as obtaining favorable berthing windows, allocation for more cranes, flexibility in case ships are late, etc.;
- 3) Operational savings due to having a centrally located inventory of boxes of various types (reefer, high cube, etc.); and
- 4) Administrative cost saving.

The second factor, especially the operational control, seems to be the most critical since interline transshipment is complicated and difficult to perform: it involves larger mother ships and a large number of ship-to-ship moves within a short period. Likewise, all mother ships have tight schedules, so making the connection is essential to the entire service network's integrity. The required level for interline operation is much higher than the traditional hub and spoke operation, where feeder services usually have slack time in their rotations to compensate for delays.

Altogether, it seems that hub concentration is the most important consideration in selecting hubs; it is way more important than location and availability of domestic cargo. This assertion is critical for Kingston since the new ports of Mariel and Veracruz both will have significant domestic cargo and may attract some transshipment activity. They cannot, however, serve as a single regional hub unless a major line decides to shift its service network and underwrite the huge investments required for such a hub. This seems unlikely in light of the observation made earlier that all the major players in the Caribbean Basin seem to have already found their hubs. Additional discussion of the hub-shifting issue is included in the following section.

Kingston's Future Scenarios

Kingston currently has two major shipping lines, CMA-CGM and Zim. CMA-CGM also is the future operator of KCT, via its subsidiary Terminal Link. What is the likelihood that Terminal Link will be able to attract additional shipping lines to select Kingston as their regional hub?

Our discussions with the major lines and terminals as well as our comprehensive review of public media did not reveal dissatisfaction of lines with their Caribbean terminals. It seems that the level of service and pricing are similar in these terminals except for Kingston in its current condition. There was no indication that any of the major lines is considering relocating its operations to Kingston as its future central hub in the Caribbean. A reasonable working assumption should therefore be that Kingston will not gain, at least in the near future, a major new shipping line. Hence, Kingston forecast scenarios should be based on the assumption that the current tenants, CMA-CGM and Zim, will continue to account for almost all of Kingston's transshipment traffic.

As we explained earlier, the growth potential in this type of transshipment is already exploited and future growth will only be generated by the organic growth of the Caribbean Basin economies, which seems quite modest. Likewise, as we discussed, even with the larger ships deployed on AWP, there is only limited transshipment potential.

The future growth of Kingston's transshipment traffic therefore relies on interline transshipment generated by the deployment of post-Panamax ships on the Cross-Canal services and the respective consolidation of shipping services. CMA-CGM is the largest shipping line now calling Kingston and the one with several mainline services in the Caribbean. Zim has a single AWP Through-Caribbean mainline, which already uses Kingston as its hub. It seems, therefore, that its interlining options are limited. Hence, most of the potential growth is likely to be generated by CMA-CGM.

The following sections describe two possible service consolidation and restructuring schemes that CMA-CGM may pursue along with estimates of the potential transshipment traffic that each could generate.

Prospects of CMA-CGM's AWP Service Consolidation

Figure I.13 lists CMA-CGM AWP services; Figure I.18 lists the rest of its services (light-blue shade). As seen in these Figure I.s, CMA-CGM has a total of eight Cross-Canal services: three AWP, two Europe/WCSA (Eurosal), and one Europe/NCSA/Oceania. In addition, CMA-CGM has seven

Caribbean Specialist services, many operated by smaller and older ships. It therefore seems that the present service network of CMA-CGM provides many restructuring options.

This section is concerned with AWP consolidation. The three AWP services of CMA-CGM include two Asia/ECNA (the Manhattan and the Vespucci) and one Asia/GCNA (the Pacific Express 3 or PEX3). The two Asia/ECNA services could be consolidated. However, there is no point in changing now the major East/West services, all of which belong to the Ocean Three Alliance, when beginning in April 2017 CMA-CGM, Cosco, Evergreen and OOCL will create the Ocean Alliance. Accordingly, AWP consolidation will require shuffling of all Asia/ECNA services of the Ocean Three Alliance, including their AWS, which is difficult to predict at this stage. One salient point though is that Evergreen, the only member (except for CMA-CGM) of the Ocean Alliance involved in transshipment in the Caribbean, has its own terminal in Panama (CCT). This terminal presently handles the AWP services of the CKHYE Alliance, except for one service. It is reasonable to assume that there will be a division among the future AWP services of the Ocean Alliance with some service calling at Kingston and another at CCT along with their transshipment activity.

Prospects of CMA-CGM's Europe/WCSA Consolidation

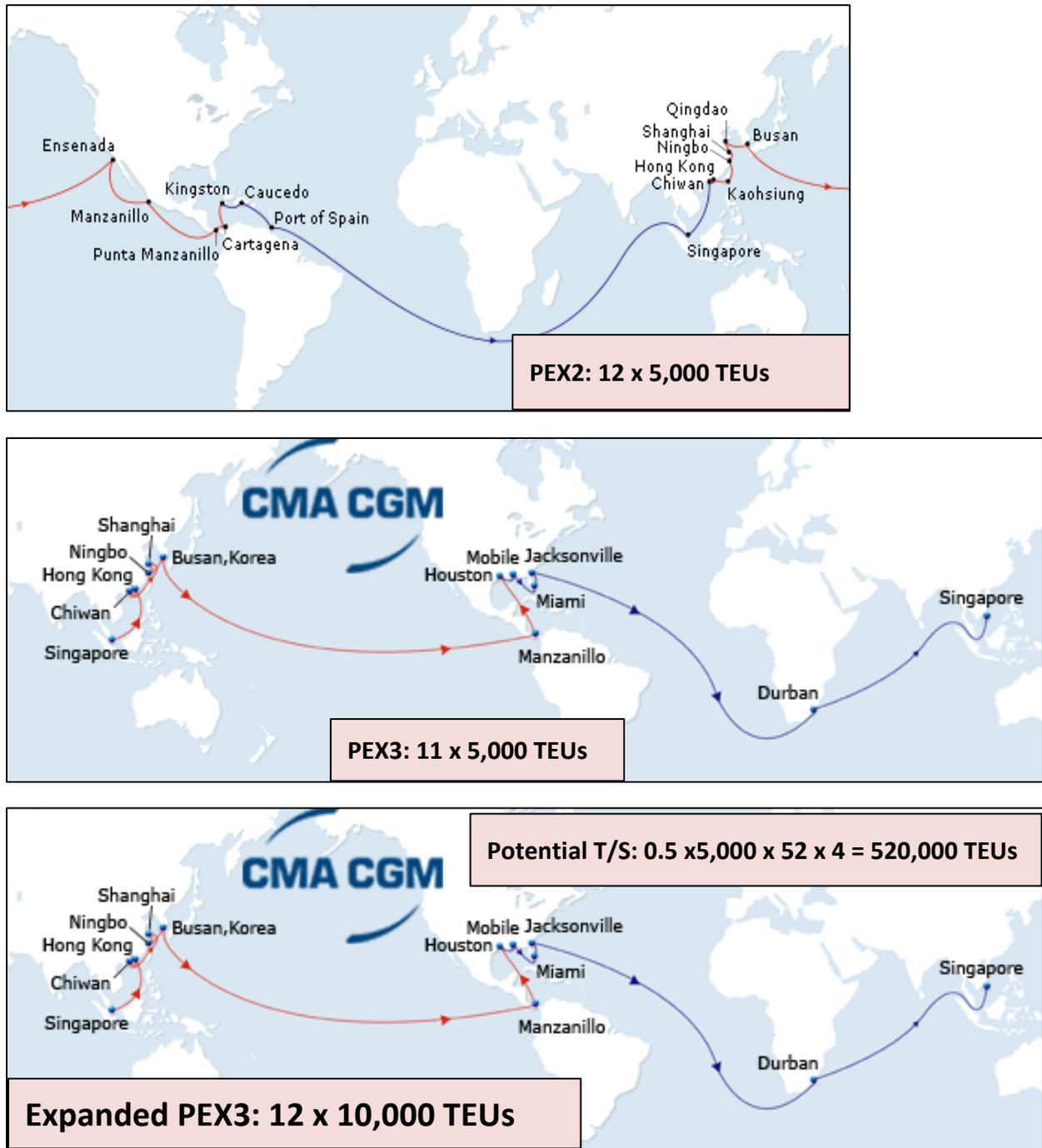
The main services that CMA-CGM has on this route are the Eurosal, which the line names WCC and WCV. The two services are jointly provided by CMA-CGM, Hapag Lloyd and Hamburg Sud. As noted, the two services will be consolidated into a single service, generating sizeable new transshipment traffic. Hapag Lloyd and Hamburg Sud, who control the majority of the ships, have their Caribbean Hub in Cartagena. It is reasonable to assume that the consolidated service will also use Cartagena as its hub. Still, some transshipment could be performed in Panama or in WCSA. Hence, this consolidation is probably not going to affect Kingston.

Prospects of CMA-CGM's Caribbean Specialist Consolidation: PEX2+PEX3

The main consolidation that is likely to affect Kingston involves CMA-CGM's Caribbean Specialist services, most of which are provided by small and old ships. Some of these services can be absorbed in the respective Through-Caribbean service which has a parallel rotation.

The first consolidation relates to CMA-CGM PEX 2 into an expanded PEX 3 service. Both services are provided by CMA-CGM ships, although the Asia/GCNA is an alliance service. Hence, consolidation of the two should be operationally simple. Figure I.2-32 shows in the upper panel the existing rotations of PEX2 and PEX3 and in the lower panel the prospective, expanded PEX3. As seen in this figure, the present services are provided by 5,000-TEU ships. Hence, to retain the same capacity, the consolidated (combined) service should be provided by 10,000-TEU ships (5,000+5,000). To make up for the termination of calls in Mexico and Kingston included in the present PEX2 rotation, the expanded PEX3 will have to extend its rotation and increase the number of ships from 11 to 12. Asian traffic destined to the Caribbean ports of Cartagena, Caucedo and Port of Spain will be handled by feeders based in Kingston. The calculation of the potential transshipment traffic generated in Kingston assumes that these feedered ports account for about half of the PEX2 ship capacity. The potential transshipment traffic that this consolidation could generate is about 0.5 million TEUs annually. The replacement of direct call by feeder call may result in shifting of some CMA-CGM traffic to competitors offering direct services, resulting in lower transshipment traffic in Kingston.

Figure I.2-32: Consolidation of PEX2 & PEX3



The advantage of the consolidation of PEX 2 & PEX3 are the savings generated by replacing of 23 x 5,000-TEU ships with 12 x 10,000-TEU ships, but there also is the additional cost of transshipment. It could well be that CMA-CGM has no alternative employment for the 5,000-TEU ships and that there are no employment options even outside CMA-CGM due to the glut of Panamax following the expansion. Hence, CMA-CGM may consider the capital cost of these ships as near zero. The difference in operating cost, mainly fuel cost, between older 5,000-TEU and modern 10,000-TEU ships also has narrowed due to the sharp reduction in bunker fuel as earlier noted. Hence, the feasibility right now of service consolidation may be negative for the time and the process may be

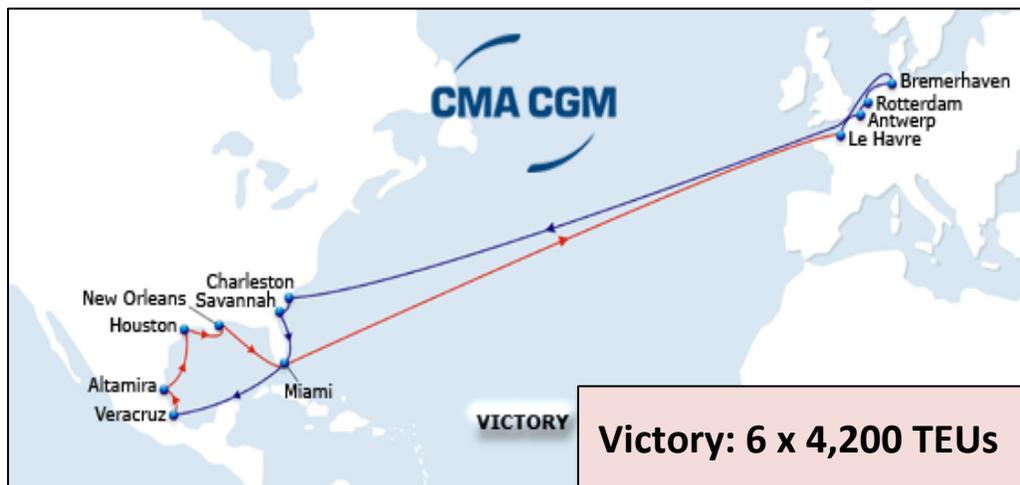
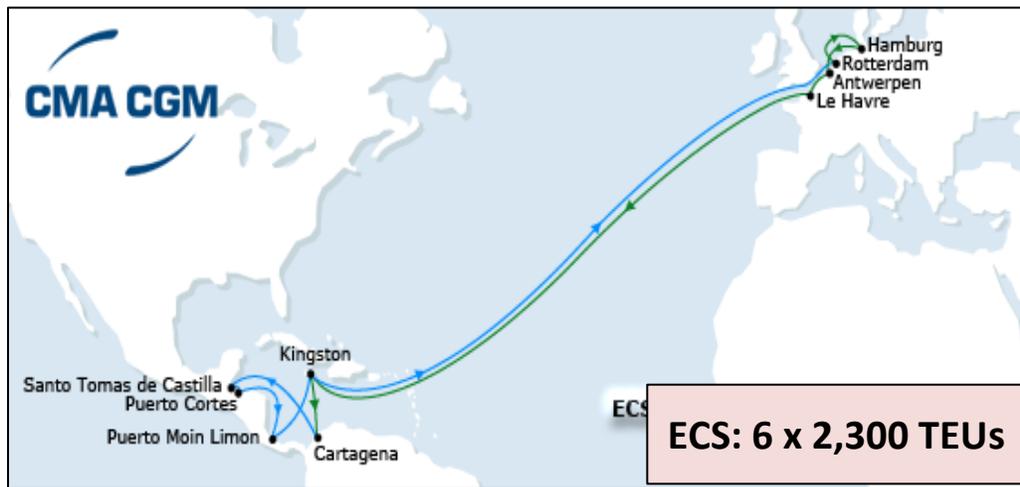
delayed for a few years until the older ships will have to be scrapped or alternative employment found for them.

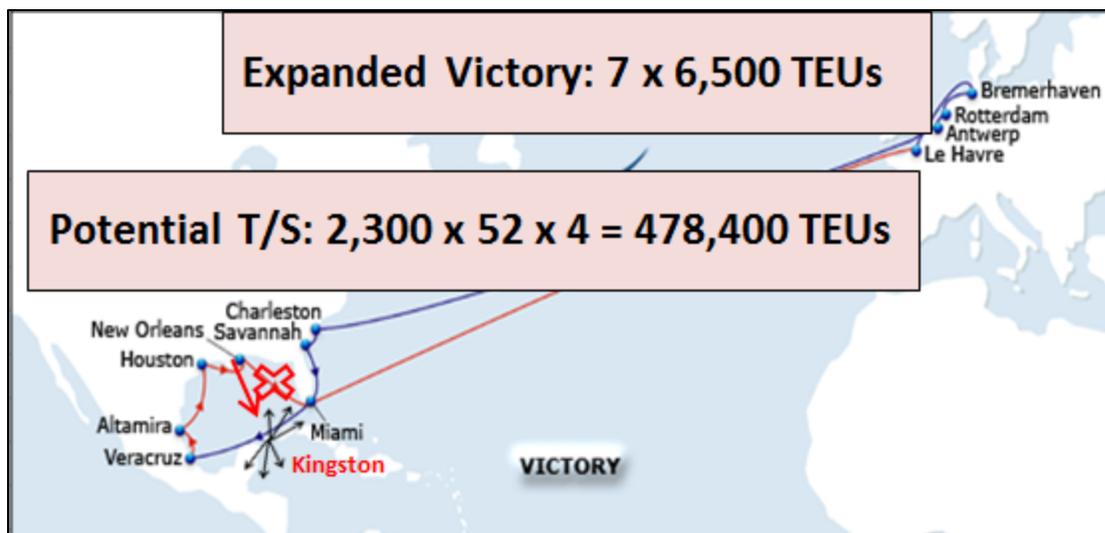
Other consolidation schemes involving PEX2 could include the two other AWP services of CMA-CGM, although in these services CMA-CGM has ship-contributing partners, who would have to agree to the change.

Prospects of CMA-CGM's Caribbean Specialist Consolidation: PEX2+PEX3

The second consolidation is not related to the Canal expansion. Figure I.2-33 illustrates a possible consolidation of two Caribbean Specialist services with parallel rotations. The smaller service, ECS, is absorbed by the larger Victory service by adding to the latter a Kingston call and replacing the direct calls by feeder ones. The problem with such consolidation is that ECS is mainly a "banana" service. Bananas require short transit times and are difficult to transship (plugging/unplugging, etc.). To retain the previous transit time, the rotation of the Expanded Victory can be modified to include Kingston as the last out port. Regarding the transshipment of reefer boxes, it seems that this is a growing trend (see Eurosal section). As with the previous consolidation, the potential transshipment here is about 0.5 million TEUs.

Figure I.2-33: Consolidation of PEX2+PEX3





Prospects for Transshipment in Kingston

The prospects for Kingston transshipment are highly dependent on CMA-CGM restructuring its present service system in the Caribbean. More specifically, it depends on whether CMA-CMA intends to pursue consolidation of its Through-Caribbean and Caribbean-Specialist services following the Panama Canal expansion and the opportunity to deploy larger and more economical ships. This consolidation and the interline transshipment generated by it seems to be the main growth potential for Kingston.

The growth potential of hub and spoke is limited and the Canal's expansion will have limited impact on it. The main impact of the expansion will be to divert traffic from All-Water Suez (AWS) to All-Water Panama (AWP) services. This traffic is geared to North America – not to the Caribbean countries. The countries in the Caribbean Basin will not increase their trade with Asia because of this diversion and therefore will not generate more transshipment traffic for Kingston and the other hubs.

Consolidation of shipping services is an internal decision of shipping lines related to their strategy in developing their service network. To maximize connectivity, all regional services should be concentrated in a single hub, as demonstrated in the case of Hamburg Sud's hub in Cartagena. CMA-CGM did not confide with us its strategic plans. Nevertheless, it is reasonable to assume that CMA-CGM will attempt to bring most of its shipping services to Kingston, creating massive transshipment traffic there. The two consolidation schemes illustrated in Figures I.2-32 and I.2-33 have the potential of generating additional transshipment traffic of about 1 million TEUs in Kingston in a relatively short time. The above schemes are only two out of many other schemes and options that CMA-CGM can come up with once it controls Kingston, including those related to the future Ocean Alliance. But, it could well be that CMA-CGM will delay its consolidation plan in light of the current slump in the shipping market, whereby smaller ships are chartered at deep discounts and price of bunker is low.

Altogether, a conservative estimate of the potential additional transshipment traffic that CMA-CGM could generate in Kingston is for about 1 million TEUs within the next 5 years.

Summary of Transshipment Analysis

There are four key points in the transshipment analysis. Firstly, the Panama Canal expansion creates opportunity for Jamaica to capture cargo flows along this route, especially due to the modest shift of Asia/North America trade from the Suez to the Panama route. The changing size of vessels and deployment of Post-Panamax Generation II (PPX2) of 8 - 10,000 TEUs should be noted when considering Jamaica's infrastructure capacity for transshipment services.

Secondly, the small growth in hub and spoke transshipment is currently linked to the Caribbean Basin gateway (domestic) traffic, and is already exploited by the current feeding system. There is substantial growth in interline transshipment due to the restructuring of mainlines, mainly through consolidation of parallel-routed services and intersecting-route services. While consolidation may affect established trade routes, shippers otherwise have little incentive to divert established route to Jamaica. Therefore, Jamaica is unlikely to serve as a single regional hub unless a major line decides to shift its service network and underwrite the huge investments required for such a hub.

Thirdly, Jamaica must consider the location of hubs and nearby feeding ranges, especially when considering hub and spoke transshipment. As mentioned above, the concentration of all mainlines at a single regional hub is critically important for interline transshipment. An example of this Jamaica could follow is Cartagena.

Lastly, this section recognizes the potential of Kingston, especially in the continued role of the main hub to CMA-CGM and Zim. We note that CMA-CGM has the potential to add 1 million of additional transshipment traffic within the next 5 years following the restructuring of its service network. Otherwise, all major lines operating in the Caribbean Basin appear to already have regional hub ports, and as mentioned above, unless highly incentivized, are unlikely to come to Jamaica.

1.2-3 Detailed Traffic Forecast

Forecast Methodology

The traffic forecasts estimate the total cargo that the SEZ, forming part of the Global Logistics Hub, would be able to attract based on the relative advantages of Jamaica, including its strategic location and plans to improve its logistics performance to global standards.

The Industry Cluster Analysis presented later in this report identifies three major clusters that, given Jamaica's specific conditions, are likely candidates to locate in the proposed SEZs. These are:

- ▶ Biomedical;
- ▶ Electrical Equip, Appliance, Manufacturing; and
- ▶ Transportation and Logistics.

Subsequent chapters identify the specific actions that would improve Jamaica's attractiveness to these clusters in areas such as SEZ and customs regulations, logistics services and performance, infrastructure capacity and operations, human capacity development, utility availability and pricing, etc.

The dataset used as a base to prepare the forecasts was historic trade flows between major regions for commodities associated with the identified industrial clusters. The databases consulted to collect information on these specific flows were: US Trade Online, Eurostat and UN Comtrade. The common

period where these data were available in all databases was 2003-2015. The major trade flows considered for the forecasts include: US to Asia, Asia to US, US to Latin America, Latin America to US, Europe to US, US to Europe, Asia to Latin America, Latin America to Asia, Europe to Latin America and Latin America to Europe.

The above trade flows were then used to run regressions for each industrial cluster considering the GDP of leading countries in each region to estimate the most representative regressions that would allow us to project the trade flows based on GDP projections. For example, as noted in the cargo analysis above, the US, China, Colombia, Chile, and Brazil are lead exporters and importers for their respective regions, so we considered their GDP growth rates indicative for the region. The historic GDP growth and projections were taken from the April 2016 World Economic Outlook (WEO) database prepared by the IMF.

The selected regressions for the two industrial clusters under consideration have a high degree of correlation with GDP of the main importers (the countries driving each trade) for the Biomedical and Electrical Equip, Appliance, and Manufacturing clusters. The forecasted growth rates were separated by cluster, to ensure projection accuracy. For example, while the biomedical cluster in China has a forecasted growth rate of 5% annually, the industrial cluster’s projected growth rate is 3%, so we used recently historic volumes for the region in these industries, applied the separate annual growth rates, and formed projections for each cluster.

Once the global projections for each cluster were completed, we then determined which of the flows are more likely to be diverted to Jamaica. Several elements were considered in the determination of the capture rates, including: the size of the flows, current consolidation of shipments, direction of flows, current shipping routes, likelihood of capture for regional distribution of finished goods, degree of diversion necessary for capture by Jamaica, etc. Table I.2-30 shows the expected market capture rates for both industrial clusters analyzed. These were developed based on projecting volumes in each of these industries on each trade route, then aggregated to find Jamaica’s potential share. For example, the current share of east coast and Gulf ports of Asian-US trade is 34%.

Table I.2-30: Proposed Market Capture by Jamaica

Origin	Destination	Share
Asia to	US	15%
	Latin America	0%
Europe to	US	0%
	Latin America	75%
Latin America to	Europe	50%
	US	75%
	Asia	0%
US to	Europe	10%
	Asia	10%
	Latin America	50%

Source: Nathan Associates.

From our experience and analysis, we know that this share can be expected to grow to 40%-45% in the near future. Our assumptions are that one third can be captured by a Caribbean hub such as Jamaica’s if competitive, likely another third will head to a Panama hub, and another third could go

directly to US ports. We assigned high market shares between Latin America and Europe and the US based on industry volumes in recent years and simply because Jamaica is en route between Europe and Latin America, with the exception of Brazil and Argentina. Again, some of these routes will utilize the Panama hub, some will be direct, and some will utilize a competitive Caribbean hub such as Jamaica. Similar analysis was applied to the other routes, though these are much smaller in actual volume. The traffic was then projected using the GDP forecasts for the 2016-2021 and 2016-2035 period prepared by the IMF as part of the April 2016 World Economic Outlook (WEO) database for the same countries used in the regression analysis. Our forecasts are also prepared for this period.

Baseline Opportunities

If Jamaica successfully became a globally competitive logistics hub today, with supporting transport and industrial services, it is possible to attract approximately 15% of global trade between Asia, Europe, Latin America, and the US in the biomedical and machinery clusters. The reasoning behind this is a result of aggregating the market shares above to find the potential volume Jamaica could capture, as discussed below. In the biomedical cluster, the highest volume flow currently is from Asia to the United States, followed by the US to Europe. If Jamaica could capture just 15% of the Asia to US flow, and 10% of the US to Europe flow, that would add almost 6,000 TEUs per year at this baseline level. Jamaica is in an even better position to intercept trade from Europe to Latin America, which could add a further 2,000 TEUs. In total, the potential volume for Jamaica to capture in the biomedical cluster industries is almost 12,000 TEUs. With much higher volumes, there is also great potential for Jamaica to capture industrial trade in the machinery and electrical equipment cluster, with a possibility to intercept more than 250,000 TEUs, or 15% of the global trade flows in these industries. Currently the highest volume flow for this cluster is from Asia to the US, with 76% of the total trade volume. Even if Jamaica only captured 15% of this trade flow, it would contribute 195,000 TEUs per year to Jamaican imports for processing. Between both clusters, at a baseline level Jamaica could capture more than 270,000 TEUs per year. These would consist of imports for processing or storage only, and if they are re-exported after some value added activity, this could mean an increase of 540,000 TEUs per year, not yet accounting for growth.

Forecasted Demand

Maritime Cargo

Our forecast used the average volumes from 2013 to 2015 as a baseline level, and projected cargo volumes until 2021 based on current trade volume in the select clusters and GDP growth rates. The CAGR (Compound Annual Growth Rate), based on GDP and trade volume, is 4.8% on average for the biomedical cluster, while the growth rate for the machinery and electrical equipment cluster is 3.1%. The United States has the highest CAGR overall averaging 5.6%, with 6.7% annual growth in the biomedical cluster, while industrial growth in other countries such as China and Colombia remain around 3%. Brazil was the only target country facing declining growth in projections for the machinery and biomedical clusters. By 2021, Jamaica could be importing more than 325,000 TEUs, processing, and re-exporting these for a total increase in shipping of 650,000 TEUs, which would be the new port demand level. In the longer term, this total volume to and from the Logistics Hub could be more than 500,000 TEUs by 2035. This is dependent on the success of the Jamaica Logistics Hub initiatives, including attraction of industry players participating in the major trade flow routes for each cluster referenced above. In this best case scenario, Jamaica would see between 15% and 18% of the total biomedical and machinery trade in global flows between Asia, Europe, Latin America, and the US by volume only. All projections are shown in Table I.2-31.

Table I.2-31: Projected Maritime Cargo Volume to Jamaica by Cluster (TEUs)

		2016	2017	2018	2019	2020	2021	2030	2035
BIOMEDICAL EQUIPMENT									
Asia to	US	5,425	5,685	5,958	6,244	6,543	6,858	10,046	12,419
	Latin Am.	0	0	0	0	0	0	0	0
Europe to	US	0	0	0	0	0	0	0	0
	Latin Am.	2,148	2,251	2,360	2,473	2,591	2,716	3,978	4,918
Latin Am. To	Europe	258	271	284	297	312	326	478	591
	US	170	178	187	196	205	215	315	390
	Asia	0	0	0	0	0	0	0	0
US to	Europe	1,063	1,114	1,167	1,223	1,282	1,344	1,968	2,433
	Asia	809	848	888	931	976	1,023	1,498	1,852
	Latin Am.	2,003	2,100	2,200	2,306	2,417	2,533	3,710	4,587
CLUSTER TOTAL		11,877	12,447	13,044	13,670	14,326	15,014	21,994	27,191
LIGHT MANUFACTURING									
Asia to	US	201,947	208,208	214,662	221,317	228,178	235,251	351,333	362,342
	Latin Am.	0	0	0	0	0	0	0	0
Europe to	US	0	0	0	0	0	0	0	0
	Latin Am.	22,200	22,889	23,598	24,330	25,084	25,862	38,623	39,833
Latin Am. to	US	15,012	15,477	15,957	16,452	16,962	17,487	26,116	26,935
	Europe	4,715	4,862	5,012	5,168	5,328	5,493	8,204	8,461
	Asia	0	0	0	0	0	0	0	0
US to	Asia	4,017	4,141	4,270	4,402	4,539	4,679	6,988	7,207
	Latin Am.	3,198	3,297	3,399	3,505	3,613	3,725	5,563	5,738
	Europe	16,236	16,739	17,258	17,793	18,345	18,914	28,246	29,131
CLUSTER TOTAL		267,326	275,613	284,157	292,966	302,048	311,411	465,074	479,647
TOTAL		279,203	288,060	297,201	306,636	316,374	326,426	491,136	506,838

Source: Nathan Associates.

Most of the cargo is expected to result from the machinery cluster from Asia to the US, and Europe to Latin America, and the biomedical industries from Asia to the US. With the addition of services, this increased level of trade will have an even greater impact than can be projected in cargo volumes alone. It must also be noted that port demand will be twice the forecasted imports or intercepted cargo, as Jamaica will be importing the cargo, adding value or services, then re-exporting to the final destination. Considering also the potential additional transshipment traffic that CMA-CGM could generate in Kingston is for about 1 million TEUs in the next 5 years we arrive to the total port demand for Kingston, as shown in Table I.2-32.

Table I.2-32: TEU Port Movements associated to LHI

	2016	2017	2018	2019	2020	2021	2030	2035
Transshipment	200,000	400,000	600,000	800,000	1,000,000	1,000,000	1,000,000	1,000,000
SEZ Traffic*	558,406	576,120	594,402	613,272	632,748	652,852	982,272	1,013,676
Total Movements	758,406	976,120	1,194,402	1,413,272	1,632,748	1,652,852	1,982,272	2,013,676

Source: Nathan Associates.

Note: SEZ traffic accounts for LHI projected cargo volume that is imported, processed by adding value or services, and re-exported, or more simple put, projected cargo volume for the LHI x 2.

Air Cargo

We projected air cargo (Table 1.2-33) based on historical traffic data at Norman Manley International Airport and Sangster International Airport. Projections of air cargo generated by SEZ activity were based on the projections of maritime trade volumes, considering a three percent factor for biomedical and a one percent factor for light manufacturing products. For transshipment, we assumed that 30 percent of projected air cargo from Latin America and Europe operated at Miami International Airport could be diverted by 2036 if the Vernamfield Air Cargo terminal begins its international operations in 2030. While we estimate Vernamfield air cargo terminal construction would begin by 2025, the Airports Authority of Jamaica (AAJ) plans to begin using the Vernamfield runway for small-scale local operations as early as 2018. Accordingly, the volume of freight handled in Jamaica's air cargo facilities is projected to grow from 16,588 tons in 2016 to approximately 97,902 tons in 2021, 445,579 tons in 2035, and 570,654 in 2040. The air cargo forecasts also considered air cargo and passenger traffic statistics from AAJ and the International Finance Corporation for the period 2003 to 2016 as well as AAJ's most recent reported data for fiscal years 2016-2017 (April 1 – March 31).

Table I.2-33: Projected Air Cargo Volume in Jamaica (Tons)

Air Cargo Tons		2016	2017	2018	2019	2020	2021	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	
BIOMEDICAL EQUIPMENT																			
Asia to	US	488	682	1,341	1,873	1,963	2,057	3,014	3,156	3,299	3,441	3,583	3,726	3,868	4,010	4,153	4,295	4,438	
	Latin Am.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Europe to	US	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Latin Am.	193	270	531	742	777	815	1,193	1,250	1,306	1,363	1,419	1,475	1,532	1,588	1,645	1,701	1,757	
Lat.Am.To	Europe	23	33	64	89	94	98	143	150	157	164	171	177	184	191	198	204	211	
	US	15	21	42	59	62	65	95	99	104	108	113	117	122	126	131	135	140	
US to	Asia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Europe	96	134	263	367	385	403	590	618	646	674	702	730	758	786	814	842	869	
	Asia	73	102	200	279	293	307	449	471	492	513	534	556	577	598	619	641	662	
	Latin Am.	180	252	495	692	725	760	1,113	1,166	1,218	1,271	1,323	1,376	1,429	1,481	1,534	1,587	1,639	
CLUSTER TOTAL		1,069	1,494	2,935	4,101	4,298	4,505	6,598	6,910	7,222	7,533	7,845	8,157	8,469	8,781	9,092	9,404	9,716	
LIGHT MANUFACTURING																			
Asia to	US	6,058	8,328	16,100	22,132	22,818	23,525	35,133	35,353	35,574	35,794	36,014	36,234	36,234	36,454	36,454	36,675	36,675	
	Latin Am.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Europe to	US	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Latin Am.	666	916	1,770	2,433	2,508	2,586	3,862	3,887	3,911	3,935	3,959	3,983	3,983	4,008	4,008	4,032	4,032	
Lat.Am. to	US	450	619	1,197	1,645	1,696	1,749	2,612	2,628	2,644	2,661	2,677	2,694	2,694	2,710	2,710	2,726	2,726	
	Europe	141	194	376	517	533	549	820	826	831	836	841	846	846	851	851	856	856	
	Asia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
US to	Asia	121	166	320	440	454	468	699	703	708	712	716	721	721	725	725	729	729	
	Latin Am.	96	132	255	351	361	373	556	560	563	567	570	574	574	577	577	581	581	
	Europe	487	670	1,294	1,779	1,835	1,891	2,825	2,842	2,860	2,878	2,895	2,913	2,913	2,931	2,931	2,949	2,949	
CLUSTER TOTAL		8,020	11,025	21,312	29,297	30,205	31,141	46,507	46,799	47,090	47,382	47,673	47,965	47,965	48,256	48,256	48,548	48,548	
TOTAL		9,089	12,518	24,247	33,398	34,503	35,646	53,105	53,709	54,312	54,915	55,518	56,122	56,434	57,037	57,349	57,952	58,264	

Airport	2016	2017	2018	2019	2020	2021	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
NMIA Organic	10,588	13,500	13,689	13,881	14,075	14,272	15,030	15,240	15,454	15,670	15,890	16,112	16,338	16,566	16,798	17,033	17,272
NMIA JLHI Cluster			48,493	66,795	69,005	71,291	65,000	58,500	52,000	45,500	39,000	32,500	26,000	19,500	13,000	6,500	0
Total NMIA	10,588	13,500	62,182	80,676	83,080	85,563	80,030	73,740	67,454	61,170	54,890	48,612	42,338	36,066	29,798	23,533	17,272
SIA Organic	6,000	7,000	10,000	12,000	12,168	12,338	12,994	13,176	13,360	13,547	13,737	13,929	14,124	14,322	14,522	14,726	14,932

Airport	2016	2017	2018	2019	2020	2021	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
V. Field Cluster (Landing and Departing)*							41,210	48,917	56,624	64,330	72,037	79,743	86,867	94,574	101,697	109,404	116,528
V. Field Transshipment							26,373	54,329	111,919	172,914	237,469	303,295	374,873	386,119	397,702	409,634	421,923
Total V. Field							67,584	103,246	168,542	237,244	309,506	383,038	461,740	480,693	499,400	519,037	538,450
Total Air Cargo (tons)	16,588	20,500	72,182	92,676	95,248	97,902	160,608	190,162	249,356	311,961	378,132	445,579	518,201	531,081	543,720	557,296	570,654

* This cargo segment counts for landing-import and departing-export

Source: Nathan Associates. NMIA cargo air projections, SIA interviews.

1.2-4 Cargo Flows and Transshipment Conclusion

In summary, Jamaica has the potential to capture substantial trade that will engender a host of activities associated with freight handling, value-added, and light manufacturing activities. With improved performance in transport and logistics services, Jamaica can expect to insert itself into the global supply chain for certain trade flows. This can happen when countries on the receiving end of trade flows realize economic benefits by virtue of flows through Jamaica.

As the analysis has shown, Jamaica has the potential to process over 0.63 million TEUs and 1.01 million TEUs in cluster-related volumes by 2020 and 2035, respectively. Total container volumes could increase substantially with the addition of transshipment traffic, with 1.63 million TEUs and 2.0 million TEUs by 2020 and 2030, respectively. The underlying assumption in these forecasts is that the JLHI will be successful in providing the global supply chains and the targeted clusters with competitive logistics services (fast, reliable, predictable and competitively priced), a business environment that supports the successful settlement of light industry and distribution centers (flexible and empowering SEZ law and regulation, improved education focusing on technical skills and technology, and lower cost of energy), and an enhanced trade facilitation approach by Customs. The Industry Analysis chapter presented later in this report provides an expanded description of the necessary conditions to attract the freight shown in this section. The key is that the cargo reflected in the forecasts is already being served by other countries. In order for Jamaica to attract it, it needs to offer better conditions than the other countries.

In terms of infrastructure and transport services, we emphasize the need for increased connectivity, a reduction in cost and time, and improved reliability and predictability through improved road, air, port, and logistics services. Trends in global shipping and the competitive nature of the bunker market, present substantive challenges for Jamaica to gain a competitive advantage and increase its market share in bunkering in the Caribbean, as Panama is the main competitor and is likely to absorb bunkering services as a result of increased traffic. However, the Panama Canal does provide a chance for Jamaica to capture Asian, US, and Latin American markets with a particular focus on commodities that align with the clusters identified in the Industry Analysis chapter. Domestic and transshipment container trades offer good prospects for Jamaica and, by definition, the expected growth in transshipment will offer greater maritime connectivity, a prerequisite for global logistics hub status as high connectivity drives opportunities for value added services and light manufacturing. Jamaica has the advantage that expected growth in container volumes can be accommodated with available capacity.

While future volume prospects are not as impressive for airport services, Kingston's airports can offer a complementary freight option, particularly if air connectivity can be improved. Global and regional air freight competition from well-established airport hubs and the lack of a national carrier, among other factors, constrain air freight opportunities under current conditions. However, given Jamaica is above the world average relative to its ICAO rating and meets the FAA's Cat 1 standards, expanded air connectivity can be achieved with NMIA improvements. We believe this is possible within the short-to-medium term in a BOT arrangement with a global airport operator.

In addition to needed investment in airport infrastructure, there are other areas that will need to be improved to support a thriving logistics hub. Easy access from the port to the free zone, perhaps through a dedicated and contained truck thruway, can provide the needed integration between two important logistics assets; depending on the distance, flows can be handled by port trucks, a far less expensive means for draying trucks between the two sites. Additionally, real time information on the

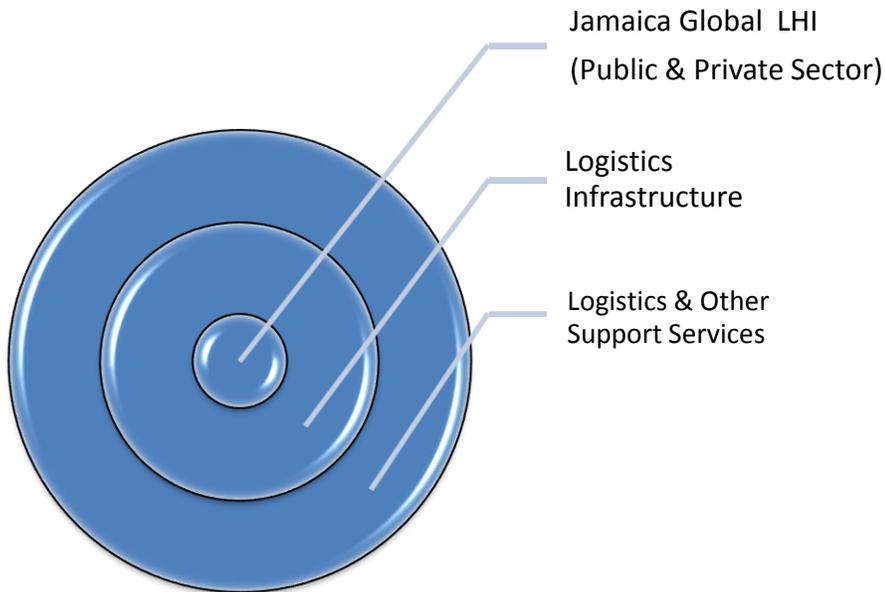
status of freight can facilitate the logistics planning requirements for shippers and logistics service providers. These and other infrastructure needs are evaluated in Part II.

Part I.3 Review and Assessment of Existing and Pipeline Projects

To address Jamaica’s vision to become a regional hub with global connectivity, it is important to consider the context of its existing transport and infrastructure assets as well as the planned expansions, projects, and investments. This chapter presents a review and assessment of Jamaica’s current and planned infrastructure and logistics assets and determines the degree to which they will be complementary to the development of the logistics hub. Additionally, this review serves as the first step to identify gaps that need to be addressed to fully realize the vision of the LHI.

To achieve the vision for Jamaica’s LHI and become the fourth node in the global logistics chain, Jamaica needs to move beyond just capitalizing on its strategic geographic location and improve efficiency and spur innovation to develop a logistics hub with robust connectivity. Figure I.3-1 illustrates Jamaica’s LHI cluster approach that was used to develop this part of the report.

Figure I.3-1: Jamaica Global Logistics Hub Initiative Cluster



I.3.1 Existing Logistics Infrastructure

Jamaica’s geographic position in the Caribbean provides an opportunity to develop a logistics and transshipment hub that can serve a potential consumer market of approximately 600 million people in the Americas.⁴² It is important to strengthen and develop the intermodal linkages between land,

⁴² Includes the populations of South East U.S., Central America, the Caribbean, and East Coast South America.

sea, and air transportation in the context of expanding Jamaica as a global transport hub that will be similar to Rotterdam, Dubai, and Singapore.

Growth in the logistic sector benefits a nation's general growth, providing economic and social gains by facilitating the movement of cargo, people, services and goods at both the local and international levels. Improvements in infrastructure have shown to have greater and faster impact on total factors of productivity. For national development to be achieved, comprehensive planning in strategic areas of the economy is necessary.

Jamaica's road, railway, air, maritime and other logistics infrastructure assets are analyzed and described below.

Maritime Infrastructure

As an island country, Jamaica's water-based transport sector is well developed. Jamaica already serves as a prominent regional transshipment hub and has premier cruise ship terminals and other maritime-related infrastructure.

The Port Authority of Jamaica (PAJ) and the Maritime Authority of Jamaica are working to evolve the country into a global transshipment and logistic hub. Jamaica has three deep water ports and nine ports dedicated to specific commodities. Some of the major port facilities are outlined below.

Kingston Container Terminal

Located in Kingston, the Kingston Container Terminal (KCT) is one of the region's leading container transshipment ports. It is located in the south east of the country and is near the Norman Manley International Airport. It consists of three terminals: the North Terminal (with a 535-meter berth and 4 Super Post Panamax Ship-To-Shore (STS) cranes), the South Terminal (with 1,300 meters of berth, equipped with 5 STS Post Panamax Cranes and 6 STS Super Post Panamax cranes) and the West Terminal (with a 475 meter berth and 4 STS Super Post Panamax cranes), that combined have an annual capacity of 2.8 million TEUs.

Kingston Wharves Terminal

The Kingston Wharves Limited Terminal is also located in the Kingston Harbour. Historically, the terminal operated mostly as a domestic terminal, but has increased its share in transshipment activities serving the Caribbean, Central America, and the US.

This privately owned multipurpose port terminal has a continuous quay measuring 1,655 meters, and has 9 berths for ro-ro, lo-lo, container, general cargo, break bulk, and bulk cargoes. The terminal includes 176 reefer plugs with 44-volt capacity. Its current annual capacity is 1.5 million TEUs.

The company that operates the terminal, Kingston Wharves Limited (KWL), is also a logistics provider that beyond operating the terminal, also provides a set of customizable services ranging from mixed cargo handling to warehousing. Their terminal has multiple storage areas: the on-dock open storage area is approximately 242,000 square meters; the on-dock transshipment car park measures 48,562 square meters; the on-dock warehouse storage area is 21,225 square meters; and the additional off-dock storage area measures 20,000 square meters. KWL also currently operates three multipurpose warehouses with a combined area of 165,000 square feet. These facilities are located within the port boundary and function under the approved Free Zone status from the GoJ and will transition to operate under the new SEZ regime when the new SEZ law is implemented.

The Port of Montego Bay

Located in the northwest part of the country, the Port of Montego Bay handles both cargo and cruise ship activities. Berths Five and Six are used exclusively for cruise ships since that is the most popular tourist destination of Jamaica. The port facilities include a 2,694 square meter cruise ship terminal and approximately 427 meters of berth. The mixed use terminal includes 1.2 hectares of yard space for container storage and a warehouse area of 1,858 square meters. Both the cruise and mixed use port terminals are owned by PAJ, but the mixed use terminal is operated by Port Handlers Ltd.

Ocho Rios

Along the north coast of the country, Ocho Rios is another important port that handles mostly cruise ships. The Port of Ocho Rios consists of two facilities: the Reynolds Bauxite Pier owned by the Bauxite & Alumina Trading Company of Jamaica (BATCO) is used at times to dock cruise ships, while Lannaman & Morris Shipping operates the Ocho Rios Cruise Shipping Terminal, a dedicated cruise ship pier owned by PAJ. The Reynolds Pier is 274.3 meters long, has a vessel draft capacity of 12.2 meters, and can handle both passenger and cargo vessels. The cruise ship pier has two berths. Berth One is 222 meters long and Berth Two is 274.3 meters long. The draft for the cruise terminal is 9 and 9.75 meters, respectively.

Port Antonio

In Portland, Port Antonio has two separate facilities, one of which is dedicated to cruise ship passengers at the Ken Wright Cruise Pier, which is owned and operated by PAJ. The other facility handles cargo at Boundbrook Wharf, which is 167.6 meters long and has a draft of 7.9 meters. Although Port Antonio was the primary port for the shipping of agricultural products in the past, it is no longer operational. The Errol Flynn Marina is another cruise terminal in Portland owned and operated by PAJ.

Falmouth

There is a joint venture development project between the PAJ and Royal Caribbean Cruises International to establish a new cruise ship pier in the town of Falmouth. The pier is capable of accommodating the new Oasis class of mega cruise vessels recently introduced to the industry. These vessels carry 8,000 passengers and a crew of about 2,000. The first ship called at the Falmouth Pier on February 17, 2011.

Specialized Commodity Ports

There are additional specialized and privately-owned port facilities, including Port Kaiser in St. Elizabeth for the export of alumina from Rusal-Alumina Partners of Jamaica, Port Esquivel Rocky Point in Clarendon, and Port of Lucea en Hanover. Furthermore, the Kingston area is home to nearly a dozen additional privately owned and operated ports, including Petroleum Corporation of Jamaica (PCJ)'s Antilles Dock; Caribbean Cement Company's Cement and Coal Piers; Jamaica Gypsum & Quarries gypsum pier; Newport Fersan Jamaica's JLA Pier; Newport Mills' Newport Wharf & Storage (formerly the Wherry Wharf); Petroleum Corporation of Jamaica (PCJ) PETROJAM Refinery pier, The now closed Rapid Sheffield Pier; The Rubis Energy Jamaica Ltd's Rockfort Pier (formerly Shell Pier); and Aegean Bunkering (Jamaica) Ltd's Texaco Pier.

Air Infrastructure

Jamaica has three international airports: Norman Manley International Airport (NMIA) in Kingston, Sangster International Airport (SIA) in Montego Bay, and Ian Fleming International Airport (IFIA) in the northeastern section of the island near Ocho Rios. It also has three domestic aerodromes: Ken Jones, Negril, and Tinson Pen, which all operate mainly for passenger traffic. SIA is the most popular airport, serving mainly international tourists visiting the north coast of Jamaica (3.4 million passengers in 2012), while NMIA is the second busiest airport and serves both passengers (mostly to domestic and business traveler) and cargo. IFIA, which opened in 2011, focuses mostly on general aviation and has some scheduled, albeit limited, commercial flights.

The Jamaica Civil Aviation Authority (JCAA) is the regulatory body that is responsible for all navigational activity and matters relating safety and security. They are currently implementing a five-year strategic plan that spans 2015-2019. The JCAA has been actively pursuing bilateral air service agreements (BASA) with other countries with the goal to expand the aviation's impact on the Jamaican economy. Jamaica is currently party to 28 BASAs, and is advancing on additional agreements with Qatar, India, Sri Lanka, Burkina Faso, Austria, Kenya and Ethiopia.

Sangster International Airport

SIA is a larger airport than NMIA, and almost 95% of its passenger traffic is international tourists. Of Jamaica's 1.7 million total annual air visitors⁴³, close to 72% of them used SIA.⁴⁴ In 2003, the GoJ granted a 30-year concession to a private international consortium, MJB Airports Limited, for the operations and management of the airport. The concession included a 5-year construction and investment phase that doubled the air terminal building, added 6 bridges and gates, increased the apron area, and improved or added areas providing customer service. SIA has the capacity to handle up to 4,200 passengers per hour. The airport has one runway that is 2,662 meters long and 46 meters wide and is capable of accommodating B747s. A new control tower is currently under construction as part of a JCAA program to improve air navigation systems and comply with International Civil Aviation Organization (ICAO) global air navigation plans.

As seen in Table I.3-1, SIA hosts more airlines than NMIA, nevertheless air traffic at SIA depends in a large number of charter airlines, which impact regular itineraries and frequency including variations due to seasonality. Figure I.3-2 shows various destinations that service SIA, with different colors representing regularly scheduled flights and charter flights. SIA has regular or seasonally scheduled direct flights to many locations of Canada, the U.S., Mexico, Panama, Europe, and the Caribbean.

Current air cargo facilities include two cold storage rooms with a size of 25 by 25 feet, a 6,000 square foot customs processing facility, and a 900 square foot X-Ray area,

⁴³ One visitor has to both arrive and depart by air, therefore counting as two air passengers in the aggregate.

⁴⁴ Montego Bay Sangster International Airport Website. "History Facts." Accessed 2016. <http://www.mbjairport.com/history-facts>.

Table I.3-1: Main Airlines Serving SIA

Main Airlines Serving SIA		
AeroGal	Cayman Airways	Spirit Airlines
Airberlin	Condor	Sun Country
Air Canada	Copa Airlines	Sunwing
Air Canada Rouge	Delta	Tame
Air Tran	Frontier Airlines	Thomas Cook
Air Transat	Iberworld	Thomson Airways
Allegiant Air	Jazz Airlines	Travel Service
Allegro Airlines	Jet Blue	United Airlines
American Airlines	Jetairfly	US Airlines
Arkefly	Miami Air	USA 3000
Blue Panorama	Neos	Virgin Atlantic
Canjet	Orbest	West Jet
Caribbean Airlines	Southwest Airlines	White Airways

Source: SIA

Figure I.3-2: Route Map of SIA



Source: <http://www.mbjairport.com/route-map>

Norman Manley International Airport

NMIA is located on Kingston Harbour, south of Jamaica's capital city. NMIA is currently operated under a 30-year concession agreement by NMIA Airports Limited (NMIAL) which is owned by the Airports Authority of Jamaica (AAJ). The government is seeking a private investor to take over the concession and expand and modernize the facilities as well as optimize its operations.⁴⁵ As previously mentioned, JCAA recently commissioned into service a new 131-foot air traffic control tower in order to meet ICAO standards for a projected increase in air traffic.⁴⁶

NMIA is the airport with the greatest potential to realize the LHI vision due to its proximity to Kingston as a city and the main port gateway, its proximity to the Caymanas SEZ, and its existing air cargo operations. During 2016, NMIA's passenger and air cargo and mail traffic were 1,622,530 passengers and 10,588 tons, respectively. Due to its potential, we provide below an in-depth review of the airport, including operations, passenger and cargo traffic, and connectivity.

Operations

NMIA has a single runway which is 2,716 meters long and 46 meters wide and is designed to handle B747-400 and B777 aircrafts. The runway was constructed using land reclamation into the Kingston Harbour and currently sits 2.43 meters above mean sea level. The cargo apron is located west to the cargo concourse structure that extends south from the terminal building and can accommodate up to 7 aircrafts. The runway length allows NMIA to handle B777s operations to London. However, the runway does not meet ICAO Annex 14 standards for Runway End Safety Areas (RESAs) and a result has plans to extend its runway by 300 meters. The runway expansion will be part of multiple modernization and expansion works that will take place during the upcoming concession.

Operations at the passenger and cargo terminals are in good operating order since the airlines and airport have to meet international security requirements as well as operating standards of the international airlines. This also impacts the rates charged for the services.

Passenger Traffic

Figure I.3-3 shows the major destinations in 2013 served from NMIA. Fort Lauderdale, New York, and Miami represent 65% of the seat capacity. Other important destinations include Toronto, London and Cayman Islands with another 21%.

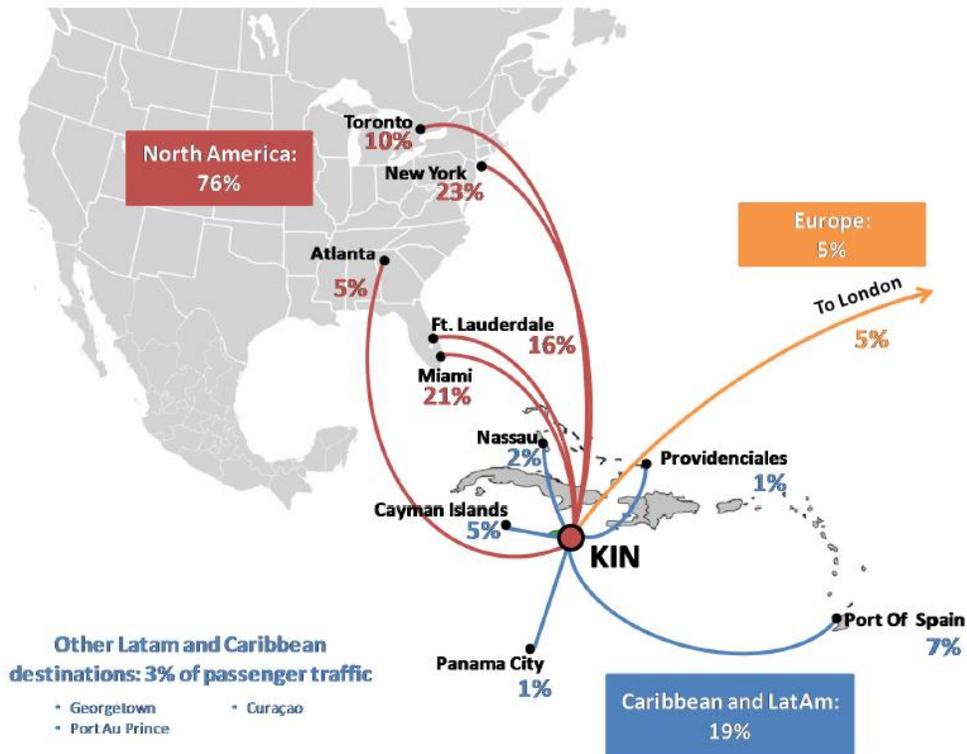
Cargo Traffic

NMIA has a cargo and logistics center that was completed in 2006. It provides 3,810 square meters for cargo operations, which includes an area for airport customs operations as well as cargo service providers and couriers.

⁴⁵ More information on current developments at NMIA can be found in the "Review of Jamaica's Logistics Related Pipeline Projects" section (3.4).

⁴⁶ Hodges, Peta-Gay. "Air Traffic Control Boosted." Jamaica Information Services. January 2, 2017. Available at <http://jis.gov.jm/air-traffic-control-boosted/>.

Figure I.3-3: NMIA International Seat Capacity by Destination, 2016



Source: IFC, AAJ, and DBJ

NMIA has two areas to handle cargo. The Cargo Pier is connected to the Terminal and has 4,445 square meters plus customs offices. The Cargo and Logistics Centre, which was built in 2006, is in the northeast corner of the airport and currently has 5,130 square meters of leasable space. FedEx and DHL are currently operating there among other logistics companies. The site has space to expand to an additional 16,000 square meters, for a total potential area of up to 21,150 square meters. There are plans for a second phase of development to add space for warehousing and commercial cargo services, which would include a 1,858.06 square meters (20,000 square feet) warehouse facility at the NMIA Cargo and Logistics Centre (NCLC) that has already been approved and would be completed by Q4 2017/18. NMIA also has a cold storage facility for the transshipment of perishable goods via air cargo.

The main origins and destinations that connect directly from NMIA are the US and Canada, which together, share about 80 percent of passenger traffic. The Eastern Caribbean market share is 9 percent of the passenger traffic, the London market share is 6 percent, and the remaining market share is split among a variety of regional destinations, as listed in Table I.3-2. As discussed in Chapter I.2 Current Air Connectivity section, NMIA air connectivity is limited to a reduced number of destinations compared to its regional competitors, which is a disadvantage for the LHI.

Table I.3-2: Main Destinations Serving Norman Manley International Airport

Destinations Outside the Caribbean	Caribbean Destinations
Ft. Lauderdale	Nassau
Miami	Curacao
New York	Providenciales
Orlando	Havana
Toronto	East Caribbean
London	Grand Cayman
Panama City	

Source: NMIA

Table I.3-3: Main Airlines Serving Norman Manley International Airport

Caribbean	British
American Airlines	Air Canada
JetBlue	Spirit
Top 3	WestJet
Cayman	Copa

Source: NMIA

Ian Fleming International Airport

The Ian Fleming International Airport is located in the Saint Mary Parish 10km from Ocho Rios in Northern Jamaica. This airport is primarily used to support the local tourism industry, has a 4,800 foot-long runway, and can accommodate small commercial aircraft (such as the 10-passenger Cessna Citation Excel). The airport was upgraded in 2009 with a new terminal building and a runway expansion from its original length of 3,000 feet. In recent years, with the support of tourism stakeholders in the nearby region, the Airport Authority of Jamaica (AAJ) has been advocating for the airport's expansion and modernization in order to sustain larger passenger flows.⁴⁷ At the moment, the AAJ is awaiting Cabinet approval for the implementation of a one year US \$15 million project to extend the runway and expand and modernize the terminal building so that the airport can receive larger air crafts and grow the airport's business. The larger runway would (of 5,500 foot) and proposed modernization would facilitate larger aircraft, including the Avro RJ 85 which is comparable to the BAE 146-200 (90-seater, 4 engine jet).

The main destinations serving Ian Fleming International Airport include Miami and other Caribbean countries. Airlines currently serving Ian Fleming International Airport include Caribbean Airlines, as well as local charter airlines and private jets.

Land Transport infrastructure

There are two modes of land transportation operational in Jamaica: road and rail transportation. Land transport is susceptible to bottlenecks involving natural disasters (such as hurricanes and tropical storms) that often damage infrastructure. For the movement of both people and cargo, road

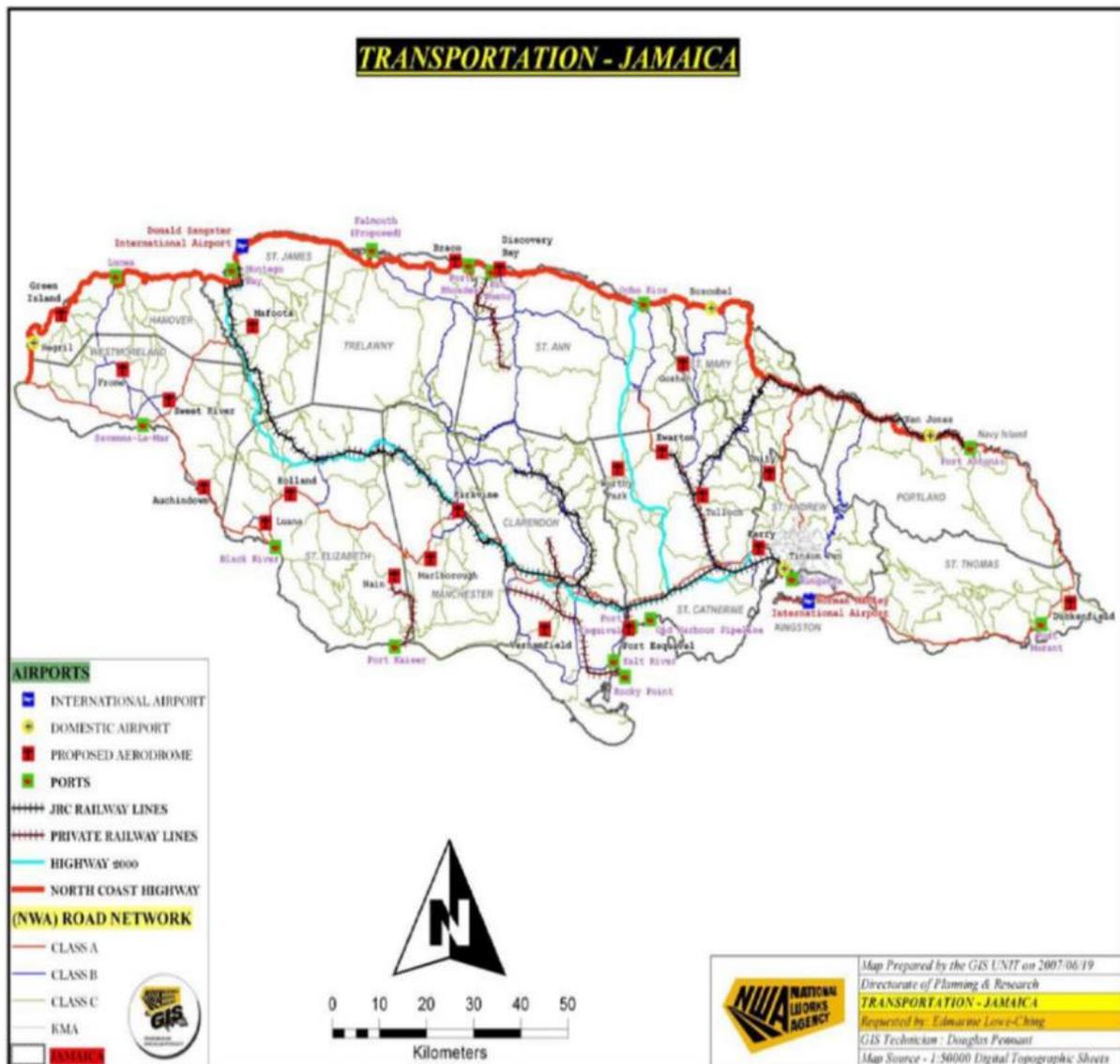
⁴⁷ Information on current developments at Ian Fleming International Airport can also be found in Appendix I.3.

is the most dependable mode of transport in Jamaica due to its dense network in the island, as well as the limitations in the rail network and related infrastructure maintenance.

Road Network

The Jamaican road network has a total 22,121 kilometers of roads, of which 16,148 kilometers are paved and 5,973 kilometers are unpaved. The network also includes about 800 bridges throughout the island. The Jamaica National Works Agency (NWA) is responsible for its maintenance. The road network is also composed of parochial roads (14,895 kilometers) and farm roads (1,500 kilometers) which are under the responsibility of local authorities (Parish Councils), and community roads (4,200 kilometers) which are the responsibility of the Rural Agriculture Development Agency (RADA).

Figure I.3-4: Jamaica’s Land Transportation Network



Source: National Transportation Network

An Inter-American Development Bank (IDB) report from 2013 indicates that according to NWA 31% of the main road network is in fair condition, and 38% is in bad condition.⁴⁸ The majority of the roads in good condition are along the north coast and between Kingston and Ocho Rios (on the A1 road) and on the A2 road on the southwest part of Jamaica.

The major highway constraints occur on the roads between Ocho Rios and Kingston, and Kingston and Montego Bay via Ocho Rios. The current road system linking the north and south part of the island are subject to flooding, closures, steep grades and limited passage. There have been improvements in road infrastructure in the island including a realignment of the main roads and construction of new highways. Figure I.3-4 shows the land transportation network (both road and rail) in Jamaica.

The main road development projects include the Northern Coastal Highway Improvement Project and the Highway 2000 Project. Highway 2000 system is a network of toll roads that was created through a public private partnership (PPP). It currently operates as two toll roads. The first toll road is the Highway 2000 East-West that was created based on a concession agreement in 2001 between the National Road Operating and Constructing Company Limited (NROCC) and TransJamaican Highway Limited (TJH). In 2002, TJH signed an operation and maintenance agreement with another private company, Jamaican Infrastructure Operator (JIO). The Highway 2000 East-West is made up of two segments:

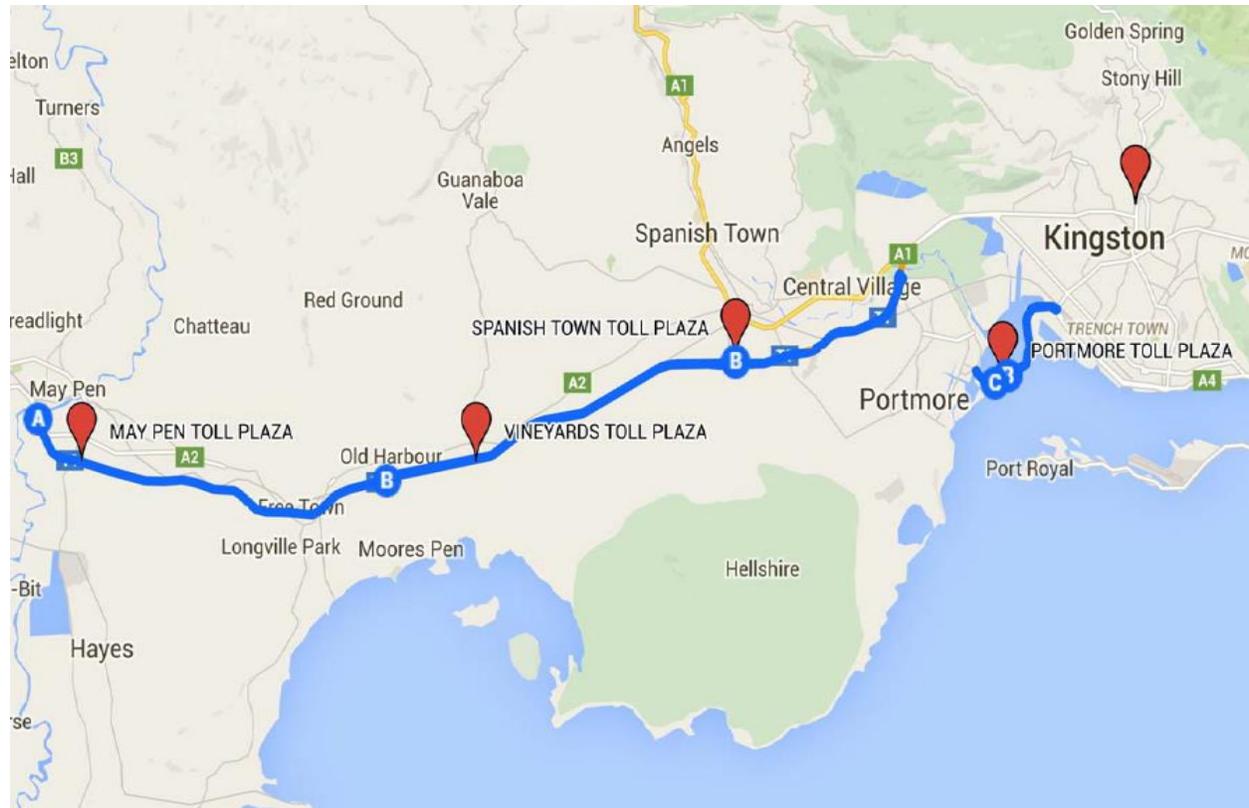
- ▶ Kingston to May Pen - 43.5 kilometers – US\$ 5 for a passenger vehicle or US\$14 for a truck
- ▶ Portmore to Kingston - 6.4 kilometers – US\$ 1.5 for a passenger vehicle or US\$4.8 for a truck

The Highway 2000 East-West toll road is expected to be extended 230 kilometers through Mandeville to finally connect Kingston with Montego Bay. This extension is being evaluated with no specific plans for its development.

The second toll road was recently completed and opened in the middle of 2016. Phase 2A of the North South Link of the Highway 2000 Project is a 67.2 kilometer-long, dual carriageway. The concession for this segment was awarded in June 2012 by NROCC to Jamaica North South Highway Company Limited (JNSHC) for 50 years. The North-South segment goes from Caymanas in St. Catherine to Mammee Bay in St. Ann. This segment represents the full extent of this toll road per the 2002 development plans. Figure I.3-5 shows Highway 2000 and its toll plazas.

⁴⁸ Interamerican Development Bank, *Jamaica Logistics Chain Study*, March 2013.

Figure I.3-5: Highway 2000 East West with Toll Plazas



The toll rates are revised each July based on a formula which takes the exchange rate, Jamaican consumer price index, and US consumer price index into consideration. The average toll rates per kilometer are shown in the Table I.3-4 and are the same for the long distance segments of the East-West and North-South toll roads. The urban segment between Kingston and Portmore has rates over two times those of the long distance segments.

Table I.3-4: Toll Rates at the Highway 2000 East-West (US\$/km)

Vehicle Type	Kingston - May Pen and Caymanas – Ocho Rios	Portmore – Kingston
Passenger Car	0.11	0.24
Truck	0.33	0.74

Source: Nathan Associates with data from toll road websites

Even though the Highway 2000 toll roads represents an important private sector investment that will help cargo movement in Jamaica, the effective toll rates that are charged are on the high end when compared with toll roads in the US, as shown in Table I.3-5. While the intercity roads represent monetization and expansion of already existing roads, Highway 2000 is mostly greenfield projects, and the difference in toll rates is quite significant. The urban roads, on the other hand, have very similar rates for passenger vehicles but higher rates (35% more) for trucks utilizing Highway 2000.

Table I.3-5: Sample Toll Rates in the United States (US\$/km)

Vehicle Type	Intercity		Urban		
	Indiana Toll Road	Florida Turnpike Mainline	Southbay Expressway SR125	91 Express Lanes (Orange County, CA)	
				Lowest	Highest
Passenger Car	0.02	0.04	0.28	0.16	1.05
Truck	0.16	0.15	0.55	no trucks allowed	

Source: Nathan Associates with data from toll road websites

Trucking companies are relatively consolidated into three or four major companies. An interview with one of them indicates that they have relatively new trucks. Cold chain cargo is moved using reefer containers. Fuel is moved by specialized companies. About 80% of their movements are of containers between Kingston Port and the Kingston Free Zone or what they call the Corporate Area. The other movements are distributed between Spanish Town, Ocho Rios, Montego Bay and Mandeville. Table I.3-6 shows the distance and cost of the representative destinations to the Port of Kingston.

Table I.3-6: Jamaican Cargo Transport Rates

Destination from Port of Kingston	Distance (km)	Cost (US\$/km)
Free Zone	3.7	29.1
Portmore	12.5	11.1
Ocho Rios	90	5.8
Montego Bay	187	4.2

Source: Published rates from a trucking company

Rail

The railway network in Jamaica was one of the earliest modes of transportation in the island with construction beginning in the 1880's. At its peak, the railway network had 335 kilometers had of standard gauge track (1.435-meter gauge) under the control of the Jamaican Railway Corporation (JRC).⁴⁹ It connected 9 of the 14 parishes in Jamaica (Clarendon, Kingston, Manchester, Portland, St. Ann, St. Catherine, St. Elizabeth, St. James and St. Mary) and had more than 40 stations.

In 1992, JRC railways closed for public and freight operations as a result of heavy debt and significant annual losses. There was a brief revival in 2011, but it closed again in August 2012.

Currently, most of railways are no longer operational with only some track being used for the transport of bauxite, alumina, and sugar to private marine bulk terminals. The railway track is owned by the JRC which receives royalties for its use by the private sector companies. Only 57 kilometers of

⁴⁹ GoJ Transport Taskforce. "Vision 2030 Jamaica - Transport Sector Plan 2009-2030." MTW. July, 2009.

rail are in service using six privately owned mining railway lines. There is a Railway Enterprise Team that is evaluating options for its potential revival, but investment costs for the rehabilitation are high.

There is a recent report from the World Bank that evaluated the viability of the rail operations in Jamaica. The conclusion was that rail is not viable.

In 1985, the railroad operated two lines and a short branch:

- ▶ Kingston to Montego Bay – 113 miles
- ▶ Spanish Town – Ewarton - 15 miles
- ▶ Port Esquivel Branch – 3 miles
- ▶ An additional line owned by ALCOA (at the time) in Clarendon

From the demand point of view, the traditional rail cargo is minerals, sugar and other agricultural products. In 1983, 90% of the revenue was from alumina and bauxite and 9% from passengers. At the moment, minerals still use short rail routes between the mines, processing centers and private ports where they are exported. Given the minerals' origin and destinations in Jamaica, their volumes are not likely to use any other rail segments (e.g. long distance railway between Kingston and Montego Bay) and therefore leave sections of the railway without any significant demand.

The Jamaica Fiscal Policy Paper 2016-17 states that:

“Jamaica Railway Corporation (JRC) - GOJ has entered into a Memorandum of Understanding with Herzog International Inc. to undertake detailed due diligence to facilitate the preparation of a proposal to the GOJ. Herzog has undertaken the necessary due diligence and at December 31, 2015, the company submitted a revised business plan to rehabilitate approximately 207km of the 334.9km rail track. The work will be undertaken on a phased basis.”

Jamaica Fiscal Policy Paper 2016-2017, p.147

I.3.2 Analysis of Existing Infrastructure Networks

This section presents the results from the assessment of Jamaica's existing transport networks using Nathan's transport logistics diagnostics tool. The data gathered for the tool was collected through interviews with transporters and port operators. The tool helps provides visual analysis and evaluation of logistics scores based on those interviews. Figure I.3-7 maps Jamaica's major logistics corridors, including the key nodes of the corridors.

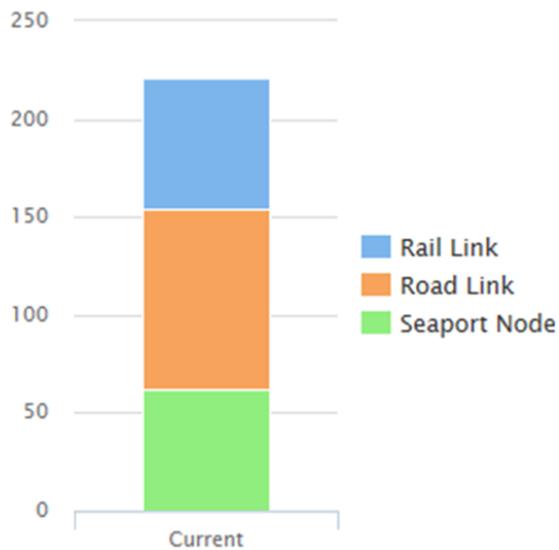
Figure I.3-6 Overview of Jamaican Logistics Corridors



Source: Generated from Nathan’s Transport Logistics Diagnostics Tool, Nathan Associates Inc., 2016.

The logistics scores that result from our logistics analysis is based on the time, cost, and reliability of specific links. The logistics score is a complex combination of distance, time, time variations (delays), and fixed costs associated with the links (road and rail) and nodes (ports, free zones, airports, and rail stations), measured out of an index score of 100. Overall, Jamaica scores 91 in roads, 62 in ports, and 66 in rail for a combined score of 219 as shown Figure I.3-7. These scores are described in detail below by sector.

Figure I.3-7 Logistics Scores in Jamaica by Mode (Indexed Score out of 100)



Source: Nathan’s Transport Logistics Diagnostics Tool, Nathan Associates Inc., 2016.

Roads

According to interviews with transporters, most of the shipments are concentrated in roads in the Kingston area (80% according to a transporter). The longer trips (from Kingston Port to Montego Bay for example) have a higher overall cost, but reduced cost per kilometer. Table I.3-7 summarizes the physical characteristics (distance, terrain) and operational characteristics (surface condition,

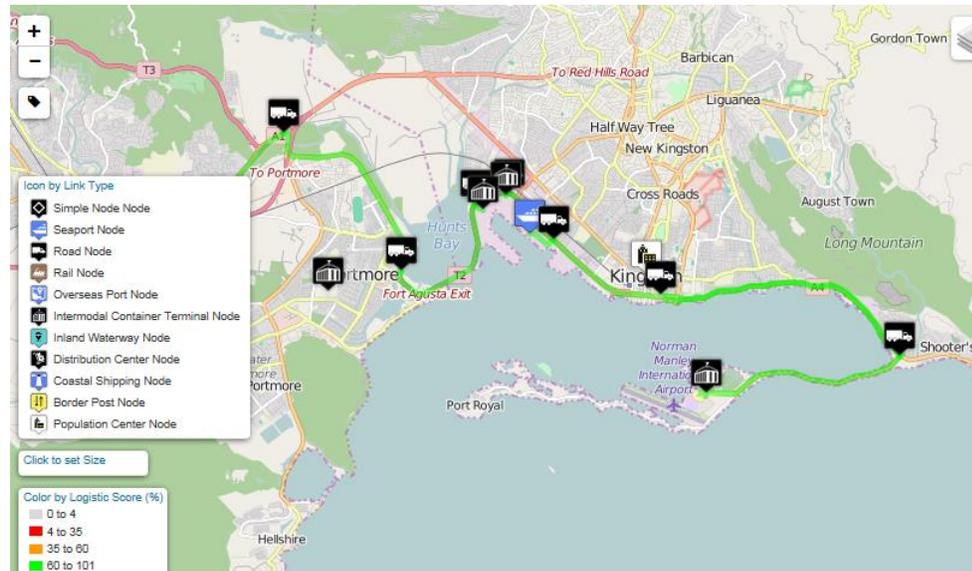
congestion) of the selected corridor segments. The tool's factor value presented in Table I.3-7 is calculated based on terrain characteristics, surface condition, and congestion and is later used to distribute the transport costs among the different segments of the corridor. A factor of 1 indicates baseline, so higher factors describe how sensitive a corridor is to delays and congestion (assuming cost and distance remain constant).

Table I.3-7: Road Network Logistics Scores

				BASELINE		BAD CONDITIONS	
		Length km	Price USD/ TEU	Logs Score	Factor	Logs Score	Factor
Norman Manley	KCT	23.03	6.8	96.6	1	90.24	1.7
Norman Manley	KFZ	21.61	6.2	95.8	1	87.8	1.9
Norman Manley	Kingston Wharf	20.4	6	97.3	1	89.2	1.5
Norman Manley	Spanish Town FZ	34.93	10.4	97.6	1	82.3	1.5
KCT	Spanish Town FZ	20.64	6.2	97.3	1	85	1.4
North - South Road Corridor (A1, A3)		157.4	51	86	1	70	1.9
MB Port	MB Free Zone	.52	.3	91.67	1	78	2.1
	SIA Airport	6.42	4.2	87.5	1	89	1.3

Source: Nathan's Transport Logistics Diagnostics Tool, Nathan Associates Inc., 2016.

Figure I.3-8: Baseline Conditions in Airport-Kingston Corridor



Source: Nathan's Transport Logistics Diagnostics Tool, Nathan Associates Inc., 2016.

When conditions are favorable (such as low traffic times), the logistics scores are very high, with the Airport-Kingston road corridor at an average of 97%. The **Kingston Industrial Area** with the container terminal and **free zones** scores slightly lower than destinations such as the Spanish Town FZ in light traffic primarily because of higher price and speed restrictions. With traffic congestion around Kingston that can cause delays up to one hour, the reliability and time component of the model

result in much lower logistics score for roads in this corridor, down to approximately 80%. The other potential road bottleneck is the North-South Highway due to terrain, lack of diversion, and long distance. In fact, the logistics score for this north-south corridor is 43% more sensitive to any traffic congestion than roads in the capital corridor because of the terrain factors.

Ports

The overall logistics score for ports in Jamaica is 66 with very little variation across components. The combined port logistics score for Jamaica is broken down in Table I.3-8.

Table I.3-8: Jamaican Ports Overall Logistics Scores

Seaport Components	Price per (US\$)	Avg. Time (hr)	Reliability %	Logistics Score
Berth	150	24	45	66.5
Channel	76	60	70	97.8
Consolidation	92	40	123	66.5
Customs	184	96	55	66.5
Gate	16	14	30	66.5
Intermodal Transfer	46	48	55	66.5
Yard	92	40	55	66.5

Source: Nathan’s Transport Logistics Diagnostics Tool, Nathan Associates Inc., 2016.

The least efficient component of the port sector in Jamaica is customs, which is the biggest contributor to higher costs and higher processing times. It should be noted that the channel is the biggest asset to ports providing higher capacity scores. There are also issues with sufficient equipment at some ports that also lowers the port scores after customs. For example, KWL lacks sufficient handling equipment to more efficiently get containers off the yard, however, KWL’s major user had no complaints because all resources were available to them.

Conclusion of Existing Infrastructure Networks

The transport logistics analysis tool results demonstrate that of road, rail, and maritime transportation, Jamaica ranks best in road transport. The logistics score that results from the tool provides an indicator that combines distance, time, time variations (delays), and fixed costs in the transport network measured out of 100. Overall, Jamaica scores 91 in Roads, 62 in Ports, and 66 in Rail. The ports component, while sufficient in capacity, scored lower because of customs inefficiencies that cause high costs and high processing times for shipments. These results align with the rest of our overall findings that indicate that while existing infrastructure in Jamaica is generally adequate for current cargo volumes, Jamaica needs to continue investing on improving processes (especially in customs and costs) and access to realize the LHI vision and the ensuing increased demand for efficient and cost effective logistics services. Overall, there is high potential to realize these goals, as exemplified by the high logistics score in the Airport-Kingston corridor.

I.3.3 Other Logistics Infrastructure

Most of the free zones in Jamaica are located in either Montego Bay or Kingston, and are near the airports and ports. Those main zones include:

- ▶ **Kingston Free Zone:** Located next to the Kingston Container Terminal is a 784,000 square foot facility space.

- ▶ **Montego Bay Free Zone:** Situated on a 95-acre site south west of the city of Montego Bay, the site includes a 488,110 square foot factory and office space.
- ▶ **Cazoumar Free Zone:** Located on a 5-acre ocean front property in Montego Bay, the zone has 65,000 square feet of space for office and information technology businesses.
- ▶ **Portmore Informatics Park:** Located in St. Catherine, the park was constructed on a 13.5-acre site.
- ▶ **Kingston Wharves Limited:** KWL operates three multipurpose warehouses with a combined area of about 15,300 square meters, located in the Kingston Harbour port area.

According to a recent paper by Dr. Eric Deans titled “*Performance of Jamaica’s Free Zones,*” the free zone landscape in Jamaica consists of approximately 134 free zones entities (without including new applicants in the pipeline) plus approximately 36 non-free entities who occupy zones located in ten (10) parishes across the island. Of all free zones, 46% are located in Kingston, 35% are located in Montego Bay, 8% are located in Saint Catherine, and the remaining 11% are located throughout other parishes. Approximately 40% of the companies currently operating in free zones that enjoy free status are Business Processing Outsourcing firms (BPOs), while manufacturing represents 20%, logistics and distribution companies represent 11%, warehousing and merchandising represent 11%, and the remaining 5% represents assembly activities. Most of the firms operating within free zones that do not have a free zone status consist of warehousing and distribution firms, many of which are located within the Kingston Free Zone. Such firms have recently been hindered by having to pay full duty on imported goods and by more intensive and time consuming customs documentation requirements. These port centric firms will most likely benefit from the new SEZ Act, especially if customs inefficiencies are appropriately addressed. The Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF) provided a list of all the Free Zones established in Jamaica. Such list includes the different types of Free Zone categories as well as their respective activities. This information is included in Table I.3-9.

Table I.3-9: Free Zone Distribution by Category

Free Zone Categories	Activities
Assembly	Assembly of buses
BPO	BPO, call centers, data entry and telemarketing, data processing, distribution, ICT’s, inbound and outbound collections, learning services, manufacturing electrical services, processing, refurbishing electronics, telemarketing, warehouse & transshipment
Distribution	Lubricants distribution, distribution/management consultants, logistics/distribution, warehousing & distribution of general merchandise
Manufacturing	Cake making, confectionary & packaging, export of ground provision, manufacturing & metal fabrication,
Merchandising	General merchandise
Warehousing	Storage & dehydration of Ethanol, warehousing, distribution of household goods, food and gift items
Others	N/A

Source: Ministry of Industry, Commerce, Agriculture and Fisheries

According to the provided list of free zones, the total area for existing free zones is a combined 3 million cubic feet. The largest holders of space in the zones include:

- ▶ Jamaica Broilers Ethanol Plant (28%)
- ▶ Kingston Wharves Limited (13%)
- ▶ GulfRay America's Manufacturing Ltd. (12%)
- ▶ Walkerswood (6%)
- ▶ Sutherland Global Service (5%)
- ▶ Jamaica National Automotive Industry International Corporation (5%)

The main locations of warehouses are Kingston, Montego Bay, St. Catherine and St. Thomas. Factories Corporation of Jamaica Ltd, is the largest provider of real state in Jamaica with approximately 175,000 square meters of properties under their management. The level of occupancy for 2015 was 81%. Table I.3-10 shows the total available warehouse space in Jamaica and its level of occupancy in the last two years.

Table I.3-10: Warehouse Space Availability and Level of Occupancy

	March 2015	March 2014
Number of companies	111	112
Total available space (m ²)	160,526.31	160,274.03
Vacant space (m ²)	30,643.19	25,338.89
% Occupancy	81	84

Source: Jamaica Factory Corporation

According to an IDB study on the Jamaica Logistics Chain, warehouses exist throughout the major populated hubs in the country. However, the current facilities are not sufficient due to lack of space and risk of flooding.⁵⁰

Information Technology and Communications

In its Vision 2030 for the ICT sector, the GoJ articulated the goals to be (a) a strong and competitive ICT sector, and (b) national development advanced by widespread adoption and application of ICT.⁵¹ The liberalization of the telecommunications sector that followed the enactments of the Telecommunications Act 2000 was instrumental in boosting private sector investment in telecommunications. Cable & Wireless (C&W) was the monopoly provider of domestic and international voice and data telecommunications in Jamaica. In early 2000 the Government issued two licenses for domestic mobile communications to Mossel (Digicel) and a joint venture between Centennial Communications and Oceanic Digital Jamaica. In 2003, the GoJ completed the liberalization of the telecommunications market when it opened the market to competition in the lucrative international voice and data service market. For the first time, C&W (later rebranded as

⁵⁰ Interamerican Development Bank. "Jamaica: Logistics Chains Study Final Report." March, 2013.

⁵¹ ICT Task Force. "Vision 2030 Jamaica: Information and Communications Technology (ICT) Sector Plan 2009-2030." September, 2009. pp. 49-72.

LIME), faced competition in all market segments. Competition has been relentless leading to constant changes in product offerings, pricing, and technologies used for service delivery. The service provider's landscape also changed; firms entered, other exited, yet others remained but were acquired by new owners. The initial flurry of firms entering and exiting that followed the liberalization of the sector has been replaced by a more subdued environment in which market consolidation had left fewer but larger telecom operators in the market.

Digicel

Digicel has become the fastest growing mobile communications operator in the Caribbean. Digicel entered the Jamaican market in 2001 using GSM technology competing against Cable & Wireless's Time Division Multi Access (TDMA) technology. C&W was no match for Digicel's superior marketing machinery, fast network rollout and GSM technology. It took only thirteen months for Digicel to match C&W's number of mobile subscribers (400,000). To put this in perspective; it took ten years to C&W to reach that number of subscribers. Two years later C&W started offering mobile services with GSM technology but Digicel had already established itself as the leading mobile provider. It is estimated that Digicel has currently 75% market share in mobile services and more than one thousand cell towers covering all fourteen parishes in Jamaica.

MiPhone/Claro

In 2001, Centennial and Oceanic joint venture started competing with Digicel and C&W using CDMA technology. Branded as MiPhone, the network roll out lagged behind Digicel and C&W, concentrating services around the larger metropolitan areas. After struggling to build out their network and grow subscribership to more than 100,000, in 2007 the company was acquired by America Movil (doing business as Claro), who promptly upgraded the network to GSM and launched customer centers around the country accompanied by an aggressive advertising campaign.⁵² The revived competitive environment led C&W to rebrand as LIME and upgrade to a 3G network in 2008.

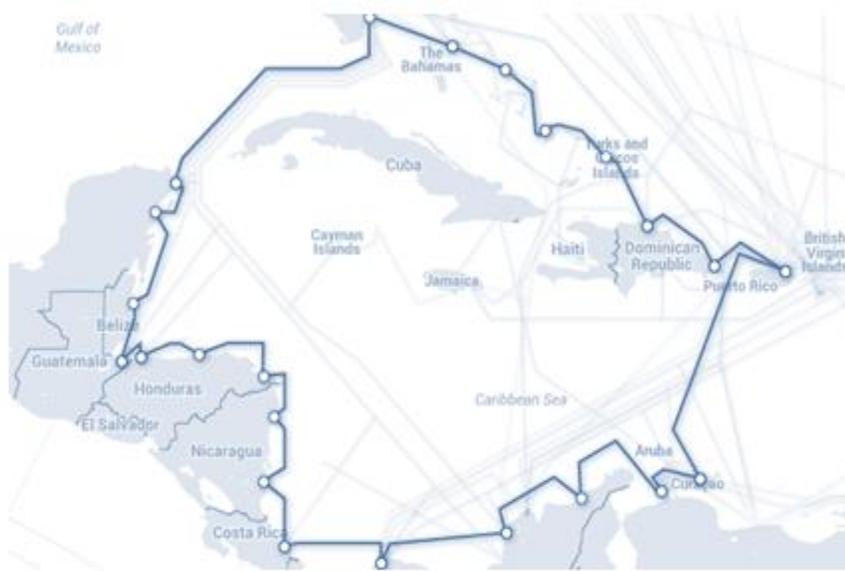
Claro/Digicel

As part of a larger Latin American-Caribbean transaction, Digicel acquired Claro in August 2011, which LIME contested and the court rejected. The prime minister approved the merger on the conditions that both networks operate separately and the coverage conditions are met. In January 2012, the Fair Trade Competition (FTC) appealed to the High Court, claiming there will be significantly reduced competition in the wireless market under the merger. It was not until later in 2012 that Digicel completely shut down Claro network operations, after appealing to the new prime minister to remove the merger conditions.⁵³

⁵² Golding, Paul, Vanesa Tennant and Terry-Ann Virtue. "Telecommunications in Jamaica: Monopoly to Liberalized Competition to Monopoly," Fourth Annual SIG Globdev Workshop. Shanghai. Dec. 3, 2011. Available at: <http://www.globdev.org/files/Shanghai%20Proceedings/18%20PAPER%20Telecommunications%20in%20Jamaica%20Sept%202.pdf>.

⁵³ Telegeography, 19 January 2015.

Figure I.3-9: ARCOS Cable Network



Source: TeleGeography, Submarine Cable Map 2015

Flow (Columbus Communications Inc.)

Flow entered the market in 2005 offering primarily cable TV, fixed voice and internet to residential and corporate customers. Flow is a subsidiary of Columbus Communications Inc.

Columbus owns the Americas Region Caribbean Optical-ring System (ARCOS). ARCOS is a sub-sea fiber optic cable that joins 23 cable landings stations connecting countries in the LAC region. In addition, Columbus owns Fibralink, a fiber optic submarine cable connecting Jamaica with the ARCOS submarine cable. Figure I.3-9 shows the ARCO Cable Network through the region.

In January 2015, Flow and LIME merged after C&W acquired Columbus in a US\$1.85-billion transaction. This transaction was approved by the GoJ with a long list of conditions, and was contested to no avail by Digicel.⁵⁴

Most recently, in May 2016, Jamaica issued a license for a third wireless operator, Caricel, which is planning to invest more than US \$100 million in the next three years.

Jamaica Digiport International Limited is the provider of higher speed data and other telecommunication services to the Free Zones and Offshore Companies. It has a fully automatic digital domestic network with over 180,000 telephones (main lines), and direct dialing to most countries overseas is possible with this system. Other international services include cellular lines, PBX systems, pay telephones, credit authorization terminals, data services, toll free services, telegraph, facsimile, television, telex and card lease circuits. At the moment there are six electromechanical exchanges and 59 digital exchanges serving the island.

⁵⁴ Telegeography, 19 January 2015.

ICT Infrastructure

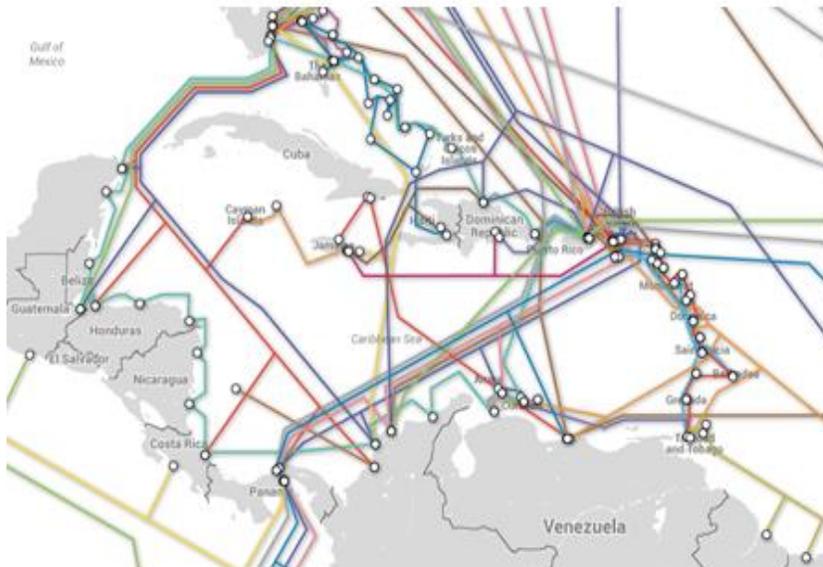
With five fiber optic submarine cable landing stations, Jamaica is well connected to the worldwide internet via neighboring countries (shown in Figure I.3-10). The vast Caribbean network of submarine cables can be seen in Figure I. 3-11, which shows that the majority of these cables connect through Miami.

Figure I.3-10: Jamaica Submarine Cable Landing Stations



Source: TeleGeography, Submarine Cable Map 2015

Figure I.3-11: Caribbean Network of Submarine Cables



Source: TeleGeography Caribbean Network of Submarine Cables

The cable systems connecting Jamaica with the rest of the world include:

- ▶ The Cayman-Jamaica Fiber system, owned by C&W/Columbus, has a length of 870 kilometers and a landing station in Kingston. It was put in service in 1997.
- ▶ Fibralink, owned by C&W/Columbus to connect to Haiti and the Dominican Republic has a length of 1,000 kilometers and a landing station in Bull Bay, Jamaica. It was put in service in March of 2006.
- ▶ Colombia-Florida subsea cable (CFX-1), owned by C&W/Columbus has a length of 2,400 kilometers and a landing station in Morant Point, Jamaica. It started service in August of 2008.
- ▶ East-West Cable, owned by C&W/Columbus, connects to the Dominican Republic and Puerto Rico. It has a length of 1,750 kilometers and a landing station in Harbour View, Jamaica. It started services in February of 2011.
- ▶ ALBA-1 subsea cable connecting to Cuba and Venezuela is owned by Transbit and Telecom Venezuela. It has a length of 1,860 kilometers and a landing station in Ocho Rios, Jamaica. It started services in August of 2012.
- ▶ Jamaica has 2 Atlantic Ocean INTELSTAT earth stations; 2 AM and 7 FM stations, 2 TV stations and 3 coaxial submarine cables.
- ▶ Digicel owns 3,100 kilometers of subsea fiber connecting Jamaica and other Caribbean countries to the United States.⁵⁵ It has 811 cell sites in Jamaica, more than it has in almost any other Caribbean island except Haiti.⁵⁶ C&W (FLOW) owns Fibralink, a subsea and terrestrial fiber cable.

Utility Reliability and Costs

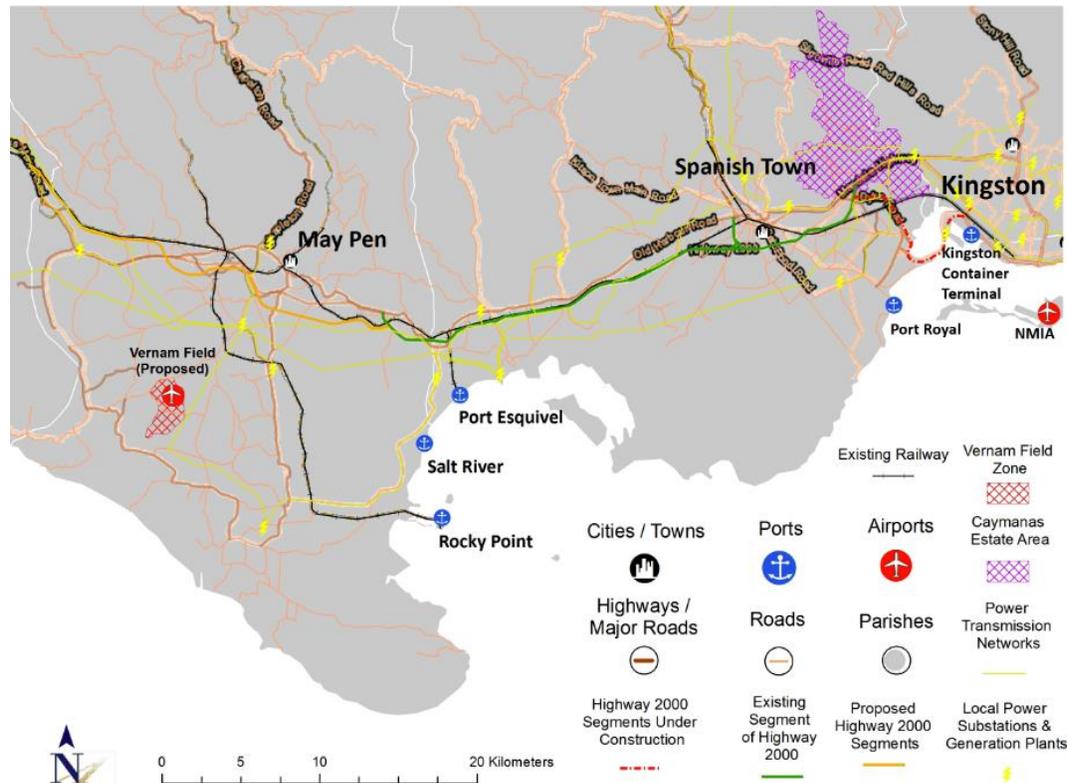
Logistics activities require easily accessible, high functioning, and cost efficient utilities. The regulatory body that oversees the operations of utility companies on the island is the Office of Utilities Regulation (OUR), which serves as an independent regulator. It has oversight responsibilities over the electricity sector, telecommunications, and water and sewage,

Jamaica Public Service Company (JPS) is the major distributor of electricity in Jamaica. It is engaged in the generation, transmission, and distribution of electricity and also purchases power from 5 independent providers. In 2011, Marubeni Corporation and Korea East-West Power purchased 80% of the shares of JPS. JPS has over 606,654 customers, owns and operates 4 power stations, 9 hydroelectric plants, 43 substations and 14,000 kilometers of distribution and transmission lines. Figure I.3-12 maps the power transmission networks and related infrastructure in the southern part of the country that includes the greater Kingston area, Spanish Down, and Vernamfield.

⁵⁵ Digicel Form F-1 Registration Statement for the Securities and Exchange Commission. June 26, 2015.

⁵⁶ Digicel Form F-1, p 124.

Figure I.3-12: Power Transmission Networks and other Infrastructure in Southern Jamaica



Source: Nathan Associates Inc.

In Chapter I.4, Jamaican utilities’ cost and reliability are benchmarked vis-à-vis regional competitors under both Pillar 2: Business Environment, and Pillar 4: Technology. Jamaica and its regional competitors are scored based many factors, including the cost and reliability of water, electricity, and broadband. Jamaica scores poorly compared to its regional competitors, especially in the areas of utility costs of utilities, which poses a challenge to attract private and foreign direct investment. Additionally, the World Bank report on Caymanas cites lack of quality utility infrastructure (water, power, or waste water treatment capacity) as a main concern of developers.⁵⁷

Jamaica is unique in that its utility infrastructure is developed and available (especially electricity and ICT), however pricing or institutional challenges negatively affect utilization rates. For example, Jamaica has a large amount of international broadband connectivity with multiple submarine cables, yet it ranked 105 out of 146 countries in the ITU’s ITC Development Indicator, which combines various measures of access and usage of utilities and ICT.⁵⁸ Table I.3-11 shows how Jamaica compares to its competitors in other ITC indices.

⁵⁷ According to an IDB study on the Jamaica Logistics Chain, warehouses exist throughout the major populated hubs in the country. However, the current facilities are not sufficient due to lack of space and risk of flooding.

⁵⁸ International Telecommunications Union. “Measuring the Information Society Report.”. 2015. Available at <http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf>.

Table I.3-11 Ranking of ICT Development Index and Sub-Indices in the Region

	Rank: ICT Development Index (IDI)	Rank: ICT Access Sub-index	Rank: ICT Use Sub- index	Rank: ICT Skills Sub- index
Barbados	29	24	29	36
Costa Rica	57	70	52	52
Trinidad & Tobago	70	67	66	107
Colombia	75	86	72	60
Panama	89	81	95	91
Dominican Republic	103	118	92	85
Jamaica	105	103	99	110
Cuba	129	160	134	58

Source: ITU, Measuring the Information Society Report, 2015.

In relation to electricity, electricity costs 18 cents per kilowatt hour in Jamaica, which is high compared to regional competitors, as listed in Table I.3-12. Furthermore, the World Economic Forum ranks Jamaica 7th out of the 9 regional competitors in terms of reliability.

Table I. 3-12: Electricity Tariffs in the Region

Country	Year	Cost per kWh in USD
Trinidad and Tobago	2012	0.03
Colombia	2015	0.13
Bahamas	2016	0.15
Panama	2015	0.16
Barbados	2016	0.17
Dominican Republic	2015	0.17
Jamaica	2015	0.18
Costa Rica	2015	0.26
Cuba	2014	0.38

Source: Nathan Associates Inc. using data from national utility regulators

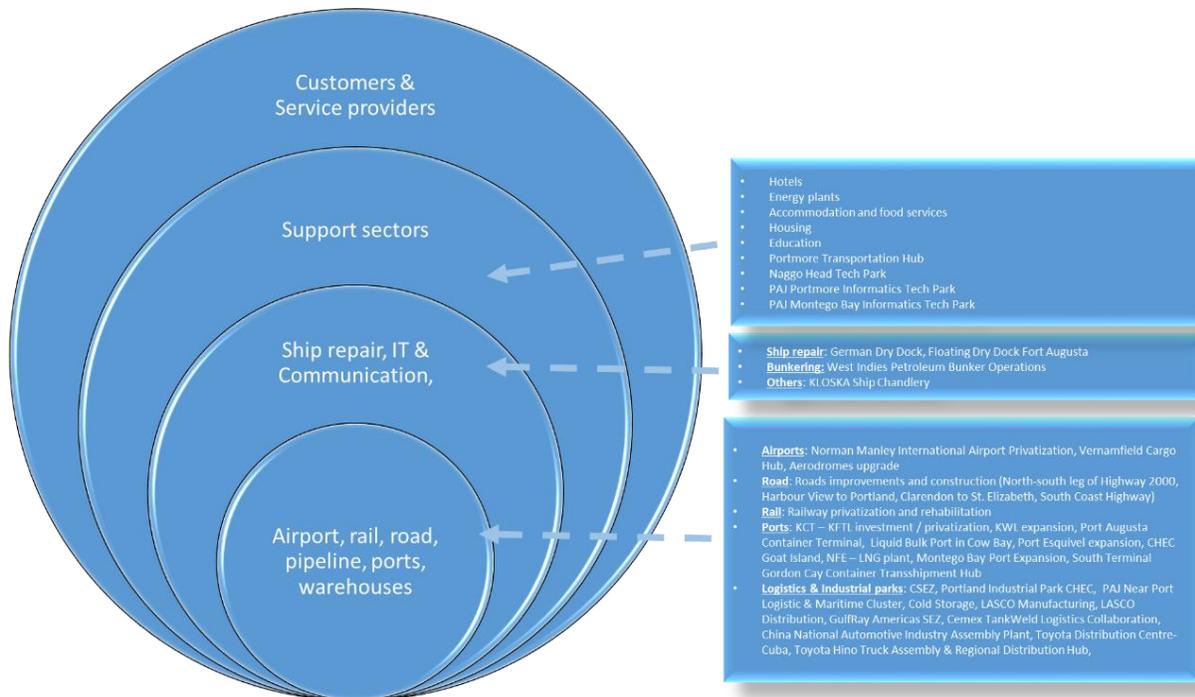
It is evident that for Jamaica to be competitive with countries such as Panama, the Bahamas, or Trinidad and Tobago, it must work to reduce utility tariffs, improve reliability indicators, and expand access to users. The main utility regulator, OUR, is working towards achieving those goals and aligning itself to the country's National Vision 2030. According to their latest corporate business plan, by 2020, OUR expects that Jamaica will rank as "the # 1 country in the LAC Region in utility consumer protection and satisfaction as well as the coverage, affordability and provider performance of all regulated utilities."⁵⁹

⁵⁹ Office of Utilities Regulation (OUR). "Corporate Business Plan & Budget, FY 2016/17 – 2019/20." November 11, 2015.

I.3.4 Review of Jamaica’s Logistics Related Pipeline Projects

Jamaica’s current logistics and transport assets have sufficient capacity to handle existing cargo and trade flows. However, in order to grow into a regional hub, additional investments and developments are needed. There are many private-sector initiatives and planned investments that have potential relevance to the success of the vision of the LHI. Figure I.3-13 shows a graphic representation of the pipeline projects we have identified for the LHI grouped by activity or sector as part of the envisioned logistics cluster.

Figure I.3-13: Cluster of Existing and Pipeline Projects



Source: Nathan Associates from Various Sources

It should be noted that the working definition of pipeline projects for this report includes investments that are in progress as well as projects that are conceptual in nature. Nathan Associates originally proposed conducting a multi-criteria analysis (MCA) for each planned infrastructure project (the pipeline of projects) based on twelve factors. To complete that analysis, the team intended to use information sourced by the GoJ and the various entities developing these assets. However, during several rounds of interviews in Jamaica, with both government authorities and private sector stakeholders and investors, very little tangible documentation was provided. Most of the information received was verbal and limited in scope because the vast majority of the projects are private investor initiatives restricted by non-disclosure-agreements.⁶⁰

⁶⁰ On July 8, 2016, the Jamaica Observer published an article citing Dr. Deans discussing the Logistics Hub Development, including the quote: “All aspects of the logistics hub are receiving investor interest. There is a wide range of projects and reforms that are in various stages of development... You should also be aware the majority of projects are planned, designed, engineered and financed by the private sector and as such, the respective investors are in control of the execution of the respective projects and the release of information... The information we are privy to is subject to confidentiality

Table I.3-13 provides more specific insight into the missing information that is needed to be able to fully analyze the 12 factors that comprise the proposed MCA. The historical, technical, and financial information along with feasibility studies and project management details for each project that are prerequisites for conducting the proposed MCA of the pipelines projects; but this information either does not exist or was not shared with us due to confidentiality.

Table I.3-13: Proposed Pipeline Project Analysis Factors and Criteria Versus Available Information

Factors	Criteria	Available information
Nature of the project	Sector category	Yes
Strategic importance	Seamless flow of goods that fosters trade, employment and economic growth	Limited
Technical justification	Capacity constraints, potential performance benefits, technical requirements	Very limited, most projects are in conceptual phase
Market demand	Respond to identify logistics demand	Very limited, most projects are in conceptual phase
Economic justification	Cost-benefit analysis to determine IRR	None
Bankability	Ability to attract private sector debt, equity financing and international financial institution sovereign loans	None
Borrow and credit rating	Ability to repay and generate positive cash flow	None
Guarantees	Take or pay minimum usage agreements or other forms	None
Other investors and lenders	Other potential investors feel comfort about the project	None
Feasibility studies	Economic, financial, technical, legal, environmental, and social impact feasibility	None
Local capacity	Ability of public sector to manage, design, construct, operate and maintain a project	Only PAJ
Enabling Environment	Environmental best practices	No information available

Source: Nathan Associates Inc.

Accordingly, due to the lack of information, we have instead conducted a qualitative assessment on the pipeline projects presented below. While we analyzed a wide range of projects, this sub-section only includes projects that we have deemed most relevant and necessary to fill existing infrastructure gaps and are most likely to play a fundamental role for Jamaica to fulfill the vision of the LHI. Projects that did not meet such criteria are listed and described in the Appendix I.3. Among these less relevant projects are also ones rated as “unclassified” in this section’s qualitative assessment of pipeline projects. These are projects are either not of critical importance for the success of the LHI and/or are in the hands of the private sector with very little information available, often due to confidentiality restrictions.

Maritime Infrastructure

As an island country, Jamaica has several existing and potential maritime related projects and investments. Investment in Jamaica’s port sector is very active and advanced. Below are the development plans for the key port investments that are relevant for the LHI vision.

agreements due to certain proprietary information or developments the investor would not wish to get into the hands of their competitors at this time.”

Privatization and Expansion of the Kingston Container Terminal

The privatization of the existing KCT has been finalized. A 30 years' concession has been granted to Kingston Freeport Terminal Limited (KFTL), a French Consortium led by CMA CGM and Terminal Link, to finance, expand, operate, maintain KCT. A limited liability company was formed to accept the KCT Concession on behalf of the TL Consortium under a US \$510 million concession agreement. The official hand over took place on July 2016.

The concession agreement includes requirements for dredging the access channel to the Kingston Harbor and the basin of the KCT from 13.5 to 14.2 meters to allow for the handling of the larger (Post-Panamax) vessels, as well as reinforcing part of existing quay and expanding annual capacity to 3.6 million TEU, and adding additional equipment (14 gantry cranes and 60 straddle carriers) to be able to receive larger container vessels. As of January 2017, dredging of the shipping channel and the Port Bustamante Basin had begun. The added capacity, efficiencies gains, and potential increased liner connectivity provided by CMA CGM are key elements for Jamaica to become a logistics hub. It should be noted, however, that the GoJ should ensure that regulations are in place to ensure that the port operator does not engage in anti-competitive behavior. Ensuring that KWL continues to operate is one way to mitigate that risk.

Expansion of Kingston Wharves Limited Terminal

KWL has plans to expand annual capacity of its multipurpose terminal to 1 million TEU per year as part of a US\$100 million phased investment upgrade plan. Investments would include harbor dredging, rehabilitation of the container yard, acquiring new equipment. The expansion plans include major harbor dredging that will increase the draft to handle Post-Panamax vessels. KWL has also acquired a US\$4 million mobile harbor crane, which is the largest in operation in Jamaica. Additional equipment investments also include the installation of a mobile gantry crane, the LIEBHERR LHM 550 crane, bringing the total to 5 cranes in the terminal.

Port Augusta Container Terminal

Port Augusta, a 50 hectare land reclamation project, includes plans to build a new container terminal with the capacity to handle 2 million TEU. The dredging works involve removing 15.7 million cubic meters of material. The project would include a 1-kilometer length berth with a maximum draft of 15.2 meters providing the capacity to accommodate 13,000 TEU vessels. This development seems to have stalled, but in the long term, this project (or a similar one) can be strategic for the future planning horizon of the LHI.

Harren & Partner Ship Repair & German Ship Repair

Harren & Partner Ship Repairs also has plans to establish float ship repair operations and maintenance, and is investing both a wet dock and a floating dry dock facility. The company is a joint venture between Harren & Partners and German Drydocks that will establish a floating dry dock operation. German Drydocks is currently in the process of conducting geotechnical studies. The proposed floating dry dock would have the capacity to handle up to 3 Panamax Ships on the dry side and 2 wet dock operations simultaneously. Investment is estimated to be at US\$210 million over a five-year period.

Conclusions on Port-Related Pipeline Projects

The efficient functioning of KCT and KWL are a critical factor for the success of the LHI. To serve as the fourth node of the logistics hub, maritime connectivity and efficiency is of the utmost importance.

The functioning of the port, for both transshipment and domestic cargo provides opportunities for large scale value-added activities. Along with modern and efficient logistics and customs, the ports of Kingston are the first node for Jamaica’s supply chain as an international hub. As the transport logistics analysis showed, the least efficient component of the port sector in Jamaica is customs, which causes high costs and the major delays for processing. Any investment in port sector infrastructure will be rendered null without improvements in customs.

There are also additional port development projects, including cruise terminals, and private commodity based ports, however, these additional port development projects are not considered essential for the short or mid-term success for realizing the LHI vision. With improvements and efficiencies expected from the investments in the Ports in Kingston, Jamaica will have sufficient capacity to handle the forecasted cargo flows presented in Chapter I.2. Furthermore, there are regional concerns of overcapacity for ports in the region as countries have invested in port capacity as a response to the expansion of the Panama Canal. These overcapacity concerns are discussed further in the regional competitive analysis in Chapter I.4.

In the long term, the development of an additional port, such as the Port Augusta Container Terminal, should be studied and reserved to ensure long term success of the LHI vision.

Air Transport

The development and improvement of the air transport sector is an important sub-goal of the transport sector goals outlined in Jamaica’s 2030 Vision. To that end, the JCAA’s Vision is “to be recognized as a world-class civil aviation authority, integrally involved in the sustainable development of a safe and thriving global aviation community that supports and serves Jamaica.” There are several air transport and air sector developments in Jamaica. However, for the success of the LHI, aviation sector development is less critical than the maritime sector. That is not to say that aviation is not important – just that specific to the hub, there are two key initiatives in aviation that are most important: the improvements to NMIA for the short and mid-term and the development of Vernamfield in the long term. While NMIA will play a stronger role in accommodating growth of passenger traffic, Vernamfield has the potential to become an air cargo hub with adjacent value added activities due to the vast amount of space that is available around it. These projects are described in more detail below.

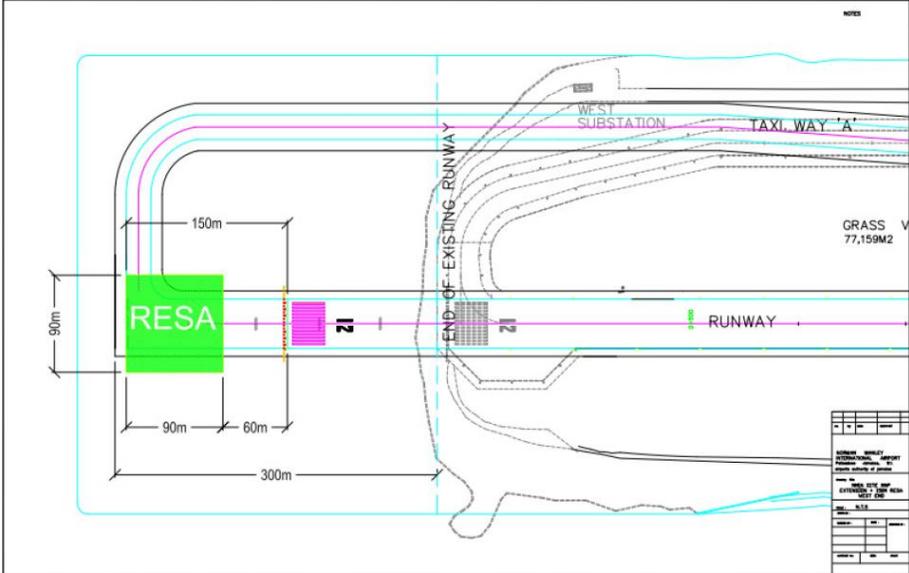
Privatization of Norman Manley International Airport

The GoJ has sought a private operator to procure capital investments to complete a modernization and expansion project of Kingston’s international airport facility and improve operational efficiency for a 30-year concession term. The privatization would involve a Capital Investment Plan with an expenditure amount of approximately US\$109,731,619, of which about 62% would be spent over the first 10 years.⁶¹ The CAPEX requirements, as per the terms of reference, included: a 300 meter runway extension to comply with ICAO standards (see Figure I.3-14); rehabilitation of the existing runway and taxiway; and RESA provision in line with ICAO requirements and any necessary works for safety compliance. It also included terms to replace the complete baggage claim system, replace tenants’ offices air conditioning, invest in ancillary services, upgrade the incinerator system, and relocate the cargo road, among others.

⁶¹ International Finance Corporation, Airports Authority of Jamaica, Development Bank of Jamaica. NMIA PPP: Information Memorandum. February, 2017.

Through an initial bidding process, the GoJ received expressions of interest and 5 bidders were prequalified. However, none submitted a proposal and privatization efforts recently stalled. The government and the IFC recently modified the capital structure to make the deal more attractive and reopened the bidding of NMIA. The Ministry of Transport anticipates it could take up to 1.5 years until project execution. The total amount required for the 30-Year Capital Investment Plan is US\$109,731,619. In November 2016, the GoJ with the advice of the IFC published a marketing document titled “Public Private Partnership for the Norman Manley International Airport,” with the objective of seeking the views of the private sector in connection with the re-tendering of the Public Private Partnership of NMIA. This document provides the mentioned details on recent developments and a proposed transaction timeline. In February 20 of 2017, the GoJ issued a Request for Qualification (RFQ) for the NMIA public-private partnership project, which closed on May 1, 2017 after receiving 9 applicants. According to this timeline, an RFP should have been published on May 1 2017 with a deadline for bid submissions proposed for mid-October 2017, while the process of bid evaluations and selection of the winning bidder should take place during mid-November 2017. The financial closing for the NMIA PPP process would take place in August 2018.⁶²

Figure I.3-14: Depiction of NMIA Runway Extension



Source: IFC, AAJ, and Development Bank of Jamaica

The modernization and improvement of NMIA is critical to improve the air connectivity of the island. The government should focus on moving forward with the privatization of the airport to provide investment for the short and medium term needs for air cargo for the logistics hub. Along with bilateral service agreements, the improvements to NMIA will increase Jamaica’s aviation connectivity and reliability. Of particular importance and relevance to the LHI, are further expansions to the air cargo facilities, including the approved plans for a second phase of development to add space for warehousing and commercial cargo services, which would include a 1,858.06 square meters (20,000 square feet) warehouse facility at the NMIA Cargo and Logistics Centre (NCLC).

⁶² DBJ. “Public Private Partnership for the Norman Manley International Airport.” Development Bank of Jamaica. November, 2016. Available at: <http://www.nmia.aero/pdf/Public-Private-Partnership-NMIA.pdf>.

Sangster International Airport Master Plan Developments

As mentioned earlier, there are a number of developments underway at SIA. With the technical assistance of the consulting firm INECO, MJB Airports Limited is currently finalizing a master plan that will include modernization and expansion projects to occur over the next five years. Recently, a new control tower was built, and other major developments are planned including the rehabilitation of taxiways and aprons, the expansion of the passenger terminal (in the W/SW sections of the terminal), an extension of the runway of 460 additional meters (added to its current length of 2,662 meters) to increase the airport's airside safety in handling planes' maximum passenger and cargo loads in compliance with ICAO standards, and an expansion of the airport's air cargo facilities.

The latter mentioned air cargo facility developments will be of particular relevance to the development of the LHI. SIA exports mostly agricultural products, 90% of which come from the neighboring Trelawny Parish. Most of these agricultural products are exported to the US, and are composed of papaya, jams, sweet potato, citrus, spices, flowers, as well as some value-added packaged foods. At the moment, SIA handles approximately 5,000 tons of air cargo per year, a Figure I. that MJB Limited officials expect to increase by 200% over the next 5 years.

As mentioned earlier, current air cargo facilities include two 25 by 25-foot cold storage rooms, a 6,000 square foot customs processing facility, and a 900 square foot X-Ray area. New air cargo facility developments in the master plan include a 24-hour Airfreight Centre where transshipment cargo can be broken down and reconsolidated with minimal Customs formalities. These facilities would form part of an airport SEZ, and would add both office and warehouse space, and include freighter parking bays with capacity to house the largest freighters. The Airfreight Centre would be equipped with state-of-the-art material handling systems to ensure the efficient handling and storage of various types of cargo, such as dangerous goods, perishables, animals, aerospace parts and valuable items.⁶³

Figure I.3-15: Location of SIA's air cargo facilities



Source: Jamaica Special Economic Zones Authority

⁶³ Jamaica Special Economic Zones Authority. "LHI Update: The Special Economic Zone Landscape." Presentation.

Development of Vernamfield Airport and Cargo Hub

Due to physical constraints of Norman Manley, including expansion limitations and sea level concerns, there is a proposed project to construct an additional international airport and cargo hub at Vernamfield to meet long term requirements for the growth of air transport in the country. This development is a large and multi-faceted project centered on the redevelopment of a 2,000-meter long concrete runway located in the parish of Clarendon. At the moment, this project is being promoted only as an air cargo airport. This is due to a clause to be included in the NMIA PPP concession agreement (as established in the Cabinet decision No. 06/17 dated February 8, 2017), which would prevent Vernamfield airport from being developed to handle passenger traffic for the next 30 years, and thus prevent it from competing for business with the new NMIA concessionaire. However, some government stakeholders interviewed suggest that AAJ could consider NMIA bids that offer to operate both NMIA and Vernamfield as both passenger and cargo airports.

From the plans that were reviewed, the project may feature the following main components:

- ▶ Air cargo with logistic services capabilities
- ▶ Airline maintenance repair and overhaul (MRO)
- ▶ Aviation training school
- ▶ General aviation
- ▶ Light manufacturing and assembly (SEZ/FZ)

This project is conceptual in nature, and would be implemented in two phases. In the first phase, the development would focus on the establishment of the aviation training school and rehabilitation of a small runway to accommodate training. The second phase would involve the construction of a 4.2 kilometer runway, which can accommodate the largest aircrafts in the industry. The introduction of MRO, logistics and cargo activities would complete phase 2 of the development. The total development project was initially estimated at around US\$1 billion. More recently, the Vernamfield concept was updated to include a larger mixed-use development around it in order to form an aerotropolis. More details on this updated aerotropolis concept are included in the “Logistics and Industrial Parks” section of this chapter.

The development of this airport could benefit the vision of the logistics hub in the long term. Our recommendation is to ensure that the area is designated and reserved to develop this airport and adjacent compatible uses, and to move forward with an Aerotropolis feasibility study and master plan. The master plan must assess the financial feasibility of the project, assess what components and land-side infrastructure are feasible and necessary, define the development phases required, and ensure that it is aligned with the vision of the logistics hub. With appropriate customs and other SEZ regulations in place, the Vernamfield air cargo hub, can potentially help Jamaica multiply its current air cargo flows, and in the long run, absorb approximately 10 to 15% of the general air cargo that is handled through Miami (this about 210,000 to 315,000 metric tons).⁶⁴

The following list presents the main requirements to promote a long haul cargo airport:

- ▶ Strategic location; close to the cross road of main air cargo trade routes.
- ▶ Good weather
- ▶ 24 hour operations

⁶⁴ Nathan Associates estimates.

- ▶ Substantial O/D cargo
- ▶ Modern and efficient airside facilities
 - Long haul runways (2) capable to enable non-stop routings to the Americas and Europe at full capacity
 - Sufficient apron space
 - Reliable Air traffic control (Nextgen)
- ▶ Modern and efficient landside facilities
 - Warehouses
 - Cool storage
 - Efficient airport access
- ▶ Other services”
 - Competitive ground handlers
 - Competitive airport tariffs
 - Competitive costs and reliable fuel services
 - Private sector type efficiencies
 - Liberal customs policy and efficient customs operations
- ▶ Other characteristics
 - No slot limitations
 - Liberal bilateral service agreements

Finally, the development of a new airport should be presented as an opportunity and not as a threat to the private sector operator of the NMIA.

Ian Fleming International Airport Expansion and Modernization

In recent years, with the support of tourism stakeholders in Jamaica, the Airport Authority of Jamaica (AAJ) has been advocating for the airport’s expansion and modernization in order to sustain larger passenger flows. At the moment, the AAJ is awaiting Cabinet approval (expected by August 2017) for the implementation of a one-year US \$15 million project to extend the runway and expand and modernize the terminal building. As mentioned earlier, the larger runway (of 5,500 feet) and proposed modernization would facilitate larger aircraft, including the Avro RJ 85 which is comparable to the BAE 146-200 (90-seater, 4 engine jet). This airport would service the hotel and tourism industries in Ocho Rios, Port Antonio, and other destinations in northeast Jamaica.

Analysis of Air and Sea Connectivity Potential

One idea that has been proposed for Jamaica’s LHI strategy is to emphasize intermodal connectivity between air and sea shipping. Intermodal connectivity truck-air-truck is already a natural combination for the shipping of time sensitive cargo and high value perishable cargo from production center warehouses to consumer center warehouses. However, intermodal connectivity sea-air or rail-air is uncommon. In our opinion these sea-air or rail-air combinations are possible but are not sustainable in the long term nor is it a critical success factor for a logistics hub.

This sub-optimal intermodal combination of air-maritime shipping can only be applied to small market niches, routes, or as a temporary solution when there is no better alternative. The temporary solution can be threatened at any time by “all air” or “all sea” solutions depending on the time sensitivity or price sensitivity of the shipper. When the sea-air route reaches the right volumes, it is clear that a more efficient alternative in terms of time or price will prevail.

This sea-air transshipment scenario does exist in Dubai, where a major container port and airport exist in close proximity. Cargo is transported from Asia via ocean to the Dubai hub and then transferred to an aircraft for the second leg of the journey to Europe or Latin America. A similar scenario is in progress in Miami. The US government has signed off on a plan by Crowley Maritime to transfer perishable maritime cargo from Central America to the Miami International Airport (MIA) for onward delivery to customers in Europe. Under the pilot program, Crowley will coordinate the ocean shipment of fruits and vegetables from Guatemala and Honduras on Crowley vessels to Port Everglades, and truck transport will be used to MIA for loading on KLM or Centurion Cargo freighters to Europe.⁶⁵ This unusual intermodal itinerary is designed to save shippers time and money since current direct all-cargo and passenger air service to Guatemala and Honduras is limited. This is an opportunity that could be explored by Jamaica. However, it is clear that the combined sea-air operation must be highly efficient and competitive in terms of service frequency and total travel time. For this market niche, a direct link between the marine port and the airport has significant value. Currently Jamaica's main port facilities are in close proximity to NMIA, however it is important to consider that in the long-term, it will be difficult to replicate the current proximity and direct access of port and airport for the future air and maritime infrastructure developments.

In conclusion, airport and port direct connectivity is a competitive advantage that is nice to have but is not a critical success factor for the development of the vision of the logistics hub. When different locations are evaluated, the cost-benefit analysis of airport-port direct access has to be conducted; but most likely the location of the ports and airports are conditioned by other unchangeable restrictions, such as available space, fiscal conditions, airspace, nature depth of waters, and proximity to existing infrastructure of production/consumption centers.

Land Transport

The government's focus on road improvements is to maintain and improve the current road network and maintain and rehabilitate bridges and roadways. The North South Link of Highway 2000 was essential in improving land connectivity between Kingston and Montego Bay. As we address in the next section, an important and urgent need is to improve truck accessibility between the Caymanas Estate and Kingston Container Terminal. Although it is not a top priority for the development of the LHI, further investments in road infrastructure is needed to improve land connectivity between Kingston and the main agricultural production centers in Jamaica.

North South Link of the Highway 2000 Project

CHEC has been involved in the North South Link of the Highway 2000 Project. The Phase 2A – North South Link of the Highway 2000 Project is 67.2 kilometers long. The alignment stretches from Caymanas St. Catherine to Mammee Bay St. Ann, crossing the Rio Cobre River and bypassing Mount Rosser and Flat Bridge. The highway will travel through the communities of Waterloo, Content, Giblatore and Wakefield in St. Catherine, providing improved inland connectivity for the LHI. This project required an investment of US \$600 million. This phase of the project was completed and opened March 2016. The second phase of the proposed developments also includes the construction of three hotels.

⁶⁵ Kulisch, Eric. "Crowley gets green light for sea-air transshipment in Miami." American Shipper. October 19, 2016.

South Coast Highway (Harbor View to Portland Highway)

This project constitutes the construction of a highway connecting Harbor View in east rural St. Andrew to Port Antonio in Portland. The highway is projected to cost around USD\$1.6 billion, which would include the design, improvement, and construction of Sections 1A and 1B of the Southern Coastal Highway Improvement Project. The project will involve the 43-kilometer stretch from Harbor View to Morant Bay at an estimated cost of US\$385 million. The work is part of the segment from Harbor View to Port Antonio covering approximately 65 kilometers of roadway and providing enhanced land connectivity.

Jamaica Railway

There have been ongoing efforts for the privatization and improvement of the existing railroad network geared towards cargo and passenger movements. Through private sector participation and investment, the government would like to rehabilitate the railway, as well as construct new terminals and renovate existing related buildings. The project would include the provision of services to passengers and cargo. There have been studies promoting cargo movement between Kingston and Montego Bay, Spanish Town and Ewarton, and tourism between Montego Bay and Appleton.

The World Bank recently developed an interim business case for Jamaica Railways Rehabilitation Concession. The report indicates that remnants of the Jamaica Rail Corporation lines run along the southern border of CSEZ site. Although the report states that a rail link connection between KCT and CSEZ is not commercially viable, the rail right of way could be paved and converted into a dedicated road that would facilitate the traffic between the port and the CSEZ as a direct access link for trucks. Creating this direct link between the port and the CSEZ is an important success factor for the LHI as it ensures efficient and secured movement of goods from the port to a major SEZ area. The protected road would thus be considered as either port property or CSEZ property and would subsequently form part of the designated customs area in order to be operationally feasible.

Logistics and Industrial Parks

There are several projects to develop logistics and industrial (light manufacturing) parks and expand SEZs. For the success of the LHI vision, we recommend focusing on a few key logistics development projects that can provide sufficient capacity of the forecasted cargo flows of the hub presented in Chapter I.2. Those key logistics projects are described below. Additional logistics projects that are in the pipeline but are less critical to the success of the hub are described in the Appendix I.3. There are also additional maritime-related service sectors, such as ship repairs and bunkering, which have projects or investments in the pipeline that would support the development of the LHI, but are not critical to the success of the LHI and are therefore described in the appendix.

Jamaica is also well positioned to compete in cold chain logistics due to the introduction of liquefied natural gas (LNG) projects that will allow significant energy cost reductions, thus providing competitive storage cost. There are several cold storage projects, such as PAJ's plans to develop two buildings for dry and cold storage for South American cargo in the Kingston Free Zone (KFZ), the JP Cold Storage Facility, and Kingston Wharves Total Logistics. The logistics cold chain could target perishable goods, including food and agribusiness, serums, test kits, vaccines, and pharmaceuticals.

Caymanas Special Economic Zone

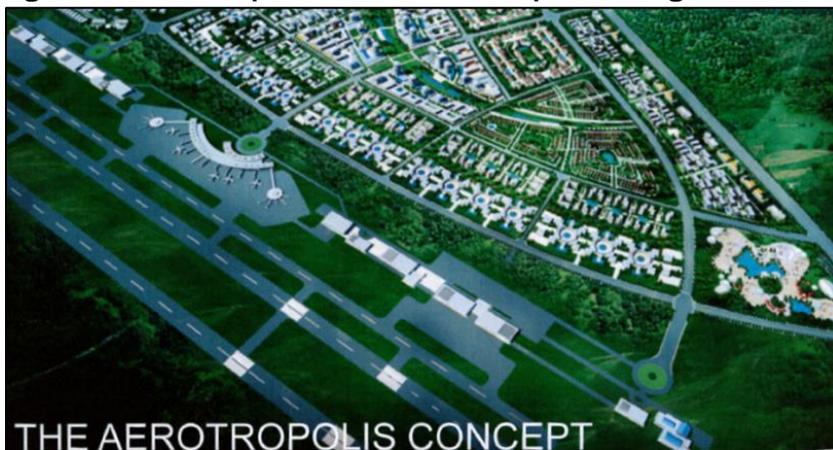
An important logistics area prime for development is the Caymanas Special Economic Zone (CSEZ) located in the Caymanas Estate Development Project (CEDA) area. CEDA has approximately 10,700 acres. It is located less than 15 kilometers away from KCT on a greenfield site owned by the Urban Development Corporation (UDC). UDC has proposed a land use plan for CEDA, which includes areas to be designated as a residential and mixed use village (including retail, restaurants, and entertainment) forest, woodland, wetland, recreation, agriculture, landscape buffer, a sport complex, light industry and manufacturing space, an enterprise zone, space for mining and extraction, and sewage treatment. The total estimated cost is US\$900 million. Construction for the mixed-use areas has already begun, including 600 residential units that were recently completed.

Of relevance to the LHI vision, CEDA also includes 1,295 acres reserved for the development of the CSEZ. With limited space for logistics and manufacturing activities near the KCT, the development of this SEZ represents a major success factor for the LHI. Chapter I.6 provides further details on the initial feasibility and market for CSEZ in relation to the LHI.

Vernamfield Aerotropolis

As mentioned earlier, a conceptual master plan was recently prepared for a Vernamfield Aerotropolis. This plan includes several conceptual renderings showing what the Aerotropolis developments would look like as well as an explanation of benefits that would result from such developments (see Figure 1.3-16 for one of the conceptual renderings). The proposed location lies within an area of approximately 10,000 hectares (of which 3,000 hectares would be immediately available) that are owned by the GoJ, with the exception of a few private residences. The plan proposes an air cargo airport surrounded by multiple compatible uses, including airside services such as MRO facilities, air cargo handling and processing, courier services, a transport training college, a mixed-use airport city development that includes light manufacturing and agro-processing, residential, and commercial uses. Suggested commercial uses in this plan include retail and wholesale enterprises, hotels, offices, and conference centers, among others. This document states

Figure I.3-16: Aerotropolis Vernamfield Concept Rendering



Source: Jamaica Ministry of Transport and Mining

that numerous benefits would result from the Aerotropolis, including capacity to handle the world largest cargo planes (Anton 124), airside investment benefits of USD\$121 into Jamaica's GDP for every dollar invested between 2017 and 2058, creation of 606,000 jobs, and an increase of tax revenues by US\$6.6 billion, among others.

Numerous entities in the GoJ currently support this development due to its critical role in the LHI. During its visit to the site and through discussion with project stakeholders, the Nathan team learned of some additional details, including that a portion of the project would involve relocating the runway two kilometers to the west of the old runway location in order to avoid established communities that are located adjacent to it. Such relocation would allow for the runway to be extended to a length of 4,000 meters. GoJ stakeholders stated that there are currently six firms interested in signing an MOU with the GoJ to collaborate in developing parts of the Aerotropolis.

Existing air cargo volumes in Jamaica coupled with our forecasts (highlighted in Chapter 1.2) indicate that future demand for air cargo under a “business as usual” scenario can be handled through the planned air cargo facility expansions in NMIA and SIA. However, due to Jamaica’s geographic reach (4-6 hours to most of the Americas and within 10 hours flying time to 1.6 billion consumers), a new air cargo airport could potentially attract air cargo traffic currently moving through Miami and other major air cargo hubs in the region. In order to do so, the Vernamfield Aerotropolis would have to offer modern and efficient airport facilities as well as competitive SEZ benefits to investors, including simplified customs procedures.

Vernamfield would also benefit if it can be developed to handle passengers as well as cargo, and through serving a Jamaican airline. By attracting significant air cargo flows, the Vernamfield airport could potentially catalyze Aerotropolis developments such as light manufacturing and agro-business industries for value-added activities that depend on access to a well-connected airport, and housing and commercial uses that would result from new employment generated. The Nathan team sees this project as strategic, but feasible if carefully implemented on a long-term planning horizon.

Kingston Wharves Total Logistics

Last October, KWL broke ground on its US\$20 million Total Logistics Facility (TLF) to increase its capacity and competitiveness in the logistics market. The modern facility located within KWL Free Zone in the port area includes the construction of a 160,000 square foot state of the art building to accompany KWL’s Modular Warehousing Facilities for rent/lease within the Free Zone area. Its completion is scheduled for 2016.

JP Cold Storage Facility

The JP Cold Storage Facility is a state-of-the-art ripening and cold storage center at JP’s property on Retirement Road in Kingston, which will be the distribution hub for the entire island. The expected investment amount on this cold storage infrastructure is US \$70 million, while capital expenditure and other costs are falling in the range of US\$1 million.

PAJ 80 hectare Port-Centric Logistics Park

This is a proposed development of an 80-hectare SEZ on lands adjacent to the KCT and owned by the PAJ. These parcels of land are currently in use as a local aerodrome, however, they are earmarked for logistics development. Reclaimed lands will be shared between terminal storage area extensions. These lands are located in close proximity to the country’s first toll road, the local highway, the rail lines, and the NMIA airport.

PAJ is seeking investors to develop the parcels of land identified using an appropriate business arrangement that may take the form of either a special purpose vehicle (SPV), a joint venture (JV) or a public-private partnership (PPP). The project’s overall development cost was estimated of

approximately US\$350 million. The project is targeted to start in 2016 with a five-year development schedule.

JISCO Jamaica Industrial Park

Jiuquan Iron & Steel Company Ltd (JISCO) recently drafted a master plan for the development of the JISCO Jamaica Industrial Park (JJIP), which will be an Aluminium Cluster involved in downstream aluminium products processing, limestone products, clean energy industries (solar and wind), agro processing, logistics, and other energy intensive heavy industries. The cluster will include manufacturing and processing of local resources (such as bauxite and limestone), wind and solar power generation facilities, an upgraded and expanded Port Kaiser with an LNG terminal, professional services (such as financial services, legal services, training services and consulting services), and commercial and residential zones.

Industrial and logistics land uses will cover close to 200 ha of land, while over 500 ha would be devoted to residential and commercial land uses, housing over 80,000 people. JISCO estimates that in the long term, the project will create approximately 67,000 jobs, and generate over 6 billion USD in revenue and over \$480 million USD in tax revenue. JJIP will be located in St. Elizabeth. The project's plan is currently undergoing approval by GoJ and, if approved, would undergo design and procurement stages in 2018 with construction underway between 2019 and 2035.

Additional LHI Support Projects

- ▶ The Caribbean Maritime Institute is awaiting a parliamentary bill to transform the institute into an official university. This training institute has had record enrolment levels across its schools, and the new designation would further provide the professionalization of maritime and logistics related practitioners.
- ▶ The HEART Trust NTA is an existing Government funded and operated training agency. It focuses primarily “on stimulating economic growth and job creation... through the creation of a highly skilled, productive and competitive workforce.”⁶⁶ It operates 27 technical and vocational education and training locations. This agency can be used to train the initial increased needs for logistics service provider, including well-trained warehousemen, warehouse clerks, dispatchers, forklift and truck drivers, logistics planners, and managers for warehousing and supply chain operations.
- ▶ The GoJ remains committed to establishing an ‘International Financial Services Centre’, aimed at transforming the country into an offshore financial hub in the long term, similar to Bermuda and the British Virgin Islands. The GoJ is exploring legislative reforms that could facilitate that goal, including the following bills: an international holding companies act; a trust act; two partnership bills; a limited liability companies act; a segregated account companies act; and a trust and corporate service providers bill.

Qualitative Assessment of LHI Pipeline Projects

The purpose of this sub-section is to classify the pipeline projects by status as well as by relevance to supporting the industry clusters that were recommended for the LHI. In Chapter 1.5's Industry Analysis, we recommend industries for the formation of industry clusters to support the LHI. The

⁶⁶ HEART Trust NTA Website. Available at: <http://www.heart-nta.org/About1>

three main industry clusters and four supporting industry clusters recommended as priority for the GoJ are:

Main Industry Clusters

- ▶ Electrical Equipment, Appliance, and Component Manufacturing (Light Manufacturing) Cluster
- ▶ Biomedical / Biomechanical Cluster
- ▶ Transportation and Logistics Cluster

Supporting Industry Clusters

- ▶ Education and Knowledge Creation Cluster
- ▶ Energy, Construction, Engineering, and Utility Services
- ▶ Business and Financial Services Cluster
- ▶ Chemicals, Plastics, and Primary Metals Cluster

Tables I.3-14 and I.3-15 provide a list of strategic LHI pipeline projects along with a basic qualitative assessment. To classify pipeline projects according to their implementation status we have categorized the projects as:

- ▶ In progress: which includes projects where construction is underway or concession terms are signed;
- ▶ Planned: which means plans exist and initial studies could be underway; or
- ▶ Conceptual: which implies that the investment is a possibility, but very little information is known or available.

Pipeline projects are classified according to the degree to which they can support the development of the LHI, categorized as one of the following:

- ▶ Strategic – direct/indirect impact: Projects that should be prioritized and realized within the next 5 years;
- ▶ Long term – direct/indirect: Projects supporting the development of the LHI, but of strategic importance in the long run and not required according to existing capacity needs; or
- ▶ Unclassified – direct/indirect/unknown impact: May or may not impact the development of the LHI. Nathan team does not opine on timing of implementation because such projects are mostly in the hands of the private sector.

If the full list of projects is realized, there is a potential for overcapacity. However, since most are private sector developments, we expect that at the very least, investors will commission market analysis (for national and international demand) in order to determine tangible needs and forecast future use. While Tables I.3-14 and I.3-15 show the strategic and long-term projects respectively in order of suggested priority, the table showing the unclassified list of projects is included in the Appendix I.3.

Table I.3-14: Qualitative Assessment of LHI Pipeline Projects (Strategic Short Term Projects)

Pipeline Project	Proponent	Details	Project Status	Support LHI
Port infrastructure				
KCT	Public – PPP	Private operator assumes operations summer 2016	In progress	Strategic – direct impact

Pipeline Project	Proponent	Details	Project Status	Support LHI
KWL	Private	Dredging, rehabilitation, and equipment investment – confidential	In progress	Strategic – direct impact
Harren & Partner Ship Repair & German Ship Repair	Private	Confidential – no studies, although geotechnical studies are underway	Planned	Strategic – direct support
Air transport				
NMIA privatization	Public - PPP	Privatization - no bidders submitted, GoJ to modify capital structure	Planned	Strategic – direct impact
Sangster International Airport 24-hour Airfreight Centre	Private	Expanded warehouses and cold storage facilities on the Eastern side of the airport	Planned	Strategic – direct impact
Inland transportation infrastructure				
North South Link of the Highway 2000 Project	PPP	Construction underway	In progress	Strategic – direct impact
South Coast Highway (Harbor View to Portland Highway)	Public & PPP	Construction underway	Planned	Strategic – direct impact
Logistics and industrial parks				
CSEZ	Public	Greenfield construction and development, UDC land-use suggestion	Conceptual	Strategic – direct impact
JP Cold Storage Facility	Private	Cold storage infrastructure investment of USD \$70 million	Planned	Strategic – direct impact
KWL Total Logistics Facility	Private	Construction of warehouses Confidential – no studies	In progress	Strategic – direct impact
PAJ 80 hectare Port Centric Logistics Park	Public	PAJ seeking investors to develop the parcels of land – no studies	Conceptual	Strategic – direct impact
Additional LHI support projects				
Caribbean Maritime Institute	Public/Private	Existing – Pending parliamentary bill to change status to a Maritime University	In progress	Strategic – direct impact
HEART Trust NTA	Public	Existing - Government funded and operated training agency	In progress	Strategic – direct impact

Source: Prepared by Nathan Associate with available information from various pipeline projects

Table I.3-15: Qualitative Assessment of LHI Pipeline Projects (Long Run Projects)

Pipeline Project	Proponent	Details	Project Status	Support LHI
Port infrastructure				
Port Augusta	Public - PPP	land reclamation and port construction	Conceptual	Long run - direct impact
Logistics and Industrial Parks				

Pipeline Project	Proponent	Details	Project Status	Support LHI
Vernamfield Aerotropolis	Public & PPP	Greenfield development of light manufacturing, housing, and mixed-use facilities	Conceptual	Long run strategic - direct impact
JISCO Jamaica Industrial Park	Private	Expansion and upgrading of a port, construction of an LNG terminal, a greenfield development of heavy and light manufacturing, and housing, and mixed-use facilities	Planned	Long run strategic - indirect impact
Air transport				
Vernamfield International Airport and Cargo Hub	Public	Redevelopment of an existing runway and construction of additional related areas	Conceptual	Long run - direct impact
Ian Fleming International Airport	Public - PPP	Runway extension project to accommodate larger aircraft	Planned	Long run - indirect impact
Other maritime infrastructure and services				
International Financial Services Centre	Public	GoJ has passed legislative reforms to facilitate the establishment of an international financial services center	Conceptual	Long run - direct impact

Source: Prepared by Nathan Associate with available information from various pipeline projects

Private Sector Perception of the Linkages with the LHI

The GoJ has been aggressively promoting the development of Jamaica's LHI; however, in interviews with stakeholders in Jamaica, private sector investors expressed concern over lack of communication from the government. Their sentiment is that the GoJ has not considered them and their needs in this endeavor. More details on the private sector perceptions and needs can be found in the Industry Analysis section related to the user's survey, but it should be emphasized that coordination with the private sector is a key success factor for the development of the vision of the LHI.

I.3.5 Conclusions for Pipeline Project Development

This section takes into consideration the team's analysis of the pipeline projects and their respective status and relevance classifications and draws conclusions on the projects that should be prioritized and needed in for the GoJ to achieve the LHI vision.

There is a long list of pipeline projects in Jamaica's LHI, although most of them are conceptual projects or listed as "unclassified." Through our research, including literature reviews, and stakeholder interviews, there are a limited number of studies on the impact of these projects and still require feasibility studies, market projections, and forecasts. We recommend that for any public investment, the GoJ must obtain and analyze independent market demand studies, as well as studies providing capacity, technical analysis and feasibility, to evaluate the return on public investment.

At this initial stage we recommend that the following pipeline projects, which are classified as strategic, be implemented within a 5-year horizon and prioritized as follows:

1. KCT concession-related improvements;
2. KWL dredging, rehabilitation, and equipment investment;
3. PAJ 80-hectare Port-Centric Logistics Park development with private sector;
4. Caymanas SEZ construction and development based on UDC land-use suggestions;
5. Railway right of way near CSEZ for conversion to a dedicated truckway connecting KCT directly with Caymanas SEZ;
6. Education and training initiatives, including changing the Caribbean Maritime Institute status to a Maritime University and providing logistics services training at the HEART Trust NTA training agency;
7. KWL Total Logistics Facility warehouse construction;
8. JP Cold Storage Facility infrastructure investment;
9. NMIA privatization, including modifications to the capital structure; and
10. Highway improvements: North coast highway improvements (A1; Ocho Rios to Montego Bay), north south link of the Highway 2000 Project and south coast highway (Harbor View to Portland Highway) investments; and
11. Expansion of air cargo warehouses and cold storage facilities in SIA.

With respect to long-term planning, key projects include the planning and development of an additional container port in the Kingston area (such as the development of Port Augusta); reserving the area for an additional airport (such as the Vernamfield International Airport as a cargo hub and Aerotropolis); and pursuing complementary initiatives to prepare for providing higher-value logistics related activities (such as facilitating activities to become an international financial hub).

Based on the conclusions from this chapter, we recommend the following set of actions that, when combined with the development of the pipeline projects, will contribute to the realization of the vision of the global logistics hub in both the short and long term:

1. Improve logistics performance, especially through streamlined and efficient customs procedures and regulations;
2. Continue to make investment in higher education of sciences and technical degrees and training for relevant logistics activities, including trained warehousemen, warehouse clerks, dispatchers, forklift and truck drivers, logistics planners, and managers for warehousing and supply chain operations as well as preparing employees for higher value global supply chain activities such as production, design, marketing, logistics and finance;
3. Improve reliability and cost of utilities and access to internet and technology;
4. Development and master planning for Port Augusta;
5. Runway expansion of Ian Fleming International Airport;
6. Development and master planning for the Vernamfield International Airport and Aerotropolis;
7. Continue to invest in industrial promotion and facilitate private-led initiatives to develop in concert with government priorities;
8. Improve Jamaica Railway infrastructure with the Vernamfield – KCT segment as a priority.

Part I.4 Logistics Hub Competitiveness Benchmarks

In order to define the strategy to best position Jamaica as a global logistics hub, it is important to examine where Jamaica stands relative to its potential regional competitors, especially on factors that are most important to potential investors relying on a logistics platform responsive to their business needs. Comparisons across rival country ports serve to inform the Jamaican government's strategy to enhance the country's competitiveness while also meeting the needs of the industrial clusters that are identified in Chapter I.5's Industry Analysis. Rival countries include:

- ▶ Freeport, Bahamas
- ▶ Bridgetown, Barbados
- ▶ Mariel, Cuba
- ▶ Cartagena, Colombia
- ▶ Moin, Costa Rica
- ▶ Caucedo, Dominican Republic
- ▶ Port of Spain, Trinidad and Tobago
- ▶ Colon, Panama

The benchmarking is comprised of competitor country research analysis. This process utilizes performance and capacity metrics and regional rankings to determine the strengths, weaknesses, and opportunities as reflected in Jamaica's regional standing.

In the sections that follow, we first describe the process for collecting the data and the challenges to ensuring comparability of data derived from a number of sources. We then describe the four pillars comprising the competitiveness benchmarking framework and the method for transforming the data into scores. Using a model specifically designed to generate scoring results, we also apply the model assuming improved scenarios in an effort to demonstrate its capability to assess the impact of changing performance levels of different indicators. In so doing, Jamaica can focus actions towards improving specific indicator scores to enhance overall competitiveness of a specific pillar. This chapter concludes with the model's application to specific industry clusters, identified in Chapter I.5's industry analysis, that offer good prospects for Jamaica. The analysis of Jamaica's competitive position in the region is also a part of the SWOT analysis in the following chapter.

I.4.1 Indicators

A database was created consisting of a set of quantifiable indicators that could provide information regarding the competitive position of Jamaica vis-à-vis the regional competitors noted above. During this process, we collected performance, cost, and capacity metrics to create regional rankings and determine the strengths, weaknesses, and opportunities for Jamaica. The initial indicators were chosen to account for and reflect requirements corporate investors would use when analyzing and selecting a corporate location and investment strategy. Emphasis was placed on quantified data from existing databases to ensure uniformity in data definition. Data were sought for the five-year period of 2011-2015.

The main data sources include various indicators reported in the World Bank's World Development Indicators (WDI), the United Nations UNCTAD Stat, and the World Economic Forum (WEF) indicators. Terminal capacity and physical data for ports often came from port and maritime authorities directly, and airport connectivity statistics were compiled with data from FlightStats, Inc. Utility, internet, and broadband costs were collected from a country's utilities authorities and the International Telecommunications Union (ITU)'s data sets.

Although efforts were made to ensure data could be standardized and quantifiable, the reality is that there were difficulties in ensuring that outcome. Data availability, especially for certain Caribbean countries, is often meager since global data gathering is often focused on larger countries with more rigorous data gathering efforts; in some cases, particularly in the Caribbean region, countries possess some data but do not process it or report it. To address missing data points, the team applied different techniques and rules to present a balanced database. Where current data are not available, we either used data from earlier years or substituted the data from another country that was similar.

We had initially hoped to include the Cayman Islands in the benchmarking exercise since the country is aggressively promoting a special economic zone (the Cayman Enterprise City) by offering an offshore business hub with tax-free incentives. However, data for the Cayman Islands are often not reported in the large global databases and hence are excluded in the benchmarking analysis.

Additionally, Cuba is also often excluded from some of the large global databases; however, since Cuba has a larger and more mature economy, we chose to include it in the benchmarking process. We applied different techniques and rules to present a balanced database, often using an available proxy country's data to fill in gaps for countries that might not be represented. This is especially relevant for the data gaps for Cuba, though the same technique was applied for other countries where certain data were lacking.

Organizing Data into the Four Pillars of Competitiveness

Using the underlying database, the indicators were organized in accord with four pillars originating from the paper "The Four Pillars of the Logistics Hub Initiative".⁶⁷ The pillars include the following:

1. **Infrastructure.** The Infrastructure Pillar incorporates data related to the quality, capacity and efficiency of logistics and transport infrastructure in a country. Port and air cargo experts provided insight into the quantifiable factors that most affect cargo and logistics quality. Connectivity and capacity both provide information on the quality of transport and logistics infrastructure.
2. **Business Environment.** The Business Environment Pillar is compiled from three sub-pillars: Macroeconomic Factors, Cost of Inputs and Business, and Trade Enabling Environment. Macroeconomic Factors include such data as GDP per capita, foreign direct investment, and the consumer price index. Cost of Inputs includes information an investor would use to compare costs for running a business, such as the average utility costs and average labor wages. The Business and Trade Enabling Environment sub-pillar accounts for regulatory and trade facilitation-related indicators that would facilitate investors' business opportunities. This pillar relies heavily on information from the World

⁶⁷ Deans, Eric. "The Four Pillars of the Logistics Hub Initiative." Unpublished discussion paper. 2016.

Bank's Doing Business data since regulatory issues are difficult to quantify and compare on an equitable basis.

3. **Human Capital.** This Human Capital Pillar addresses both quality of life and education in a country. Unfortunately, more in-depth data on education, especially related to quality and availability of engineering and technologies graduates, were not included. Although we were able to find some data providing percentages of graduates in specific areas, there were data gaps for many of the countries, including Jamaica.
4. **Technology.** The Technology Pillar was created in close consultation with an expert in information and communications technology (ICT) and the telecommunications sector that provided insights into how to quantify the technological connectivity of each country. The selected indexes include measures of connectivity, availability of information technology, and export of ICT services.

Efforts were made to collect 74 different indicators, but due to lack of availability of some data in different countries, and a focus on reliability, the field of indicators was narrowed to 38, where the majority of countries reported the majority of these data. During the narrowing process, experts in various areas were consulted on the specific factors that would most affect investment decisions. Hence, the 38 indicators were determined to be most reflective of factors influencing an investor's decision. Table I.4-1 presents the 38 indicators organized by pillar.

Table I.4-1: Competitiveness Pillars Indicators and Sources

Indicator	Source
Pillar 1: Infrastructure	
Liner Shipping Connectivity Index	UNCTAD
Max Draft in Main Container Terminal	Various (Port Authorities/Terminal Operators, etc.)
# of Destinations Per Week from Major Airport	FlightStats
Runway Length	Various (Civil Aviation Authorities/Airport Websites, etc.)
Logistics Performance Index	World Bank LPI
Pillar 2: Business Environment	
Macroeconomic Factors	
GDP Per Capita (Current US\$)	World Bank World Development Indicators
FDI inflow per capita	UNCTAD Stat
CPI	World Bank World Development Indicators
Cost of Inputs	
Water Tariff ("standard" or "industrial")	Various Utility Authorities by Country
Kilowatt price per hour	Various Utility Authorities by Country
Minimum Wage	Various (ILO, Country Labor Departments, and News Articles)
Fixed Broadband Percentage of GNI	ITU's Measuring the Information Society Report 2015
Broadband Price	ITU's Measuring the Information Society Report 2015
Cost to Export Per 20ft Container	World Bank World Integrated Trade Solution (WITS)
Cost to Import Per 20ft Container	World Bank World Integrated Trade Solution (WITS)
Business & Trade Enabling Environment	
Number of Document to Export	World Bank Doing Business
Number of Document to Import	World Bank Doing Business
Time to Export	World Bank Doing Business
Time to Import	World Bank Doing Business
Efficiency Index of the Clearance Process	World Bank LPI
# of Start-up procedures to register a business	World Bank Doing Business

Indicator	Source
Number of Days to Start a Business	World Bank Doing Business
Cost as % of Income Per Capita to Start a Business	World Bank Doing Business
Number of Tax Payments Per Year	World Bank Doing Business
Number of Hours Per Year to Pay Taxes	World Bank Doing Business
Total tax rate as % of profit	World Bank Doing Business
Pillar 3: Business Environment	
Human Development Index (HDI)	UNDP
Unemployment total	World Bank World Development Indicators
Quality of the Education System	World Economic Forum
Pillar 4: Technology	
Fixed Telephones per 100 People	ITU's Broadband Commission for Digital Development Report
Mobile Phones per 100/People	ITU's Broadband Commission for Digital Development Report
International Internet Bandwidth per User	World Bank World Development Indicators
Percentage of Households with Internet	ITU Statistics Database
Mobile Broadband Subscribers	ITU Statistics Database
Fixed Broadband Subscribers	ITU Statistics Database
UN E-Gov Index	United Nations
Secured servers per 1 million in population	World Bank World Development Indicators
ICT Services as a % of Commercial Exports	World Bank World Development Indicators

Source: Nathan Associates Inc.

I.4.2 Competitive Analysis Benchmarking Model and Scoring

With the database of 38 indicators, a Competitive Analysis Benchmarking (CAB) model was prepared, organized in the noted four pillars. The CAB model provides a snapshot of the most important data elements in relation to transport and logistics in the Latin American and Caribbean region.

The data were then transformed to provide an at-a-glance summary of performance in individual areas so that Jamaica can be readily compared to competitor countries. This was done by converting each index into scores by country based on minimum and maximum data points. Each index score was assigned a weight within the pillar or sub-pillar, again in consultation with experts in each subject.

The CAB model then compiles the scores from each index and each country within each pillar to show how Jamaica compares with regional competitors. Figures I.4-1 and I.4-2 show the baseline results of Jamaica's competitiveness in each pillar compared to regional competitors, both as scores and then as rankings.

Figure I.4-1: Baseline Competitive Analysis Model Scores

Pillars of the LHI	Scores								
	Jamaica	Bahamas	Barbados	Colombia	Costa Rica	Cuba	Dominican Republic	Panama	Trinidad and Tobago
P1 Infrastructure	16.0	36.5	6.8	45.2	17.0	29.3	30.5	55.0	14.2
P2 Business Environment	51.9	53.9	61.8	46.6	56.7	63.1	58.3	59.5	48.0
P3 Human Capital	41.2	50.1	85.2	34.8	85.1	67.5	0.7	56.6	79.5
P4 Technology	16.4	21.9	37.1	23.1	34.0	6.3	14.1	20.8	23.5

Figure I.4-2: Baseline Competitive Analysis Model Rankings

Pillars of the LHI	Ranks								
	Jamaica	Bahamas	Barbados	Colombia	Costa Rica	Cuba	Dominican Republic	Panama	Trinidad and Tobago
P1 Infrastructure	7	3	9	2	6	5	4	1	8
P2 Business Environment	7	6	2	9	5	1	4	3	8
P3 Human Capital	7	6	1	8	2	4	9	5	3
P4 Technology	7	5	1	4	2	9	8	6	3

Improved Scenarios

The CAB model also provides the ability to compare Jamaica’s position using improved scenarios. Improved scenarios show what happens to Jamaica’s competitive position if the country is able to improve its rankings within each pillar. The improved scenario score is based on assigning Jamaica improved scores that are attainable in each pillar. For example, the improved scenario within the Infrastructure Pillar would signify that Jamaica: (a) increases its Liner Shipping Connectivity Index and Logistics Performance Index scores to the same levels as the Bahamas; (b) increases the navigation draft to 16.5 meters and extends or builds an airport with a runway length of 4000 meters (same as Cuba); and (c) increases its air connectivity to the same level as the Dominican Republic.

The improved Technology Pillar scenario would signify that Jamaica: (a) increases access to fixed telephone lines to the same levels as Costa Rica and mobile phone access to the same level as Barbados; (b) is able to increase the average internet bandwidth per user and mobile and fixed broadband subscription levels to the same as Barbados; (c) increases the percentage of households with internet access to the same level as Barbados; (d) increases the number of secured servers per population and the percentage of ICT service exports to the same level as that of Barbados; and (e) increases its e-government standing in the UN to the same level as Costa Rica.

Details on the basis of the improved scenario score for each individual pillar and index can be found within the Competitive Analysis Model. It should be noted that the improved scenario holds the competitor’s rankings at their current status-quo levels. Table I.4-3 in the following section provides more details on the specific infrastructure investments that the regional competitor countries are pursuing, but it is impossible to predict which investments will materialize or not for the purpose of

the CAB model. This improved scenario option instead provides a snap shot of Jamaica’s potential to improve its competitive position. The CAB model (which has been provided in Excel) can be updated as new data on indicators is made available. Figure I.4-3 shows the results of Jamaica’s scores and ranking if it is able to achieve the improved Infrastructure and Technology scenarios, and Figure I.4-4 shows the resulting change in ranks in the improved scenario.

Figure I.4-3: Improved Scenario Competitive Analysis Model Scores

		Scores								
		Jamaica	Bahamas	Barbados	Colombia	Costa Rica	Cuba	Dominican Republic	Panama	Trinidad and Tobago
Pillars of the LHI										
P1 Infrastructure		41.1	34.4	4.5	44.4	14.1	28.7	28.3	52.8	11.6
P2 Business Environment		51.9	53.9	61.8	46.6	56.7	63.1	58.3	59.5	48.0
P3 Human Capital		41.2	50.1	85.2	34.8	85.1	67.5	0.7	56.6	79.5
P4 Technology		34.5	24.2	37.1	23.1	34.0	6.3	14.1	20.8	23.5

Figure I.4-4: Improved Scenario Competitive Analysis Model Rankings

		Ranks								
		Jamaica Improved								
		Jamaica	Bahamas	Barbados	Colombia	Costa Rica	Cuba	Dominican Republic	Panama	Trinidad and Tobago
Pillars of the LHI										
P1 Infrastructure		3	4	9	2	7	5	6	1	8
P2 Business Environment		7	6	2	9	5	1	4	3	8
P3 Human Capital		7	6	1	8	2	4	9	5	3
P4 Technology		2	4	1	6	3	9	8	7	5

Jamaica’s Infrastructure Opportunities

Although Jamaica has efficient container terminals with modern crane handling capabilities, an advantageous location, and appropriate channel draft for current trades, UNCTAD’s Liner Shipping Connectivity Index⁶⁸ shows that Jamaica’s maritime connectivity trails far behind Colombia and Panama, and closely follows the Dominican Republic. This is attributable to the nature of the shipping patterns by lines calling the terminals in Panama and Colombia as well as proximity to the east-west and north-south trade lanes. Deployment practices executed by CMA CGM, such as combining their feeder services with main liner services, could improve liner connectivity as would the location of additional shipping lines seeking to establish transshipment hubs.

⁶⁸ UNCTAD. “Stat Liner Shipping Connectivity Index.” Available at <http://unctadstat.unctad.org/>.

Although Jamaica's NMIA airport has generally acceptable capacity (as measured using runway length⁶⁹) for the current fleet that flies there, it still suffers from low connectivity scores compared to regional competitors. Air connectivity, which was measured as the number of cities with flights to and from the main cargo airport of each country, is very low in Jamaica. The number of direct flights to different destinations affects a country's ability to attract and handle air cargo, since much of the world's air cargo is handled as belly cargo on commercial passenger flights. Of the regional competitors, Jamaica has direct flights to the fewest number of international destination cities, and of those, many are only within the Caribbean.

There is some prospect for carriers with a small presence in the region to invest in a terminal to gain market entry, or those with a large presence that currently do not have terminals. In recent years, we have seen this happen with the entry of carrier operated terminals in the region, such as APMT⁷⁰ in Costa Rica and Evergreen in Panama. Shipping lines like COSCO and OOCL have a small presence in the Caribbean trades and, though they will be part of the upcoming Ocean Alliance in 2017, it is conceivable that in the mid-term future these lines, and others which have established Caribbean transshipment hubs but which do not operate their own terminals (e.g. Hapag Lloyd, Hamburg Sud, and MSC), may follow the CMA CGM and APMT example and seek their own terminal investment opportunities. While available terminal space in Kingston is taken up by CMA CGM and Zim, Jamaica could designate other areas on the island as future terminal development sites in the event carriers pursue their own terminal operations.

Additionally, improvements in Jamaica's logistics chain would enhance its scoring in the World Bank's Logistics Performance Index (LPI),⁷¹ which would increase Jamaica's overall infrastructure performance. Jamaica ranked 119 out of 160 countries in the 2016 LPI report; while many in Jamaica voice concerns about Customs performance (ranked 119), Jamaica ranked even lower for infrastructure, (120), international shipments (117), logistics quality and competence (126), tracking and tracing (116), and timeliness (136). In fact, performance seems to be on the decline as the ranking for each of the four years' reported performance (2010, 2012, 2014, and 2016) rank Jamaica 112 overall. Undoubtedly, scores in the report's 2018 edition will improve for infrastructure with construction of the new container terminal and modern warehousing now underway. In addition, with the adoption of technology initiatives envisioned in Jamaica's 2030 report⁷², improvements can be expected in the rankings for tracking and tracing, timeliness, and ease of arranging international shipments.

⁶⁹ Although NMIA is in service and handles B747-400 and B777 aircrafts, a 300 meter runway extension is necessary to comply with ICAO standards.

⁷⁰ Though established as a marine terminal operator company, APMT is a sister company to Maersk Line, the world's largest container shipping company. Both APMT and Maersk Line are a part of holding company A.P. Møller – Maersk Group.

⁷¹ The World Bank. "Connecting to Compete 2016 Trade Logistics in the Global Economy: The Logistics Performance Index and Its Indicators." 2016. Available at <http://lpi.worldbank.org/>.

⁷² ICT Task Force. "Vision 2030 Jamaica: Information and Communications Technology (ICT) Sector Plan 2009-2030." September, 2009. pp. 49-72.

Jamaica's Technology Opportunities

In the Government of Jamaica's (GoJ) Vision 2030 document for the ICT sector, the GoJ articulated the country's intent to have a strong and competitive ICT sector, recognizing that national development is advanced by widespread adoption and application of ICT.⁷³ Vision 2030 emphasizes a strong central government role in facilitating and promoting private investment in the ICT sector; however, an attractive business enabling environment, which considers enforcement of law, transparency, and reasonable sector regulations, is important to attract private investment.

In 2003, the GoJ completed the liberalization of the telecommunications sector when it opened the market to competition in the lucrative international voice and data service market. The sector's liberalization, following the Telecommunications Act 2000, was instrumental in boosting private sector investment in telecommunications. The inflow of private capital that followed benefitted the Jamaican economy as a whole, and opportunities remain to continue to improve Jamaica's competitive position in the areas of technology.

The ITU's ICT Development Index (IDI) was one of main indexes used to benchmark Jamaica against peer countries in the Caribbean region⁷⁴. The IDI combines eleven indicators into one benchmark index. The IDI can be divided into three sub-indexes: (a) ICT access, (b) ICT use and (c) ICT skills. Jamaica has a unique opportunity because overall there is a high capacity for access to technology, especially in terms of international bandwidth, however the quality of the access can be improved. For example, although Jamaica has five fiber optic submarine cable landing stations showing a high amount of internet connectivity, it ranks below almost all its peers when measuring bandwidth per internet user, which can serve as a proxy for access quality. With further industrial development, Jamaica could potentially utilize all available international capacity. Furthermore, although about 40% of Jamaica's population are internet users, the percentage of households with internet access is low for the region. If Jamaica or its private investors extend the ICT infrastructure network for the purpose of industrial development, it creates an opportunity to extend coverage to households while perhaps lowering the price of access.

The E-Government Development Index of the United Nations Department of Economic and Social Affairs (UNDESA)⁷⁵, which provides rankings of UN member states on their use of IT for delivering public services, benchmarks Jamaica in a similar position: relatively low ranking for the region, only above Cuba. Within the E-Government Index, the Telecommunications Infrastructure Index (TII) component uses measures of subscriptions of fixed and mobile voice, broadband, and individuals using the internet. The Human Capital Index component of the E-Government Index measures literacy, enrollment, and mean years of schooling. The final component of the E-Government Index is the Online Service Indicator, which surveys availability of e-government services by reviewing

⁷³ ICT Task Force. "Vision 2030 Jamaica: Information and Communications Technology (ICT) Sector Plan 2009-2030." September, 2009. pp. 49-72.

⁷⁴ International Telecommunications Union. "Measuring the Information Society Report.". 2015. Available at <http://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2015/MISR2015-w5.pdf>.

⁷⁵ United Nations, *E-Government Survey 2014 – E-Government for the Future We Want*. United Nations Department of Economic and Social Affairs (UNDESA), New York, 2014. Available at http://unpan3.un.org/egovkb/Portals/egovkb/Documents/un/2014-Survey/E-Gov_Complete_Survey-2014.pdf

national government websites, portals, e-services portals, e-participation, and ministry websites, scoring each of these between zero and one. Because it directly explores e-government tools, the Online Service Indicator perhaps best reflects the availability of e-government services, placing Jamaica on the lower end of the regional rankings. If Jamaica can improve its e-government services, such as online portals for licensing, land registration, customs, etc., this in turn will have positive effects on the ease of doing business.

Jamaica's Human Capital Opportunities

The implications for Jamaica's LPI rankings extend beyond the technology sphere to human capital. The availability of well-trained warehousemen, warehouse clerks, dispatchers, forklift and truck drivers, logistics planners, and managers for warehousing and supply chain operations will increase in importance as Jamaica establishes itself as a global logistics hub. The low LPI ranking relative to logistics quality and competence is especially indicative of personnel currently engaged in logistics activities. The ongoing development of modern warehousing in Kingston will likely be accompanied by training for these logistics positions. Demand for these and other positions will continue to rise as additional logistics-related facilities are developed. While some in Jamaica voice concerns about the orientation towards critical thinking (liberal arts education) in secondary schools, this should not be considered a hindrance to supplying capable workers. In fact, the literature suggests that critical thinkers are innovative, highly trainable, have better organizational and problem solving skillsets, and are better at ethical judgment. A recent survey of business leaders conducted by the American Association of Colleges and Universities documents the preference by employers for these skills⁷⁶:

- ▶ 93 percent of employers indicated that job candidates should have a “demonstrated capacity to think critically, communicate clearly, and solve complex problems” and state that these are more important than the undergraduate major;
- ▶ 95 percent say they prioritize hiring college graduates with skills that will help them contribute to innovation in the workplace;
- ▶ 95 percent of those surveyed also say it is important that those they hire demonstrate ethical judgment and integrity; intercultural skills; and the capacity for continued new learning;
- ▶ 75 percent of business leaders say they want more emphasis on five key areas including: critical thinking, complex problem solving, written and oral communication, and applied knowledge in real-world settings; and
- ▶ 80 percent of employers agree that, regardless of their major, every college student should acquire broad knowledge in the liberal arts and sciences.

Jamaica has the opportunity therefore to expand educational access and increase specialized training for logistics and transport related sectors while harnessing the critical thinking skills of the population with secondary education. Jamaica can also take advantage of the existing and growing training facilities on the island, such as the Caribbean Maritime Institute and the HEART Trust NTA to provide job training focused on stimulating economic growth, and invest and create other specialized training facilities, such as an aviation training school if the Vernamfield Airport and Cargo Hub project moves forward.

⁷⁶ AACU. “It Takes More than a Major: Employer Priorities for College Learning and Student Success.” Association of American Colleges and Universities, Hart Research Associates. April 10, 2013. Available at https://www.aacu.org/sites/default/files/files/LEAP/2013_EmployerSurvey.pdf.

Competitor Research

The CAB model provides a quantitative assessment of how Jamaica compares to its potential competitors in the region based on factors that can be measured or scored. However, it is also important to understand Jamaica's competitive position related to more qualitative assessments of what its competitor countries are investing in related to transport and logistics. By taking into account Jamaica's current competitive assessment from the results in the CAB model along with a more qualitative understanding of where its competitors are looking to position themselves in the future provides insight into Jamaica's potential future competitive position. Table I.4-2 provides a summary of general physical attributes for the major components that contribute to the logistics capacity of a country along with development or investment plans that they are pursuing for those assets.

Table I.4-2: Regional Competitor Logistics Infrastructure Developments

Regional Competitor	Port Terminals	Operations and/or Expansion Plans	Major Airport(s) Investment Plans	SEZ/FTZ Areas or Plans
Freeport, Bahamas	Freeport Harbour Company	Operated by Hutchinson Port Holdings & Grand Bahamas Port Authority (GBPA); In March 2016, MSC made offer to purchase GBPA.	Grand Bahama International Airport is privately owned by Hutchinson Port Holdings & Grand Bahamas Port Authority, has an 3,350m runway, but operates few flights	Freeport is a 230-square mile free trade zone on Grand Bahama Island, established in 1955. The Grand Bahama Port Authority Limited operates the FTZ. The Sea Air Business Center located in Freeport connects airport to port and bills itself as the Transshipment Hub of the Americas. However, usage and development levels are low. (300 ha)
	Freeport Container Port (FCP)	FCP is in the process of a US\$280 million Phase V Development for expansion and to increase capacity, however, the development process is questionable	Lynden Pindling International Airport in Nassau recently expanded and modernized its facilities. It has 2 runways with a max runway length of 3,350m and serves 52 destinations.	
Cartagena, Colombia	SPRC Manga Terminal	Both terminals are operated by SPRC.	Rafael Núñez International Airport in Cartagena has a 2,600m runway and serves 4 international destinations. SACSA is the local operator.	Zona Franca Parque Central is a permanent FTZ located 12 km from Contecar (115 ha)
	SPRC Contecar Terminal			
	Compas Terminal (formerly Muelles El Bosque)	Concessioned to Compas & APM Terminals with plans to invest US \$200 million in upgrading and expanding the terminal	El Dorado International Airport in Bogota is operated by Opain and has seen investments for expansion and modernization which is ongoing.	The Permanent Free Trade Zone SANTELCA is located across from the Port of Cartagena (74 ha)
	Puerto Bahia	Owned by Pacific Infrastructure Ventures, space to develop and expand.		ZOFRANCA Cartagena SA is located 14 km from the city center and has a private dock. (14 ha)

Regional Competitor	Port Terminals	Operations and/or Expansion Plans	Major Airport(s) Investment Plans	SEZ/FTZ Areas or Plans
Moin/ Limon, Costa Rica	Terminal Limon	APM Terminals is currently constructing the Moin Container Terminal on a greenfield site.	A study is underway for a new international airport to replace the Juan Santamaria International Airport in San Jose. The study will determine the actual location to build the airport, and provide basic design and master plan for the new airfield.	Zona Franca del Atlántico is a FTZ 12 km from Limon and 10 km from Moin. (10 ha)
	Terminal Moin	America's Gateway Development Corporation (AMEGA) is proposing the construction of a pure transshipment port in the Moin area.		FreeHold Free Zone is a planned area that will begin construction in Nov 2016; the Caribe Industrial Park & Free Zone is also planned near APM Terminal in Limon. (58 ha)
Mariel, Cuba	TC Mariel	PSA International-operated terminal opened in 2014.	Jose Marti International airport will be managed by Bouygues Batiment International and Aeropuertos de Paris starting in 2016. The GoC did not provide any investment indications included in the agreement.	In 2013, the Mariel Special Development Zone (SDZ) was designated as an area for free trade and development. (46,620 ha)
Caucedo, Dominican Republic	Caucedo DPW	Includes the marine terminal and free zone operated by DPW.	Las Américas International Airport is located in Punta Caucedo and is the country's second busiest airport after Punta Cana. VINCI Airports is the international operator.	Caucedo Logistics Center is being built for intermodal logistics between the port and neighboring airport. (30 ha)
Kingston, Jamaica	KCT	Privatization of KCT is complete with Terminal Link/CMA CGM Consortium concession, which includes investment and operational improvements.	NMIA airport concession to fund modernization and investment has been stalled. SIA is the other major international airport of Jamaica handling mostly tourism traffic to Montego Bay area.	At the port, there is the Kingston Logistics Center Limited (KLC) that offers an all-inclusive logistics center and FTZ.
	KWL	KWL is in a US\$100m phased investment process to improve operations and expand capacity.	Vermanfield is a proposed airport project to redevelop a 2,000-meter long concrete runway located in the parish of Clarendon for passenger and cargo operations.	Caymanas Special Economic Zone is a 1,400 acre greenfield site slated for mixed use economic and industrial development.
Colon, Panama	MIT	Owned and operated by Stevedores Services of America (SSA), there are expansion plans for a north dock.	Tocumen International Airport is a hub airport for Copa Airlines. It is currently undergoing construction of the new South Terminal. The	MIT Logistics Park is located next to MIT terminal to provide value-added logistics services. (17 ha)

Regional Competitor	Port Terminals	Operations and/or Expansion Plans	Major Airport(s) Investment Plans	SEZ/FTZ Areas or Plans
	Colon Container Terminal	CCT is a private terminal operated by Evergreen Group	private operator is Tocumen S.A.	Colon Free Zone is a SEZ divided into 9 areas for exhibition, storage and warehousing, logistics services, and other potential areas. (1,064 ha)
	Cristobal-Panama Ports Company	The concession to operate PCC was granted to Hutchison Port Holding. There are several possible expansion plans that are being considered.		
Port of Spain, Trinidad and Tobago	PPOS	POS recently completed an upgrade and maintenance project to improve the reliability of its crane equipment.	Piarco International Airport serves Trinidad, and is the operating hub for Caribbean Airlines. Operated by the Airports Authority of Trinidad and Tobago.	There are at least 8 free zones in Trinidad providing manufacturing, assembly, provision of services, international trading in products, and regional distribution.

As this table demonstrates, many competitor countries are investing in infrastructure to increase their logistics capacity, especially in the port sector. However, there is the potential that Caribbean ports are headed in the direction of overcapacity. According to UNCTAD’s annual review, in 2014, although global seaborne shipments increased by 3.4% over the previous year, large emerging economies have experienced a slowdown in economic growth while future global economic growth is expected to slow in the long term.⁷⁷ Furthermore, there are concerns by port operators that the now expanded Panama Canal may lead to idle ships as shippers redesign their supply chains and consolidate cargo into larger vessels.⁷⁸ One strategy that many ports have used to mitigate that risk is by aligning themselves to a shipping line, such as Evergreen at CCT in Panama. Most ports in the region are privately operated, some by regional or local operators (such as SPRC in Cartagena), and others by international operators (such as PSA in Mariel, Cuba or DPW in Caucedo, Dominican Republic.)

In the airport sector, most countries have introduced private operators (both international and local) which have included agreements for investing in the modernization and expansion of existing facilities. The Grand Bahama International Airport stands out from the group as it is privately owned by a joint venture between Hutchinson Port Holdings and Grand Bahamas Port Authority (GBPA), which also operates the port and the SEZ in the area called the Sea Air Business Center. The Grand

⁷⁷ UNCTAD. “Review of Maritime Transport 2015. UNCTAD/RMT/2015. Geneva, 2015.

⁷⁸ Gavin van Marle. “Overcapacity may hit Caribbean transshipment ports following Panama Canal expansion.” October 17, 2016. Accessed at: <http://theloadstar.co.uk/overcapacity-may-hit-caribbean-transshipment-ports-following-panama-canal-expansion/>.

implemented a general agreement for the development of the area that included “the legacy of a ‘free port’ with substantial tax concessions for financial, commercial and industrial enterprises,”⁷⁹ called the Hawksbill Creek Agreement, Despite having an integrated maritime, airport, and SEZ area that was concessioned to Hutchinson Port Holdings/Hutchison Whampoa, the economic impact and investment pace for those areas has stagnated for a variety of reasons, including issues related to the concession’s incentives and areas of conflicts of interest.⁸⁰ A 2014 study from the Grand Bahama Chamber of Commerce listed among other reasons that the GBPA “developed a dysfunctional (opaque) relationship with its Licensees” and that it “failed to attract new investment (domestic and foreign), complete infrastructure improvements, and create an environment for business development.” There have been recent efforts made to address the short comings of the concession, including a recently passed Investment Incentive Bill, 2016 that seeks to create a new governance structure for Freeport’s concession, including shifting the responsible for the granting of concessions to the Government of the Bahamas and away from the GBPA.⁸¹ The Minister for Grand Bahama, Dr. Michael Darville further described the trust of the new bill:

“We are confident that this new approach in the governance structure in Freeport would not only reflect what is happening in the rest of the country, but will cause for the Government to play a more integral part in the facilitation of new and existing developments on Grand Bahama, whether foreign or domestic; thus making the process more accountable and transparent,”

'Half A Billion' To Be Injected into Grand Bahama Economy After Bill Passed, Tribune 242,

All of the competitor counties also have some area in proximity to the major port areas assigned as free trade zones or special economic zones, but the size of the zones varies greatly, from less than 20 hectares all the way up to the general Mariel Special Development Zone (SDZ) in Cuba which designates more than 45,000 hectares of land for free trade and development. Usage rates for these zones are not readily available, and many seem to be in the early development or planning phases.

1.4.3 Competitive Analysis of Clusters

In Chapter 1.5’s industry analysis, we identify clusters and industries (including service sectors) that are most promising for Jamaica to capture. This is not to say the clusters can be captured under a status quo environment. The likelihood of capturing specific industries will obviously increase with appropriate infrastructure and IT-based logistics systems. To gauge the impacts of improved infrastructure and IT systems, our CAB model was designed with the ability to assess industry cluster

⁷⁹ The Grand Bahamas Port Authority. “About Us.” Accessible at: <http://www.gbpa.com/index.php/about-us/who-we-are>.

⁸⁰ The Grand Bahama Chamber of Commerce, “The Future of Freeport - 2015 and Beyond,” September 14, 2014. Accessible at: http://www.thebahamasweekly.com/uploads/16/Vision_2015_14.09.16__PM_.pdf

⁸¹ Maycock, Denise. “Half A Billion' To Be Injected into Grand Bahama Economy After Bill Passed.” Tribune 242. September 23, 2016. <http://www.tribune242.com/news/2016/sep/23/half-billion-be-injected-grand-bahama-economy-afte/>.

competitiveness by considering factors important for them to function efficiently in Jamaica. Table I.4-3 summarizes which industry clusters are incorporated into the competitive analysis model.

Table I.4-3: Clusters, Industries, or Service Sectors

Cluster	Industries	Service Sector
Light Manufacturing	Pharmaceutical Goods and Medicaments	Assembly and distribution, General warehousing and storage
Biomedical / Biomechanical	P&A For Motor Vehicles and Motorcycles	Refrigerated warehousing and storage
Transportation and Logistics	Electric Heaters, TV Receivers	
Supporting Industry	Medical, Surgical, Apparatus	
	Air Conditioning , Refrigerators, Freezers, Heat Pumps	

The competitive rankings are provided for both the baseline status quo scenario as well as the rankings in the improved scenario outcome for each cluster. Figures I.4-5 and I.4-6 show the model's results for the baseline and improved scenarios specific to the light manufacturing cluster. In the status quo scenario, Jamaica ranks 9th overall, but this rank can be improved to 2nd under certain improved conditions, particularly in the infrastructure and technology arenas.

Figure I.4-5: Baseline Light Manufacturing Cluster Competitive Analysis Score

C1 - Light Manufacturing

	Jamaica	Bahamas	Barbados	Colombia	Costa Rica	Cuba	Dominican Republic	Panama	Trinidad and Tobago
Pillars of the LHI									
P1 Infrastructure	4.8	10.9	2.0	13.6	5.1	8.8	9.2	16.5	4.3
P2 Business Environment	13.0	13.5	15.4	11.6	14.2	15.8	14.6	14.9	12.0
P3 Human Capital	4.1	5.0	8.5	3.5	8.5	6.7	0.1	5.7	8.0
P4 Technology	5.7	7.7	13.0	8.1	11.9	2.2	4.9	7.3	8.2
<i>Weighted Score</i>	27.6	37.1	39.0	36.8	39.7	33.5	28.7	44.3	32.4
<i>Rank</i>	9	4	3	5	2	6	8	1	7

Figure I.4-6: Improved Scenario Light Manufacturing Cluster Competitive Analysis Score

C1 - Light Manufacturing

	Jamaica	Bahamas	Barbados	Colombia	Costa Rica	Cuba	Dominican Republic	Panama	Trinidad and Tobago
Pillars of the LHI									
P1 Infrastructure	12.3	10.3	1.4	13.3	4.2	8.6	8.5	15.8	3.5
P2 Business Environment	13.0	13.5	15.4	11.6	14.2	15.8	14.6	14.9	12.0
P3 Human Capital	4.1	5.0	8.5	3.5	8.5	6.7	0.1	5.7	8.0
P4 Technology	12.1	8.5	13.0	8.1	11.9	2.2	4.9	7.3	8.2
<i>Weighted Score</i>	41.5	37.3	38.3	36.5	38.8	33.3	28.1	43.6	31.6
<i>Rank</i>	2	5	4	6	3	7	9	1	8

The model also provides a visual representation of Jamaica's competitive position for each industry cluster compared with a regional benchmark, as seen in Figure I.4-7 for the baseline scenario and

Figure I.4-8 for the improved scenario, both specific to the light manufacturing cluster. The benchmark country selected in each scenario is the best performing country in that specific cluster.

Figure I.4-7: Baseline Light Manufacturing Cluster Competitive Analysis by Regional Benchmark

C1 - Light Manufacturing

Pillars of the LHI	Regional Benchmark	Jamaica
P1 Infrastructure	16.5	4.8
P2 Business Environment	15.8	13.0
P3 Human Capital	8.5	4.1
P4 Technology	13.0	5.7

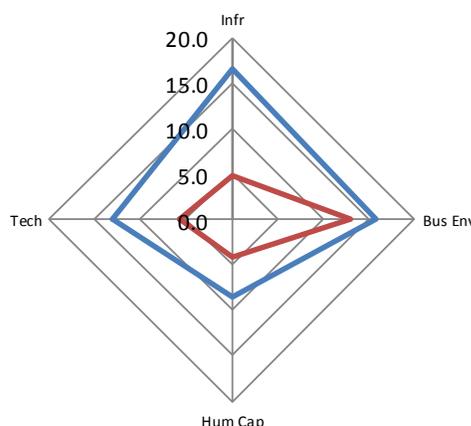
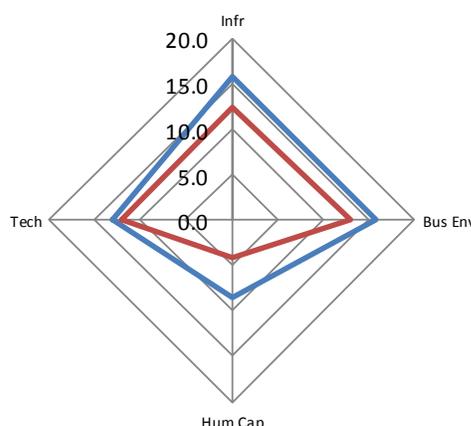


Figure I.4-8: Improved Scenario Light Manufacturing Cluster Competitive Analysis by Regional Benchmark

C1 - Light Manufacturing

Pillars of the LHI	Regional Benchmark	Jamaica
P1 Infrastructure	15.8	12.3
P2 Business Environment	15.8	13.0
P3 Human Capital	8.5	4.1
P4 Technology	13.0	12.1



Conclusions for the Competitive Position of Jamaica

The results of the competitive analysis demonstrate that Jamaica has opportunities to grow and improve throughout the four pillars of competitiveness. In the baseline rankings, Jamaica ranks 7th among the nine countries included in the regional analysis. In the improved scenario analysis, Jamaica can make significant gains in the Infrastructure and Technology pillars if it focuses attention on improving certain infrastructure and IT.

The main areas where Jamaica can improve its infrastructure ranking are by improving maritime and air connectivity and improving the logistics chain. The maritime liner connectivity will likely improve in the short term with the concession of KCT (as discussed in Chapter I.3) if CMA CGM decided to change its deployment practices and combine its feeder services with main liner services in Kingston. Air connectivity levels for Jamaica are low for the region, but there is the opportunity to improve in that area with recent developments in its bilateral air agreements (which is discussed in more detail in Chapter I.2).

To become a global logistics hub, Jamaica must improve all areas of its logistics chain. Jamaica will likely improve its scores in the LPI 2018 edition of the report as the benefits from the construction of the new container terminal and modern warehousing comes to fruition. However, the importance of modern, efficient, and cost-effective customs is a prerequisite for global competitiveness. As the World Bank has pointed out, handling charges in the Caribbean can be two to three times higher than in similar ports in other regions, often caused by customs delays in ports.⁸² Based on the competitor analysis of infrastructure developments, it is also important to note that all of the competitor countries in the region are investing in modernizing and expanding port and airport capacity and have designated free trade zones. Jamaica must find a balance of investing in making its own logistics infrastructure and networks more efficient and modernized while not creating overcapacity that diminishes the return on its investment, especially considering the regional context.

One positive development for customs reform that is not yet reflected in these scores is that Jamaica is already in the process of implementing some of these modernization efforts using online apps and e-commerce. For example, starting in 2017, the Jamaica Customs Agency (JCA) completed the implementation of the Automated System for Customs Data, ASYCUDA World, which is a “web-based application that allows clients of the JCA, including Customs brokers and shipping agents, to undertake e-transactions such as the submission of manifests, declarations, payments, and documents.”⁸³ These improvements could result in improved benchmarking scores for both e-government and Ease of Doing Business indicators.

Furthermore, as Jamaica moves towards its vision of becoming a global logistics hub, human capital will also be an important aspect to realize that vision. The availability of well-trained warehousemen, warehouse clerks, dispatchers, forklift and truck drivers, logistics planners, and managers for warehousing and supply chain operations will increase. And while the perception by many in Jamaica is such that Jamaica needs to focus on STEM (Science, Technology, Engineering and Mathematics) curriculum development in secondary schools, this is not necessarily a prerequisite for industrial location in the near- to mid-term given the inherent skill sets nurtured in a liberal arts education. Indeed, the analysis shows attention is needed in other areas if Jamaica is to provide the logistics system backbone necessary to encourage industrial location, regulatory and institutional constraints notwithstanding.

Once Jamaica has begun its transformation into a global hub, there are long term opportunities to invest in education and training to continue to evolve the hub to serve high value global supply chain activities in production, design, marketing, logistics and finance. As the International Labour Organization states, “Strategic investments in infrastructure, science, technology and innovation policies, education and skill development in developing countries have yielded unprecedented increases in the supply of offshore pools of low-wage, technically skilled workers in both

⁸² “Customs: The lynchpin for economic growth in the Caribbean,” February 15, 2016, Accessible at: <http://www.worldbank.org/en/news/feature/2015/02/16/customs-lynchpin-economic-growth-caribbean>

⁸³ Author Unknown. “ASYCUDA World – Reforming Jamaica Customs.” Jamaica Observer. January 18, 2017. Accessible at: http://www.jamaicaobserver.com/business/ASYCUDA-World--Reforming-Jamaica-Customs_86846.

manufacturing and services.”⁸⁴ Making these key investments can provide a competitive edge over countries in the region that do not invest in those areas allowing Jamaica to meet the needs of the next wave of development for global supply chain providers.

Finally, Jamaica has a unique opportunity to harness technological opportunities on the island. Overall, there is a high capacity for access to technology, especially in terms of international bandwidth; however, the quality of the access can be improved. If Jamaica and private investors extend the ICT infrastructure network for the purpose of industrial development, there is an opportunity to extend coverage to households at expectedly more affordable prices. Jamaica can also improve its e-government services, including online portals for licensing, land registration, customs, etc., which will improve the ease of doing business in the country. As previously mentioned, the implementation of ASYCUDA World is the type of e-government improvements that will directly affect and improve the logistics sector.

This competitive analysis of Jamaica, vis-à-vis its regional competitors, serves as an input into the SWOT analysis provided in the next chapter. That chapter also outlines the process of using the SWOT analysis and other frameworks to identify industry prospects and constraints towards the development of a logistics hub.

⁸⁴ “Promoting Decent Work in Global Supply Chains in Latin America and the Caribbean. Key issues, good practices, lessons learned and policy insights.” Lima: ILO Regional Office for Latin America and the Caribbean, 2016. 120 p. (ILO Technical Reports, 2016/1).

Part I.5 Industry Analysis

Building on the benchmarking analysis undertaken the previous chapter which highlighted Jamaica's competitive position in Latin America and the Caribbean, Chapter I.5 seeks to identify the most promising industry sectors, sub-sectors, and business functions, which should be targeted by the LHI in order to best position Jamaica to become a global logistics hub. The analysis undertaken in this chapter incorporates inputs and findings from previous chapters, including the demand forecast presented in Chapter 2, the analysis of logistics infrastructure investments in Chapter I.3, and the aforementioned competitiveness analysis in Chapter I.4. Chapter I.5 is divided into the following sections:

- ▶ I.5.1: Investment Trends
- ▶ I.5.2: Trade Flows
- ▶ I.5.3: Investor Perceptions
- ▶ I.5.4: Strengths, Weaknesses, Opportunities, and Threats (SWOT)
- ▶ I.5.5: Enabling Environment
- ▶ I.5.6: Industry Identification
- ▶ I.5.7: Improving Competitiveness
- ▶ I.5.8: Conclusion

Section 5.1 analyzes investments trends in Jamaica in order to assess the factors that will influence the country's ability to position itself as a global logistics hub, including actual and anticipated investments, investment requirements, potential areas for growth, and Jamaica's comparative advantages. The findings of this section serve as inputs for the SWOT analysis and Multi-Criteria Analysis (MCA) detailed later in the chapter. Section 5.2 reviews the results of the demand forecast detailed in Chapter I.2 to determine those trade flows most applicable to both Jamaica's existing industries as well as prospective industries with the potential to locate to Jamaica. Section 5.3 details survey results gathered through consultation with local and international investors in Jamaica. The survey results, which identified current strengths and weaknesses of logistics and transshipment services and facilities in Jamaica, serve as inputs for the SWOT analysis. Section 5.4 presents the findings of the SWOT analysis. These findings are in turn used to make recommendations on policies, industrial development, and promotion strategies to enable Jamaica to pursue opportunities to expand existing industries and attract new industries in line with its vision of becoming a global logistics hub. Section 5.5 assesses the logistics hub enabling environment in Jamaica through analyses of its policy, legislative, and regulatory frameworks. The results of the analyses in this section identify institutional challenges that must be overcome in order to best support implementation of the Jamaica Logistics Hub. Section 5.6 identifies the industry sectors and sub-sectors with the greatest potential to locate to the Jamaica Logistics Hub, including sectors that the country currently lacks. Section 5.7 builds on the suite of analyses undertaken in Chapter I.5 to make recommendations for improving the competitiveness of the Jamaica Logistics Hub. This includes a description of the value proposition for the Jamaica Logistics Hub. The chapter concludes with a summary of findings.

I.5-1 Investment Trends

As detailed in Chapter I.3, Jamaica’s existing logistics and transport assets are sufficient to serve current requirements. To address the future requirements of the Jamaica Logistics Hub, however, it is necessary to analyze trends in investment to identify those trends that are likely to have the greatest impact on logistics and industrial development in Jamaica. To do so, this section assesses several factors that impact Jamaica’s ability to position itself as a global logistics hub. These factors include the following:

- ▶ Ongoing and anticipated industry investments
- ▶ Investment requirements
- ▶ Potential areas for growth
- ▶ Comparative advantages

Ongoing and Anticipated Industry Investments

To assess ongoing and anticipated investments in Jamaica, Nathan organized projects in the following categories:

- ▶ Transport Infrastructure Assets: rely on movement and exchange of freight (i.e. roads, ports, airports);
- ▶ Operation Infrastructure Assets: where Jamaica Logistics Hub industries will be located (i.e. special economic zones, port and airport areas, etc.);
- ▶ Complementary Projects: those with no direct relevance to the project categories above, but may rely on or be complementary to them.

Tables I.5-1 and I.5-2 highlight ongoing and anticipated investments in Jamaica by the aforementioned categories. The projects included in the first two categories warrant the most attention given that these represent assets most attractive for industrial development.

Table I.5-1: Ongoing Investments by Category

Project	Operation Infrastructure Assets	Transport Infrastructure Assets	Complementary Projects
Privatization and Expansion of the Kingston Container Terminal (KCT) - Investment from CMA CMG Log. Into KCT.	✓	✓	
Expansion of Kingston Wharves Limited Terminal (KWL)	✓	✓	
KWL’s Total Logistics Facility	✓	✓	
Privatization of Norman Manley International Airport		✓	✓
New Fortress LNG Hub Power Project Plant and Terminal			✓
JP Cold Storage Facility	✓		✓
China Harbor Engineering Company (CHEC) North-South High Way and real estate investment		✓	
Spanish Town Special Economic Zone	✓		
Harren & Partner Ship Repairs			✓
Heineken – Red Stripe Beer			✓

Project	Operation Infrastructure Assets	Transport Infrastructure Assets	Complementary Projects
Jamalco Coal-Fired Plant at the Bauxite Mining and Alumina Processing Plant			✓
PAJ 80 hectare Port Centric Logistics Park	✓		

Source: Nathan Associates.

Table I.5-2: Anticipated Investments by Category

Project	Transport Infrastructure Assets	Operation Infrastructure Assets	Complementary Projects
Caymanas Special Economic Zone	✓	✓	
Naggo Head Tech Park		✓	
Dry Dock/Ship Repairs- German Dry Dock	✓		
Bunkering - West Indies Petroleum			✓
Goat Island Logistics Park		✓	
Toyota Hino Truck Assembly		✓	
BMW regional hub			✓
Toyota Distribution Hub for Cuba	✓		✓
Expansion of Fargo Electronics			✓
Vernamfield Cargo Hub	✓	✓	
Dell Repairs/Returns Centre			✓
Amazon Fulfillment Center	✓		
International Financial Services		✓	
South Coast Highway (Harbor View to Portland Highway)	✓		
Ship Registry	✓		
Cold Storage Facility - Flagler Global Logistics	✓		
Total Projects per Category	8	6	5

Source: Nathan Associates.

Table I.5-3 provides an overview of the total envelope of ongoing investments relevant to the Jamaica Logistics Hub organized by sector. As seen in the table, the total investment amount is estimated to be USD \$3.397 billion.

Table I.5-3: Ongoing Investments by Sector (Total USD)

Sector	Amount (USD)
Total Ongoing Investments	\$3.397 billion
Electricity, Gas and Water Supply	\$722 million
Transport, Storage and Communication	\$819 million
Construction	\$950 million
Manufacturing	\$ 556 million
Wholesale and Retail Trade	\$350 million

Source: Nathan Associates.

Of the aforementioned assets, while timing of the various projects' completions is uncertain, it will be important to prioritize those most relevant to the realization of the Jamaica Logistics Hub. For instance, the recent privatization of KCT represents an important milestone for the logistics sector in Jamaica. The investment will lead to the expansion, rehabilitation, and dredging of the port, making it attractive to transshipment of post-Panamax vessels. In addition, the privatization of Norman Manley International Airport (NMIA) will enable the runway to be expanded, which in turn will help to attract air cargo traffic from larger aircraft. Other relevant projects that will strengthen Jamaica's logistics infrastructure include port-centric projects in Kingston, such as the expansion of the Kingston Wharves Limited (KWL) terminal, KWL's Total Logistics Facility, and the Port Authority of Jamaica's 80-hectare port-centric logistics park. Priority should be given to developing these port-centric facilities, given that new industries will seek locations for their logistics and industrial facilities that have convenient and fast port access before considering, for instance, an outside location such as the Caymanas Special Economic Zone (SEZ). Figure I.5-1 depicts a map highlighting the aforementioned port-centric projects in Kingston. Land to be utilized for industrial and logistics purposes is shown in yellow. Reclaimed areas and free zones are indicated by the labels RA and FZ, respectively. AE indicates the area currently being used as an aerodrome, but which is slated for logistics development.

Figure I.5-1: Development Areas Adjacent to KCT



Source: JAMPRO

Investment Needs

In addition to the industry-related infrastructure investments highlighted above, there are several other critical areas that will require investment in order to foster industry growth and develop the Jamaica Logistics Hub. Investment needs were selected based on the results of the analysis of trade flows undertaken in Chapter I.2 as well as through stakeholder interviews. Irrespective of potential investments, there was a general consensus that Jamaica must increase its pool of workers with university degrees, particularly in engineering and life sciences along with degrees that will support

careers in logistics and manufacturing. Other priorities include better packaging of projects to expand SEZ-related infrastructure and dredging at KCT. Having modern maritime and SEZ infrastructure sufficient to handle anticipated demand will help to attract third party logistics providers and incentivize the GoJ to make complementary investments in road, aviation, and energy infrastructure. Additional details on priority investment needs are identified below.

Training, Certification, and Accreditation of the Labor Force

A number of training institutions, similar to the Caribbean Maritime Institute, HEART NTA, and other tertiary institutions, are in need of investment and upgrade, so that they can incorporate specialized training programs specific to the needs of the sectors to be targeted through the Jamaica Logistics Hub. In addition, the GoJ should increase investment in public education in order to propel a larger share of the population into higher education or specialized technical degrees.

Improved Education in Medical and Pharmaceutical Sciences

Despite the fact that Jamaica has at least three Universities that teach life sciences, according to multiple stakeholders interviewed by the team, Jamaica's workforce is still facing a knowledge and experience gap in the medical and pharmaceutical sectors. To allow the possibility for Jamaica to become a major producer and exporter of pharmaceutical products, it is critical that the GoJ make strategic investments in education in order to develop its workforce to become capable of participating in and supporting sector growth.

Improved Ports and Logistics Infrastructure

In order to accommodate post-Panamax vessels, Port of Kingston requires dredging to both its access channel and terminal berths. The concessionaire of KCT intends to dredge to 14.9 meters during the first phase of the concession. However, in order to accommodate vessels with up to 12,000 TEUs, KCT will require dredging of at least 15.24 meters for the access channel.

Improved Inland Transport Infrastructure

Road drainage systems should be modernized. Additionally, road networks connecting the new Special Economic Zones (SEZ) near or within the Kingston area (such as Caymanas) will need to be expanded in order to facilitate truck and vehicular traffic and avoid creating bottlenecks. According to the Development Bank of Jamaica, there are several bridges and tunnels that are also in need of upgrades.

Improved Technology

As mentioned later in the chapter, there is the opportunity for Jamaica to invest technology and automation services that will make the LHI more attractive to foreign investors. Particularly important investments in this area include e-Government services to facilitate customs procedures (such as the recently implemented ASCUYDA World and other e-commerce initiatives), a single-window SEZ process, web-enabled freight tracking, portals for businesses registrations of that support LHI clusters, and improvements to the technology platform (such as an IT Control Tower at PAJ facilities).

Improved Aviation Infrastructure

Airports in Jamaica must be upgraded and modernized to accommodate larger aircrafts and increase capacity for air cargo traffic and related services. For instance, NMIA is in need of a 300-meter runway expansion. The modernization and rehabilitation of the Vernamfield Airport to transition from a military airport to a commercial airport could provide benefits for the Jamaica Logistics Hub, since

the runway can be expanded to a length of 4,000 meters. Such an expansion is not possible at NMIA due to physical restrictions of the location of the airport between the harbor and Kingston. According to the Jamaica Exporter’s Association, Vernamfield Airport is considered a crucial investment.

Strategically Packaged Projects

Comprehensive business cases for SEZ-related investment projects should be marketed as packaged projects to entice investment from private sector lenders.

Improved Energy Infrastructure and Reduced Costs

While investments in Liquefied Natural Gas (LNG) are being made, more affordable energy is still greatly needed in Jamaica. This will require the GoJ to diversify the national energy supply by investing in areas such as petroleum coke (petcoke), coal, natural gas and renewables (including solar, wind, hydro, and biofuels/biomass). As well, electricity costs should be reduced to 12 cents per kilowatt hour. This would support development of the Jamaica Logistics Hub by opening the Jamaican market to more energy-intensive industries as well as reducing operations costs related to energy consumption.

Third Party Logistics Service Providers

The presence of multiple third party logistics (3PL) service providers is fundamental to the success of the Jamaica Logistics Hub, as 3PLs would attract major investments from anchor companies, which would in turn enhance Jamaica’s competitiveness.

Modernized Tools and Agro Parks for the Agriculture Sector

To ensure that the agriculture sector is operating in accordance with international standards, investments should be made in retooling. Modernization within the agricultural industry can impact access to global markets, ultimately impacting manufacturers and the cost of production. The GoJ should continue to invest in the establishment of agro parks and, through the MICAF, adopt and adapt to international standards to support the agricultural sector. This would allow Jamaica to take full advantage of the high-quality agricultural commodities it already exports, such as cassava, and potentially increase its market share of value-added activities, such as food processing and packaging.

Potential Areas for Growth

Based on the results of the trade flows analysis in Chapter I.2, the following industries (Table I.5-4) were identified as those most likely to experience future growth in Jamaica assuming required infrastructure is in place.:

Table I.5-4: Potential Investment Areas

Potential Investment Areas	Description
Automotive distribution	Assembly of vehicles, parts of vehicles and/or repairs for distribution/redistribution in the Americas
Automotive spare parts	Remanufacturing of auto parts, for storage and distribution in the Americas
Repairs and returns electronic devices	Storage, repairs and distribution of spare parts for warranty/non warranty service
Manufacturing of household electronics	Assembly and distribution of household electronic equipment in the Americas, such as television, medical equipment, LED lights, etc.

Potential Investment Areas	Description
Light manufacturing	Other light manufacturing, assembly and related supporting industries in SEZ clusters
Dry docking	Marine ancillary services in ship repairs
Warehousing and 3PL	Target large 3PL companies and facilitate their warehouse service offering to Major Multi-National Companies (MNCs).
Air cargo services - DHL, FedEx, UPS	Establishment of cargo airport hub to support sorting and redistribution of courier, express and parcels to/from the Caribbean and Central America regions
Motorcycle assembly	Assembly of motorcycles, parts of vehicles and/or repairs for distribution/redistribution in the Americas
Aluminum products	Increase of bauxite processing companies to manufacture aluminum products
Pharmaceutical products and medicaments	Represents one of the highest valued commodities in terms of \$/metric ton. While Jamaica is not a major producer/exporter of these commodities, there is an opportunity for Jamaica to engage in value added activities in this sector due to high demand in the US. In 2014, the US imported 52.2 billion USD in medicaments, and 2.23 billion USD in pharmaceutical products. ⁸⁵
Agriculture/ agri-business	With investments in related supporting industries (such as cold-chain logistics), the agriculture industry will attract more investment.

Source: Nathan Associates.

Investment Trends and Patterns

This section provides an overview of those investment trends and patterns in Jamaica that are relevant to the development of the country's industrial sector.

For much of its history, the Jamaican economy has relied largely on natural resources; first as an exporter of agricultural goods until its independence in 1962, and until the 1990s, as a major exporter of bauxite.

Following economic and financial liberalization in the 1990s, Jamaica's economy became increasingly reliant on the importation and distribution of finished goods. That decade saw significant private sector investment (based on trend of loans from local financial institutions⁸⁶) in the following sectors:

- ▶ Manufacturing
- ▶ Construction and land development
- ▶ Accommodation and support services (e.g., tourism)
- ▶ Transport, storage, and construction
- ▶ Distribution

Between 2000 and 2009, Jamaica experienced a significant investment shift towards accommodation and support services (tourism) as the industry with the highest investments, followed by distribution; construction and land development; transport, storage and communication; and manufacturing. More recently, between 2010 and 2015, the private sector investment profile shifted yet again to include, in order of investment amount: distribution; accommodation and

⁸⁵ "The Atlas of Economic Complexity." Harvard Center for International Development, Accessed Oct., 2016. Available at: http://atlas.cid.harvard.edu/explore/tree_map/import/usa/all/show/2014/.

⁸⁶ Bank of Jamaica Data. Available at: http://boj.org.jm/statistics/econdata/stats_list.php?type=3.

support services (tourism); construction and land development; transport, storage and communication; and manufacturing.⁸⁷

When viewing investment trends over a longer horizon, such as 2003 to 2015, Jamaica experienced the greatest growth in foreign direct investment (FDI) in accommodation and support services (tourism) with USD\$1,395.3 million, followed by the mining and quarrying with USD \$1,135.3 million, and information, communications, and technology with USD\$1,116.2 million.⁸⁸

Today, Jamaica's economy is predominantly driven by FDI and foreign exchange earned through remittances and exports. According to the Bank of Jamaica, Jamaica received USD\$551 million in FDIs in 2014, a 33 percent increase from 2012.⁸⁹ Despite recent increases, Jamaica lags behind several other competing countries in the region, including Dominican Republic, Trinidad and Tobago, Bahamas, and Costa Rica.⁹⁰

As shown in Figure I.5-2, FDI inflows increased steadily until peaking in 2008 at approximately USD\$1,400 million. This was followed by a steep decline in the aftermath of the 2008 financial crisis, which lasted until 2011 when FDI reached a low of just over USD\$200 million. Since that time, FDI has recovered substantially, with USD\$551 million recorded in 2014, and an increase of over 30 percent in the first three quarters of the 2015-2016 fiscal year.⁹¹ These positive trends indicate likely continued growth in FDI and signal stability for investment in industries operating in the Jamaica Logistics Hub (e.g., distribution, transport, storage, and communication).

Table I.5-5 highlights trends in Local Direct Investment (LDI). The table indicates that there has been significant growth in multiple industries with the potential to operate in the Jamaica Logistics Hub, with distribution and electricity, gas and water, and agriculture exhibiting the highest growth during the time periods 2000-2009 and 2010-2015. For distribution, Jamaica was the leading country among nine regional competitors between 2010 and 2015. Specific manufacturing activities, such as food, drink, and tobacco, and chemicals and chemical products, also showed significant LDI growth.

⁸⁷ Bank of Jamaica Data. Available at: http://boj.org.jm/statistics/econdata/stats_list.php?type=3.

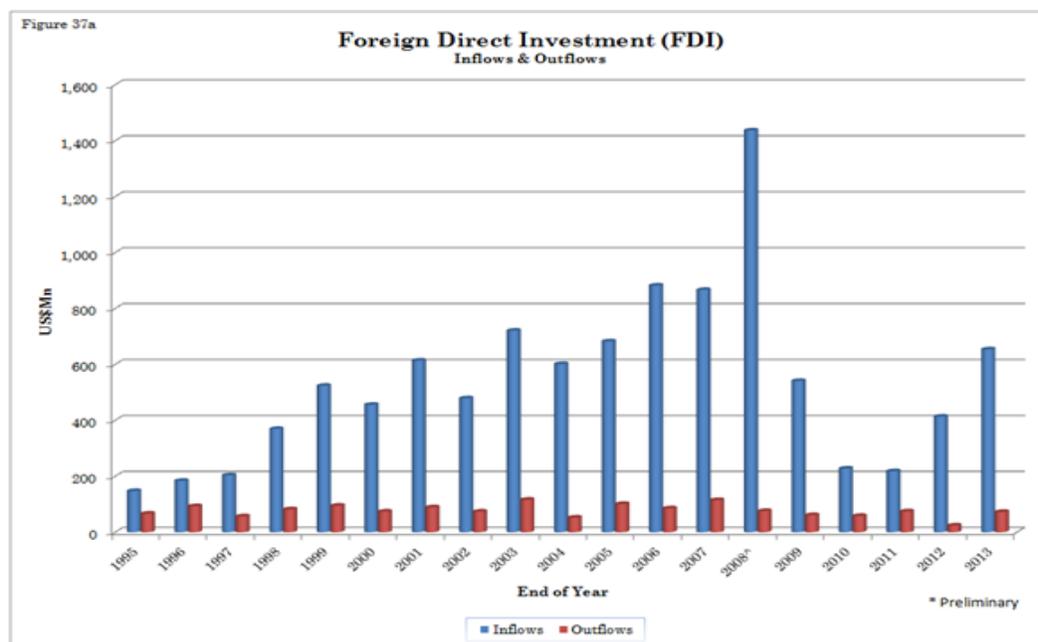
⁸⁸ "Annual Survey of Enterprises." Jamaica Bauxite Institute and JAMPRO, 2015.

⁸⁹ "Country Fact Sheet: Jamaica." UNCTAD World Investment Report, 2015. Available at: http://unctad.org/Sections/dite_dir/docs/WIR2015/wir15_fs_jm_en.PDF

⁹⁰ "Reforming International Investment Governance," UNCTAD World Investment Report, 2015. Available at: http://unctad.org/en/PublicationsLibrary/wir2015_en.pdf

⁹¹ Santander Trade Portal and Export Enterprises SA. "Jamaica: Foreign Investment." July, 2016. Available at: <https://en.portal.santandertrade.com/establish-overseas/jamaica/investing-3>.

Figure I.5-2: Foreign Direct Investment 1995 - 2013



Source: Bank of Jamaica, 2016.

Table I.5-5: LDI by Sector Based on Commercial Loans

Industries	1990 - 1999	Rank	2000 - 2009	Rank	2010 - 2015	Rank
Agriculture	16,626,410	6	24,175,513	6	41,663,174	7
Production	14,745,817		21,821,426		35,712,954	
Marketing	1,778,831		1,219,742		4,983,062	
Land Acquisition	101,762		1,134,345		967,158	
Mining	1,717,268	8	3,462,603	8	3,978,005	8
Manufacturing	38,743,013	1	53,720,755	5	69,241,341	5
Sugar, Rum and Molasses	4,208,299		3,647,391		3,576,185	
Food, Drink and Tobacco	6,786,170		19,211,817		27,196,893	
Paper, Printing and Publishing	2,454,862		1,584,438		1,534,224	
Textile, Leather and Footwear	2,570,636		1,099,900		1,108,568	
Furniture, Fixture and Wood Products	1,784,305		1,761,282		3,572,571	
Metal Products	1,405,731		2,383,999		1,377,398	
Cement and Clay Products	3,686,877		5,269,979		4,729,423	
Chemicals and Chemical Products	2,663,688		2,249,155		4,590,236	
Other	13,182,445		16,512,794		21,555,843	
Construction and Land Development	33,752,056	2	75,608,988	3	135,311,937	3
Construction	27,075,594		69,192,538		126,408,607	
Land Development	3,926,387		4,571,418		7,276,233	
Land Acquisition	2,750,075		1,845,032		1,627,097	
Transport, Storage and	23,995,684	4	64,520,611	4	69,676,873	4

Industries	1990 - 1999	Rank	2000 - 2009	Rank	2010 - 2015	Rank
Communication						
Electricity, Gas and Water	1,187,611	9	16,989,806	7	49,850,976	6
Distribution	23,326,035	5	113,233,619	2	242,316,621	1
Tourism	28,101,996	3	201,786,644	1	182,521,143	2
Entertainment	1,797,778	7	2,560,226	9	7,880,278	9

Source: Bank of Jamaica 2016

While tourism has remained among the top Jamaican sectors in terms of both FDI and LDI for several decades, several sectors important to the Jamaica Logistics Hub have also seen substantial investment, including distribution services; construction and land development; and transport, storage and communication. In recent years, manufacturing and ICT along with tourism have been among the top three recipients of FDI.⁹² These upward investment trends in manufacturing and trade, and logistics-related sectors present a positive outlook for industries with potential to locate to the Jamaica Logistics Hub.

Comparative Advantages

This section analyzes the comparative advantage of Jamaican industries through the use of Michael Porter's "Diamond of National Advantage" model. This is an analytical tool that assesses "home base factors" to determine competitive advantages of specific industries in a particular territory or nation.⁹³ This model uses "differences in national values, culture, economic structures, institutions and histories as determinants of competitive success."⁹⁴ By analyzing the following four factors, which constitute the Diamond of National Advantage model, we are able to gain deeper insights as to how Jamaica's institutional and business environment may affect the potential success of industries locating to the Jamaica Logistics Hub.

- ▶ **Factor conditions:** A nation's competitive position in factors of production, such as skilled labor or infrastructure, which are necessary to compete in a given industry;
- ▶ **Demand conditions:** The nature of home-market demand for an industry's product or service;
- ▶ **Related or supporting industries:** The presence or absence of supplier industries and other related industries that are internationally competitive;
- ▶ **Firm strategy, structure and rivalry:** The conditions in a nation, which govern how companies are created, organized, and managed, as well as the nature of domestic competition.⁹⁵

The data and information used to identify these factors was collected from sources available to Nathan through this study as well as through consultations with industry stakeholders. The subsequent analysis assesses the internal factors that may provide Jamaica with competitive

⁹² "Investing in Jamaica: The Investment Hub of the Caribbean." JAMPRO. March, 2015. <http://www.jamaicatradeandinvest.org/sites/default/files/resources/01%20-%20Investing%20in%20Jamaica.pdf>.

⁹³ Porter, Michael E., "The Competitive Advantage of Nations," *Harvard Business Review*, April 1990. Available at: <https://hbr.org/1990/03/the-competitive-advantage-of-nations>.

⁹⁴ Ibid.

⁹⁵ Ibid.

advantages that emphasize development of certain industries over others. This section does not consider industries that are not yet present in Jamaica. Potential industries are considered subsequently in this chapter.

Factor Conditions

Factor conditions include a nation's competitive position with respect to production. These include infrastructure resources, education and human resources, access to credit, and information technology, among others. To assess these conditions, Nathan analyzed Jamaica's existing economic landscape with a particular focus on those areas most critical to the development of the Jamaica Logistics Hub to determine its relative strengths and weaknesses as well as how Jamaica compares to other countries within the region.

Infrastructure Resources

Further expansion and development of the KCT is critical to the success of the Jamaica Logistics Hub. Besides it being the seventh largest natural harbor in the world and the eighth busiest port in Latin America and the Caribbean, KCT is well positioned to grow its presence in the region through its recent privatization. As mentioned earlier, the privatized port will undergo modernization of its facilities and dredging to accommodate larger vessels. The area adjacent to KCT reserved for industrial development – Kingston Wharves Terminal – and the newly improved Highway 2000 are also valuable infrastructure assets vis-à-vis the Jamaica Logistics Hub.

We also reviewed several well-known indices that assess and rank infrastructure by country. According to the World Economic Forum (WEF) Global Competitiveness Report, in 2015, Jamaica ranked 70 in overall quality of infrastructure, above the Dominican Republic (93), Costa Rica (103), Colombia (108), Haiti (142), and Cuba (152), but below Barbados (22), Panama (39), Trinidad and Tobago (52) and Bahamas (66). Another benchmark for assessing this factor is the Logistics Performance Index (LPI). The LPI is a benchmarking tool developed by the World Bank that assesses countries' performance on trade logistics. According to the LPI, in 2014, Jamaica ranked 70 out of 160 countries in the index. This represented a significant improvement from its previous rank of 124 in 2012. As of 2014, Jamaica is third within the Caribbean, with Bahamas (66) and Dominican Republic (69), ranking slightly higher. LPI rankings for countries with major global hubs are the Netherlands (2), Singapore (5), and Dubai – UAE (27).⁹⁶ Though the above indicates that Jamaica falls in the mid-range of regional competition, it has received considerable investment in key infrastructure in recent years, including the completion of the North-South Highway, the widening of Marcus Garvey Drive, the privatization and expansion of KCT, the privatization of NMIA, and the construction of a new highway from Portland to Kingston via St. Thomas. It is expected that these investments will continue to improve Jamaica's regional competitiveness. Other anticipated future investments, such as the proposed development of the Caymanas SEZ are also expected to positively influence Jamaica's regional and global competitiveness.

Education and Human Resources

Jamaica has an estimated labor force of 1.3 million, of which an estimated 15 percent are unemployed and 20 percent are represented by trade unions. The GoJ has made efforts to improve the technical capacity of the population through training programs in fields related to engineering,

⁹⁶ World Economic Forum. "The Global Competitiveness Report." 2014. Available at: http://www2.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf.

logistics, and manufacturing. For example, the Caribbean Maritime Institute, HEART NTA, and other tertiary institutions are upgrading and adding new programs that will be supportive of the Jamaica Logistics Hub. As was found when assessing infrastructure and trade logistics in Jamaica against competitors, the country has a middling ranking worldwide in terms of quality of the education system. The WEF Global Competitiveness Report in 2015 ranked Jamaica 70 out of 144 countries. Within the region, Jamaica received the fourth highest ranking behind Barbados (15), Costa Rica (21), and Trinidad & Tobago (44). The report ranks Jamaica as having a better quality of education than Panama (50), Colombia (90), and the Dominican Republic (132). Globally, major global logistics hubs, including Singapore (4), Netherlands (8) and Dubai (9), all ranked near the top of the index for quality of education.⁹⁷

The United Nations (UN) Human Development Index (HDI) measures and ranks countries' levels of social and economic development based on four criteria: life expectancy at birth, mean years of schooling, expected years of schooling and gross national income per capita.⁹⁸ In 2015, Jamaica was ranked 99 of 188, representing one of the lowest rankings across the region for HDI, with only Haiti and the Dominican Republic ranking lower than Jamaica. The rankings of other countries in the region include Bahamas (55), Barbados (57), Panama (60), Trinidad and Tobago (64), Cuba (67), Costa Rica (69), Colombia (97), Dominican Republic (101) and Haiti (163). Among countries with major logistics hubs, the Netherlands was fifth, while Singapore ranked 11 and Dubai was 41.⁹⁹

Jamaica could significantly increase its HDI ranking if it improves the unemployment rate in the country, which stands at 15 percent. Education is one of the most critical factors for attracting foreign investment. By investing in education generally and specifically in specialized training programs supportive of industries part of the LHI, Jamaica could reduce its employment and increase in turn increase its competitiveness.

Access to Credit

According to the World Bank's Doing Business Report, in 2016, Jamaica ranked seventh in "Getting Credit" among 189 countries. This ranking was higher than Netherlands, Singapore and Dubai. Jamaica's position as a regional leader in this area could make it a preferred location for investors who are interested in accessing local market credit. It also incentivizes local supporting industries to enter the market, which can facilitate the rapid formation of industrial clusters. Colombia, ranked second, is the only country in the region with a higher ranking than Jamaica. Other countries in the region are ranked as follows: Costa Rice (7), Panama (19), Trinidad and Tobago (42), the Dominican Republic (97), Barbados (126), Bahamas (133), and Haiti (174), while Singapore is 19, and Dubai 97.¹⁰⁰ According to the WEF Global Competitiveness Index, in 2015, Jamaica ranked 32 among 140 countries in the "Financial Market Development" indicator. The only regional competitor above

⁹⁷ World Economic Forum. "The Global Competitiveness Report." 2014. Available at: http://www2.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf.

⁹⁸ "Human Development Index (HDI)," United Nations Development Programme, 2015. Available at: <http://hdr.undp.org/en/content/human-development-index-hdi>

⁹⁹ Ibid.

¹⁰⁰ "World Bank Group. "Doing Business 2016: Measuring Regulatory Quality and Efficiency." 2016. Available at: <http://www.doingbusiness.org/~media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB16-Full-Report.pdf>.

Jamaica was Panama, which ranked 15.¹⁰¹ These indicators imply that on the strength of its financial sector Jamaica is well positioned to attract investment.

Information Technology

According to the Global Information Technology Report's (GITR) comprehensive assessment of network readiness, Jamaica ranked 82 out of 143 countries in 2015. Between 2014 and 2015, Jamaica advanced four spots in this ranking. However, Jamaica continues to lag behind most countries in the region. Other countries in Latin America and the Caribbean that are out-performing Jamaica in technology readiness include Barbados (39), Costa Rica (49), Panama (51), Colombia (64), and Trinidad and Tobago (70). The Dominican Republic (95) and Haiti (137) lag behind Jamaica.¹⁰² Singapore (1), the Netherlands (4) and Dubai (23) again show high global rankings.

The rankings emphasize the need for ongoing investment in ICT infrastructure in Jamaica. As highlighted in Chapter I.4, according to the ITU's ICT Development Index (IDI), Jamaica enjoys good access to technology, especially in terms of international bandwidth, however the quality of access must be improved. Despite its high levels of internet connectivity, it ranks below most countries in the region when measuring bandwidth per internet user, which can serve as a proxy for access quality. Through extending the ICT infrastructure network for the purpose of industrial development, Jamaica and its investors can create opportunities to extend coverage to households while lowering the price of access. As discussed in Chapter I.4, Jamaica's e-government services must be improved. The online service indicator, which is the final component of the e-government index, reflects the availability of such services, placing Jamaica on the lower end of regional rankings. Jamaica has the opportunity to improve its ease of doing business, especially for industries locating to the Jamaica Logistics Hub by improving its e-government services, such as online portals for licensing, land registration, and customs, among others.

Demand Conditions

Demand conditions in the home market can assist companies to create competitive advantages. Sophisticated home-market buyers have the ability to pressure firms to innovate faster and to create more advanced products than those of competitors.¹⁰³ This section assesses local consumer products with the greatest levels of demand to understand what industries are most favored by this competitiveness factor. Since value-added activities are expected to be key drivers of the Jamaica Logistics Hub, this section examines top Jamaican exports of intermediate and finished products. Due to the high demand abroad for such products, the home market is more likely to have already reached a high level of consumption. Below is a list of Jamaican commodities with the highest export levels in terms of value, according to the Atlas of Economic Complexity.¹⁰⁴ Removed from this list are

¹⁰¹ World Economic Forum. "The Global Competitiveness Report." 2014. Available at: http://www2.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf.

¹⁰² World Economic Forum. "The Global Competitiveness Report." 2014. Available at: http://www2.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf. Note: the Bahamas and Cuba are not included in the index.

¹⁰³ Porter, Michael E., "The Competitive Advantage of Nations," *Harvard Business Review*, April 1990. Available at: <https://hbr.org/1990/03/the-competitive-advantage-of-nations>.

¹⁰⁴ CID Harvard. "The Atlas of Economic Complexity." Harvard Center for International Development, Accessed Oct., 2016, http://atlas.cid.harvard.edu/explore/tree_map/import/usa/all/show/2014/.

products that have no value-added potential (such as certain minerals that are transported as raw materials).

- ▶ Ethyl Alcohol, Underneath, Und80% Alcohol; Spirit Beverage (which includes Compound Alcoholic Preparations)
- ▶ Beer
- ▶ Sauces and Prep; Mixed Condiments, Mustard Flour etc.
- ▶ Fruit, Nuts, Etc. (Prepared or Preserved NESOI)
- ▶ Bread, Pastry Cakes Etc.: Comm Wafers, Empty Caps Etc.

Demand conditions demonstrate that a competitive advantage exists for the production of finished and packaged food and beverage products. As a result, the presence of agro-parks in close proximity to the Jamaica Logistics Hub could yield benefits. It could help to maintain and increase the demand for logistics and transport services.

High regional demand for Jamaican products also indicates strong demand conditions. Since neighboring countries are in close geographic proximity, demand for such products would be classified as local demand in larger countries. According to analyses undertaken in Chapter I.3, the products that enjoy high regional demand include: bauxite, alumina, oils, rum and jams, non-crude petroleum oils, cement, and limestone.

Lastly, while finished goods in the foodstuff sector may not rank amongst those industries that can leverage the highest share of investment for the Jamaica Logistics Hub, Jamaica would be wise to treat industries in this sector as “low hanging fruit” that can ensure consistent utilization of hub infrastructure.

Related and Supporting Industries

Related and supporting industries refer to the upstream or downstream industries and associated institutions in a particular sector that serve to increase an exchange of knowledge, information sharing, and innovation.¹⁰⁵ Such behavior results in a clustering approach that serves to drive industry complexity and wealth creation where the growth of one industry or sector influences the growth of another. As more companies operate within close proximity, more suppliers and customers are incentivized to locate there, making the cluster more attractive, and the country more competitive. Porter suggests that clusters affect competition by increasing the productivity of the co-located companies, increasing the pace of innovation, and stimulating the formation of new businesses.¹⁰⁶ Jamaica’s existing barriers are primarily related to network efficiency and human resources, both of which can be improved by strengthening the aforementioned factor conditions. Also, there are a number of existing clusters in Jamaica that can be further leveraged and developed. These include the following:

- ▶ “Mini” logistic cluster operation (within the vicinity of Port of Kingston);
- ▶ Finance and investment (currently exists in and around Kingston);
- ▶ Law firm cluster (predominantly in Kingston);

¹⁰⁵ Porter, Michael E., “The Competitive Advantage of Nations,” *Harvard Business Review* , April 1990. Available at: <https://hbr.org/1990/03/the-competitive-advantage-of-nations>

¹⁰⁶ Ibid.

- ▶ Hotel/accommodation clusters (such as those currently along Jamaica’s northern coast); and
- ▶ Agriculture (a national sub cluster present in various geographic areas).

In addition, creating industry clusters within and around special economic zones further facilitates the exchange of knowledge and services. Therefore, the GoJ intends to promote several different types of special economic zones across the country that will create the foundation for growth of clusters.

It is important to note that GoJ has made deliberate effort to focus on the development of clusters, to drive economic growth including Micro, Small and Medium-sized Enterprises (MSMEs). The availability and access to credit in Jamaica should mean that the Jamaica Logistics Hub will be a favorable environment for MSMEs, which in turn could be supportive of the following supporting industry clusters:

- ▶ Education and knowledge creation cluster
- ▶ Business and financial services cluster
- ▶ Energy, construction, engineering, and utility services cluster

Lastly, it will be critical for land-use plans near and adjacent to the Jamaica Logistics Hub to allow for mixed uses that facilitate the formation of industry clusters. This concept is incorporated into the land-use plan in Part II of this project. To foster the formation of clusters, the GoJ should promote cluster policies. An effective cluster policy should provide incentives to foster cluster dynamics and ensure long-term funding, clear milestones, and strategic planning.¹⁰⁷

Firm Strategy, Structure, and Rivalry

According to Porter, competitive advantage can also result from how companies are created, organized and managed, as well as the level of domestic competition.¹⁰⁸ In this section, Nathan examines the level of domestic competition in Jamaica, the structure and strategy of local firms, and the effects that such factors might have on the development of the Jamaica Logistics Hub.

An apparent weakness in Jamaica is the limited rivalry within industries and relatively low level of investment in research and development (R&D). These weaknesses lead to a low level of consumer sophistication, and thus, innovation and efficiency tends to lag behind other countries. However, industries such as information communications and technology, and accommodation and support services (tourism) represent examples of industries in Jamaica with strong competition. The telecommunication sector in Jamaica has also experienced strong competition between its two leading companies, Digicel and Cable & Wireless. This rivalry has resulted in increased product and service quality, as well as a high growth rate. Consumers have become highly sophisticated, demanding that the two home companies improve and innovate rapidly. Other industries that have shown improvement in domestic competition include food and beverage manufacturing, light manufacturing such as motorcycle assembly and production, and agriculture, forestry and fishing.

¹⁰⁷ “Clusters and Clustering Policy: A Guide for Regional and Local Policy Makers.” INNO Germany AG, 2010. Available at: <http://cor.europa.eu/en/documentation/studies/Documents/Clusters-and-Clustering-policy.pdf>

¹⁰⁸ Porter, Michael E., “The Competitive Advantage of Nations,” *Harvard Business Review* , April 1990. Available at: <https://hbr.org/1990/03/the-competitive-advantage-of-nations>

As the GoJ redirects the country's education system towards science, technology, engineering and math (STEM) programs, as well as on skill training, workforce training and vocational subject certifications, Jamaica will be able to foster a more competitive internal environment. This will result in more investments in emerging industries and active involvement in manufacturing activities higher up on the value chain of existing industries. Related, it will be important for the GoJ to design policies to prevent the formation of monopolies and to foster competition among local firms.

Conclusion

By utilizing Porter's "Diamond of National Advantage" model, Nathan determined that there are opportunities for the Jamaica Logistics Hub to benefit from existing infrastructure assets and existing competitive industries in Jamaica to leverage growth of new and emerging industries and incentivize the formation of industry clusters. These existing industries can generate early growth for the Jamaica Logistics Hub and help to ensure a constant flow of goods through Jamaica's port and logistics infrastructure.

In order to take advantage of its existing opportunities, substantial investment will need to be made in education, in particular in life sciences and technology. As well, the GoJ must continue to improve e-government services, which in turn will help streamline licensing, land registration, and customs procedures. Once the Jamaica Logistics Hub is able to attract one or more anchor industries, Jamaica's ease of doing business and access to credit will facilitate the formation of industry clusters by attracting related industries. This will in turn put pressure on GoJ to make other improvements, such as to its ICT infrastructure. Lastly, in addition to development of port-centric industrial space (e.g., KCT and the Caymanas SEZ), Jamaica should prioritize completion of the privatization process underway at NMIA. Doing so would allow for runway expansion and along with it further opportunities to attract air cargo.

1.5-2 Trade Flows

This section provides insights on potential opportunities for the Jamaica Logistics Hub to be assessed further through the subsequent SWOT analysis. We identify industries with potential for location to the hub to be considered in the MCA subsequently undertaken in this chapter.

Through the analysis of trade flows undertaken in Chapter 1.2, Nathan identified five primary commodity groups for the Jamaica Logistics Hub.¹⁰⁹ The flows are based on those commodities with the highest trade volumes and values for the different trade flows from which the Jamaica Logistics Hub is expected to be able to capture cargo. The trade flows analyzed include China to US-East Coast, Jamaica to US-East Coast, and Latin America to US-East Coast. The three selected trade flows were determined based on the routes that present Jamaica opportunities to position itself as a center for transshipment of good or as a receiver of inputs for value-added activities. The US-East Coast was selected as an import destination for all three flows given that it represents the largest importer of Jamaican exports. The US also represents the largest importer and market for finished goods. China was selected among Asian countries, because it represents the largest production center in Asia with the highest share of exports to the US-East Coast. Jamaica was also considered as an exporter, which could seek export opportunities for those local industries and producers that could best capitalize on the Jamaica Logistics Hub. Once industry commodity groups were chosen for

¹⁰⁹ Please see Chapter 1.2 for a discussion of the methodology used for the analysis of trade flows.

each trade flow, the top three industry sub-groupings (broken down into 4-digit HS codes) were selected under each 2-digit industry.¹¹⁰ Tables 1.5-6, 1.5.7, and 1.5.8 display the selected industries (4-digit HS codes) that had the highest value and volumes from the selected origin and destinations.

Table I.5-6: China to US (East Coast) Imports

HS Group	HS Code	Commodity	Value (USD)	Weight (mt)
Nuclear Reactors, Boilers, Machinery Etc.; Parts	8415	Air Conditioning Machines (temp & Hum Change), Pts	696,347,062	122,792.30
	8418	Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	487,050,979	118,957.04
Plastics And Articles Thereof	3924	Tableware & Other Household Articles Etc., Plastics	1,128,369,636	319,479.65
Electric Machinery etc.; Sound Equip; TV Equip; Pts	8516	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt	1,242,159,592	260,737.99
	8528	TV Receivers, INCL Video Monitors & Projectors	1,198,813,740	43,824.02
Vehicles, Except Railway Or Tramway, And Parts etc.	8708	Parts & Access For Motor Vehicles	1,361,358,003	460,945.79
	8712	Bicycles & Other Cycles (INCL Del Tricycle) No Motor	219,594,214	56,099.96
	8711	Motorcycles (INCL Mopeds) & Cycles With Aux Motor	26,786,459	4,695.26
Articles Of Iron Or Steel	7321	Stoves, Ranges etc., Non-electric Domestic & Pts, Iron & Steel	573,285,583	185,530.92
	7326	Articles Of Iron Or Steel, NESOI	392,492,803	150,626.35

Source: UN-COMTRADE, Nathan Associates.

Table I.5-7: Commodities with highest trade volumes from Jamaica to US (East Coast)

HS Group	HS Code	Commodity	Value (USD)	Weight (mt)
Ores, Slag And Ash	2606	Aluminum Ores And Concentrates	125,314,928	5,446,192.00
Edible Vegetables & Certain Roots & Tubers	0714	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	18,613,868	9,617.51
Miscellaneous Edible Preparations	2103	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	10,802,589	3,464.97
Beverages, Spirits And Vinegar	2208	Ethyl Alcohol, Underneath, Und. 80% Alcohol; Spirit Beverage	9,488,770	2,966.66
Prep Vegetables, Fruit, Nuts Or Other Plant Parts	2008	Fruit, Nuts Etc. Prepared Or Preserved NESOI	4,313,583	964.32

¹¹⁰ Industries are displayed in Harmonized System (HS) Codes. As described by the UN International Trade Statistics Knowledge Base, HS is an international nomenclature for the classification of products. It allows participating countries to classify traded goods on a common basis for customs purposes. Available at: <http://unstats.un.org/unsd/trade/kb/Knowledgebase/Harmonized-Commodity-Description-and-Coding-Systems-HS>

Table I.5-8: Commodities with highest trade volumes from Latin America to US (East Coast)

HS Group	HS Code	Commodity	Value (USD) Approx.	Weight (mt)
Minerals, Fuels, Oils	2709	Crude oil from petroleum and bituminous minerals	13,275,588,623	20,518,109.04
Articles Of Iron Or Steel	7326	Articles of Iron or Steel, NESOI	32,471,771	11,122.01
Ores, Slag And Ash	2606	Aluminum Ores And Concentrates	479,198,280	17,748,439.31
Salt, Sulphur, Earth & Stone, Lime & Cement	2501	Salt Incl. Table & Dentrd., Pure Sodium Chloride	373,090,135	17,858,391.89
Prep Vegetables, Fruit, Nuts Or Other Plant Parts	2007	Jams, Fruit Jellies, Marmalades Etc., Cooked	79,286,575	76,516.54

Source: UN-COMTRADE, Nathan Associates.

Based on our analysis of trade flows, the commodities that may be of most interest to industries located in the Jamaica Logistics Hub are those with the highest trade flow volumes and values (e.g., electric water, space, and soil heaters; TV receivers; parts and accessory for motor vehicles) as well as intermediate products that be imported to Jamaica for value-added activities (e.g., assembly of automobiles and motorcycles) and subsequently exported to the US and Latin America as finished products.

While the largest shares of commodities flowing from Latin America and Jamaica to the US-East Coast are primary products (such as minerals), a significant flow of food and beverage commodities provides the Jamaica Logistics Hub with opportunities to engage in further value-added activities in the food processing and packaging industries.

I.5-3 Investor Perceptions

To gain better insight into the industrial sector in Jamaica, Nathan consulted with local and international investors in Jamaica on current sector strengths, weaknesses, opportunities, threats, and areas requiring improvements. A comprehensive e-survey was administered to identify user and investor perceptions of physical infrastructure and operational characteristics, costs, and levels of service for logistics and transshipment-related activities in Jamaica. The results of this survey informed the SWOT analysis and MCA undertaken in subsequent sections of this chapter. The survey was sent to a list of 80 potential and existing users and investors from multiple sectors and industries, including:

- ▶ Carriers;
- ▶ Shippers;
- ▶ Port operators;
- ▶ Freight forwarders;
- ▶ Third party logistics provider;
- ▶ Non-food manufacturing and assembly; and
- ▶ Food processing.

Insights into domestic, regional, and global markets were sought as part of the survey. The subsection that follows provides a summary of survey results and preliminary conclusions. Detailed results from the survey are included in Appendix I.5.1.

Outcome of Investor Survey

The survey identified the conditions that investors believe are necessary for industries to establish or expand their business presence in Jamaica. In summary, survey results reflect the following:

- ▶ Ports and logistics infrastructure, ICT infrastructure, and ease of doing business were rated most favorably, especially the latter;
- ▶ Most of the respondents expect demand for their services and products in Jamaica to increase;
- ▶ Most of the respondents would be willing to pay up to 20 percent more for improved services and infrastructure at the logistics hub;
- ▶ Customs procedures and fees, taxes, and government paperwork were factors with the lowest ratings; and
- ▶ Most respondents believe the current status, in terms of reduction in processing times and costs, increased reliability, and ease of doing business, would need to improve two-fold in order to make the Jamaica Logistics Hub an attractive investment for their businesses.

Given the survey results, Nathan recommends that the GoJ:

- ▶ Through the Trade Facilitation Task Force, improve the business environment by reducing government paperwork requirements;
- ▶ Continue involvement of World Bank consultants on the Jamaica Customs Act;
- ▶ Streamline the development and implementation of a modernized single window system for SEZ users to streamline customs, taxes, and other administrative transactions;
- ▶ Reduce income taxes for SEZ companies to five percent for those which qualify as “pioneer industries” under the Income Tax Relief Act. The 12% tax rate that was established under the SEZ Act may be a disincentive for industries to invest especially to those currently grandfathered under the Free Zone Act who enjoy a 0% tax rate. A reduction of income taxes to 5% for pioneer industries would help further attract industries that have the potential to act as “anchor industries” and succeed in the LHI;
- ▶ Maintain the Promotional Tax Credit of up to five percent for all SEZ companies for spending on training, research, and development;
- ▶ Through the Trade Facilitation Task Force, promote a policy that requires government agencies to develop e-government portals to simplify and streamline customs and licensing administrative procedures; and
- ▶ Through JAMPRO apply additional resources for promotional / marketing visits and tours for potential Jamaica Logistics Hub investors.

1.5-4 Strengths, Weaknesses, Opportunities, and Threats (SWOT)

To identify the most relevant strengths, weaknesses, opportunities, and threats faced by potential and existing industries in the Jamaica Logistics Hub, Nathan undertook a SWOT analysis in order to identify key recommendations on policies and industrial development and promotion strategies that most effectively capitalize on Jamaica’s strengths and opportunities while mitigating threats and managing and improving weaknesses. The results of the SWOT analysis are ultimately used to inform the chapter’s recommendations and value proposition. Findings of the SWOT analysis, presented in Tables 1.5-9, 1.5-10, and 1.5-11, are also used as inputs to the MCA, discussed subsequently in this chapter, to rank industries most applicable to the Jamaica Logistics Hub. The SWOT analysis focuses on various factors analyzed in the sections of this chapter including

Table I.5-9: Global SWOT

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Skilled labor at lower rates than in most cities in the North East US • GE's presence in the northeast region of the US • Stable economic climate (State/Local) • Continued FDI growth into Jamaica over the last few years, with US\$551 million recorded in 2014, and a rise of over 30% recorded in the first three quarters of the 2015-2016 fiscal year • Jamaica's central geographical location • Jamaica lies in very close proximity to the Panama Canal • Strong USA market; USA being a dominant trade partner receiving more than 62% of total Latin American and Caribbean trade • Jamaica lies among the top 5 exporters to the East Coast of the U.S in terms of cargo volume • Jamaica's ICT infrastructure is seen favorably by potential foreign investors • The presence of motorcycle and automobile assembly activities • Kingston has the seventh largest natural harbor in the world • Jamaica has the eighth busiest container port (in terms of container throughput) in the Latin America and the Caribbean • Most products manufactured in Jamaica already have duty free market access to the U.S., Europe, Canada, CARICOM, Colombia, the Dominican Republic, and Venezuela by virtue of existing trade agreements • Trade Facilitation Task Force's ongoing efforts to reducing trade transaction costs and improve the national trading environment 	<ul style="list-style-type: none"> • Cost of labor in many major exporting countries around the world is still more competitive than in Jamaica • Perception of high corruption in Jamaica • Jamaica's low world rankings in Education and the Human Development Index • Jamaica's high CPI relative to many countries around the world
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Potential Panama Canal expansion impacts on new business opportunities on value added activities and transshipment of containerized cargo • Re-shoring / Near-shoring of labor • Increases in global FDI flows of 36% (about 1.7 trillion) in 2015 bring positive prospects to continued FDI growth in Jamaica • Growth in global demand for electronics & medical devices • Significant containerized cargo flows from China to US-East Coast present opportunities for industries involved in value added services • High demand for agricultural goods in Asia and Europe could open more opportunities for Jamaican food exports • Opportunity for Jamaica to capture vehicle parts from Germany that are headed to US-Est Coast to engage in value added activities • Pharmaceuticals lie amongst the top commodities in terms of total value of goods flowing from Europe to Latin America, which Jamaica could capture • Businesses that are less polluting; COP21 will influence growth of these business opportunities. • Jamaica could capture and take some transfer air cargo business from Miami airport due to often inconvenient US Customs • A large share of Jamaica's imports and exports belong to the Chemicals and Allied Industry group (HS-4, representing 8% of imports and 49% of exports), which present opportunities for re-exporting value added products, such as medicaments and pharmaceutical goods. • A large share of Jamaica's imports and exports belong to the Foodstuffs and Vegetable Products Industry groups (HS-4, representing 16% of imports and 26% of exports), which present an opportunities for the country to engage in value added activities, such as food processing and food packaging. 	<ul style="list-style-type: none"> • Possibility of slowing US and World economy, which would impact trade flows Globally • More competitive ports in South America intercepting most of the cargo flows between Asia and Latin America • Increased frequency of hurricanes and flooding as a result of climate change putting the country's infrastructure at risk • Possibility of slowing US and World economy, which would impact flow of goods that Jamaica could capture

Source: Nathan Associates.

Table I.5-10: Regional SWOT

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Jamaica has one of the largest transshipment ports in the Caribbean Region • Jamaica ranks among the highest in the Region in Ease of Doing Business and Access to Credit • English being the primary language is a factor attractive to foreign investors in LHI potential industries 	<ul style="list-style-type: none"> • ICT; Jamaica ranks below most countries in the region in terms of international bandwidth per internet user • Jamaica’s low ranking relative to its competitors for indicators such as the Network Readiness, Human Development Index, and Quality of Education as well as in other human capital, technology, and infrastructure indicators • When compared to the region, Jamaica exports a relatively low amount of goods and a relatively high amount of services
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Jamaica could capture some of trade and business going to Trinidad and Tobago if LHI services prove to be more efficient • Opportunity to leverage air cargo as an essential mode of transport for perishables, pharmaceuticals, electronic devices, and time-sensitive retail goods • With an improved aviation infrastructure, Jamaica has an opportunity to capture some transfer air cargo business from Dominican Republic and Mexico • Opportunity to divert air cargo flowing from Europe to Latin America 	<ul style="list-style-type: none"> • Jamaica facing tough competition from several regional countries wanting to establish a major logistics hub, such as Dominican Republic, Cuba, Panama, Bahamas, Colombia, Costa Rica could take away business from the LHI • Competing countries in the region could offer more competitive SEZ income tax rates • Other regional hubs permit the vanning and devanning of containers as a value added service could hinder Jamaica’s competition in the Region¹¹¹ • Lower labor costs in multiple countries in the region could hinder Jamaica’s competition in the Region¹¹²

Source: Nathan Associates.

¹¹¹ Information according to stakeholder interviews, including JAMPRO.

¹¹² See “Benchmark Transshipment and Logistics Competitiveness” Chapter (I.4) for comparison of costs of labor among countries in the Region.

Table I.5-11: Domestic SWOT

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Significant LDI growth across most sectors since 1990, particularly for LHI related industries • Multiple sectors with LDI growth above industries in other countries within the region, including the distribution and manufacturing sectors. • Jamaica's ease of doing business and high credit accessibility, will benefit supporting industries to LHI industries, such as Engineering and Construction Services, Building Maintenance Services, Hvac/Refrigeration Service and Repair, Legal Services, and Commercial Banks/Financing, facilitating the formation of industry clusters • GoJ's ongoing efforts to invest in improving the technical capacity of the country's labor force • Presence of established regulatory authorities (PAJ, MAJ, Customs etc.) • Presence of a Port Community System (PCS) • Presence of ASYCUDA, automation of Customs clearance process • Two International airports, and highway network now being modernized • Excellent telecommunication & IT infrastructure • Well established logistics industry players, including shipping agents, Customs brokers, freight forwarders, and stevedoring companies • The ability for small and medium size enterprise to participate in the global logistics industry by way of the SEZ Act • The presence of training institutions, such as the Caribbean Maritime Institute, HEART NTA, and other tertiary institutions • A number of mature industries with high level of consumer sophistication in the food and beverages sectors • GoJ and LMRC initiatives to improve labor conditions • Numerous fiscal incentives under the SEZ Act 	<ul style="list-style-type: none"> • Inefficient and costly customs procedures • Urgent need to establish a modernized customs agency • Customs Administrative Fees (CAF) is unattractive to potential investors • High energy costs in Jamaica affecting prospects of heavy manufacturing¹¹³ • Low prospects for heavy manufacturing (due to high energy costs) would make it difficult to engage in value added activities on goods that have high transshipment rates, which include bulk products such as pebbles, gravel, stone, etc., and non-crude petroleum • A relatively small domestic market (with just under 3 million people) • Small portion of the population with technical degrees or higher education attainment • High port fees reported by private stakeholders (US\$400-\$500 to clear a 40-foot container) • Need for modern warehouses • Need for an improved inland transport network • Need for an improved Aviation Infrastructure • Need for additional dredging in KCT required to accommodate post-Panamax vessels • Income tax headline rate of 12.5% for SEZ companies may dis-incentivize industries from locating in the LHI • Perception on the part of shipping association and other private sector stakeholders about excessive increases in customs fines under the revised Customs Act
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Extending the ICT infrastructure network within the country for the purpose of industrial development; the already robust ICT infrastructure in Jamaica would make it easy to extend ICT infrastructure to new greenfield SEZ sites, such as CSEZ • Presence of mature industries in the food and beverages sector presents opportunities for LHI to engage in food processing/packaging activities • Urban Renewal Act, can have a positive impact on the countries public infrastructure in the long run • Work undertaken by the Trade Facilitation Task Force may lead to a comprehensive revision of the Trade Act that reduces government bureaucracy, removes various fees, and simplifies customs procedures • Promotional Tax Credit under the SEZ Act could bring about progress for Jamaica's labor force by creating more opportunities in training and higher education in professions supporting LHI industries 	<ul style="list-style-type: none"> • Uncertainty on whether all existing trade agreements will continue to apply to industries locating in SEZs • Continued negative growth trend in transshipment seen in Jamaica in recent years

Source: Nathan Associates

¹¹³ Term "heavy industry" is another universally accepted term for energy intensive industries.

investment trends, comparative advantages, physical and operational conditions of Jamaica's logistics infrastructure, policy, legislative, and regulatory factors, and global trade flows. Findings are organized into three categories according to geographic scope as follows:

- ▶ Global
- ▶ Regional
- ▶ Domestic

Presenting the results of the SWOT analysis in the context of these categories enables the GoJ to gain a better sense of its likely ability to influence the variables impacting the development of the Jamaica Logistics Hub.

Recommendations

Based on the above results of the SWOT analysis, Nathan developed the following list of preliminary recommendations to support the GoJ to develop policies and industrial development and promotion strategies to support the development of the Jamaica Logistics Hub. Recommendations include the following:

- ▶ The GoJ should prioritize the implementation of necessary amendments to the Customs Act to improve the efficiency of customs procedures. The simplification of customs procedures and reduction of fines is a cost effective means for attracting foreign investment in the Jamaica Logistics Hub.
- ▶ In order for the hub to become more attractive to investment in light manufacturing of pharmaceutical goods, medicaments, and medical devices, the GoJ must increase its investments in training and higher education programs in biomedical and biomechanical sciences.
- ▶ To attract further investment in the potential growth industries, the GoJ must continue to invest in improving its ports and logistics infrastructure. Needed investments include:
 1. Further dredging at the Kingston harbor and access channel to accommodate larger vessels;
 2. Readying industrial land adjacent to KCT;
 3. Development of the Caymanas SEZ; and
 4. Investing in warehousing infrastructure (such as cold storage).
- ▶ To assure stable growth of the Jamaica Logistics Hub, the GoJ should invest in industries that would add value to more established and mature industries already in Jamaica. This would include the food processing and food packaging industries.

I.5-5 Enabling Environment

In order for the LHI to succeed, it is a fundamental requirement that Jamaica's policy, legislative, and regulatory frameworks are aligned with its vision. In this section, Nathan assesses the factors related to policy, legislation, and regulation that affect the Jamaica Logistics Hub's ability to attract investors and users. The objective of this assessment is to identify those aspects of the existing frameworks that require adjustments in order to achieve the goals of the LHI. This section looks at the following factors:

- ▶ Customs and Administrative Procedures
- ▶ Incentives
- ▶ International Financial Sector

- ▶ International Trade

Customs and Administrative Procedures

The Customs Act of 1941 is the principal legislation governing the Jamaica Customs Agency (JCA). The JCA, which is responsible for customs clearance of goods at the ports, airports and Free Zones, has three stated objectives:

- ▶ Equitable collection of revenue;
- ▶ Protection of Jamaica's borders against illicit imports; and
- ▶ Trade facilitation.

These functions have been core to the JCA, since the mid-nineteenth century. Effective April 2013, the JCA became an Executive Agency, meaning, among other things, that it was exclusively responsible for generating revenue sufficient to cover operations and administrative costs. Customs is housed under the Ministry of Finance and Public Service, which is responsible for bringing forth to the Jamaican Parliament any amendments to the legislation. The JCA undertakes the following functions:

- ▶ Assesses and collects customs duties, fees, and penalties due on imports;
- ▶ Interdicts and seizes contraband, including narcotics and illegal drugs;
- ▶ Processes passengers, baggage, cargo and mail;
- ▶ Detects and apprehends persons engaged in fraudulent practices designed to circumvent Customs related laws;
- ▶ Protects Jamaica's industries, labor and intellectual property rights by enforcing laws intended to prevent illegal trade practices, including provisions related to quotas; the Anti-Dumping Act; and by providing Customs Records for copyrights, patents, trademarks; and
- ▶ Protects the general welfare and security of Jamaica by enforcing import and export restrictions and prohibitions, including money laundering.¹¹⁴

In June 2014, the government successfully met its IMF benchmark target by tabling a bill for a three-phased amendment to the Customs Act. These amendments are designed to facilitate collection of customs duties; to efficiently process customs related transactions; strengthen enforcement powers of the Commissioner; boost compliance; and further support the automated system for customs data.¹¹⁵ After a year of revisions the Act was amended, however at the conclusion of the revision the shipping association and other private sector stakeholders expressed concerns with the amendments, claiming that they were anti-trade, primarily because of the excessive increases in the fines.

A second bill, representing the third and final amendment to the Customs Act, is currently being considered by Parliament. This revision will address the issues that were raised by private sector

¹¹⁴ Jamaica Customs Department Website. Accessed May, 2016. Available at: <https://www.jacustoms.gov.jm/>.

¹¹⁵ Earle, Sharon. "Customs Act to be Amended." Jamaica Information Service. June 19, 2015. accessed May, 2016. Available at: <http://jis.gov.jm/customs-act-amended/>.

stakeholders following the previous amendment. Such revisions are expected to apply to the SEZ Act.

At the moment, Customs is implementing two major modernization projects: 1) the adoption of ASYCUDA World as their integrated Customs management system; and 2) a capacity building program. ASYCUDA World is a web-based application that allows JCA clients (including Customs brokers and shipping agents) to submit manifests, declarations, payments, and documents using an e-transactions. This program, designed by the United Nations Conference on Trade and Development (UNCTAD) aims to accelerate and simplify clearance procedures through standardization and computerization. However, while these developments are encouraging, interviews with many stakeholders indicate that the major challenge is Customs' interpretation that its primary mandate is to maximize revenue generation for the government. Additionally, there are several challenges with the Customs operations: customs agents have very high discretionary powers which affect the predictability of the system; there is an adversarial approach where instead of trying to correct problems to minimize delays in Customs clearance, Customs holds brokers responsible for customer mistakes and fines the brokers.

The revenue generation goal goes against Jamaica's trade facilitation needs if they are to support the LHI's stated objectives. As a result of the revenue maximizing outlook of the Customs Department, several stakeholders have expressed their concern about both current modernization projects being at risk of losing their usefulness due to this perspective, watering down the trade facilitation responsibilities.

The Customs Department and the Jamaican government (including JAMPRO) need to cooperate to change this perception as it is certainly going to affect the way foreign investors perceive Jamaica as a potential investment destination. For instance, in late 2015 Hyundai started importing vehicles to Jamaica for sale in the domestic market as well as regional distribution. There was an issue with the vehicle imports into the Kingston Wharves Free Zone for the regional market due to their lack of import certificates and payment of associated duties (which if designated for regional distribution should be zero). The significance of this case is that Jamaica needs to move quickly and with a unified approach if the successful implementation of the LHI is to successfully attract companies to locate in Jamaica's new SEZ in the short term.

Incentives

The incentives regime in Jamaica was recently revised through implementation of the Omnibus Incentive Regime, which refers to five pieces of legislation. The objective behind this revision is to eliminate the discretionary nature of incentives and create a more predictable and transparent regime. This revision process is not yet complete. The legislation that is referenced below provides fiscal benefit by way of reduced customs duties and additional stamp duty rates, or reduced corporate income tax liability. The legislation from the Omnibus Incentive Regime (along with relevant incentives) is as follows:

The Fiscal Incentives (Miscellaneous Provisions) Act, 2013

- ▶ The general headline corporate income tax rate of 25 percent for non-regulated companies and 33.33 percent for regulated companies. Regulated companies are those regulated by the Bank of Jamaica, Financial Services Commission, Office of the Utilities Regulator, and the Ministry of Finance and the Public Service;

- ▶ The 30 percent Employment Tax Credit (ETC) that can reduce the headline tax rate (25 percent) to an effective tax rate of a corporation to 17.5 percent where the statutory taxes are paid in full and on time.¹¹⁶ Regulated companies are not eligible to receive the ETC;
- ▶ A capital allowance change can be claimed.¹¹⁷ (This includes an expanded definition of 'industrial buildings' that includes hospitals and intellectual property rights). A key difference from the previous regime is that the depreciation is calculated on a straight line basis;
- ▶ A restricted loss carry-forward scheme, such that, with exceptions, the loss carried forward is capped at 50 percent of the chargeable income for that year (before deduction of tax losses carried forward).

Income Tax Relief (Large-Scale Projects and Pioneer Industries) Act, 2013

- ▶ While regulations are not yet finalized, the legislation makes provision for an extended tax credit benefit to entities that qualify as a large-scale project or pioneer industry. The definitions of these terms will be provided once the regulations are finalized. The Act indicates the commercial application of research and development that would qualify for consideration. The value of the incentive is capped at 0.25 percent of the GDP for the previous financial year.¹¹⁸

Customs Tariff (Revision) (Amendment) Resolution 2013

- ▶ Duty-free importation of capital equipment and machinery by all Jamaican companies and individuals;
- ▶ Productive Input Relief (PIR) scheme that allows for the duty-free importation of additional sets of items by designated entities within the manufacturing, agriculture, tourism, health, and creative industries;
- ▶ The Commissioner of Customs, based on guidance from the Ministry of Industry, Commerce, Agriculture and Fisheries, the Ministry of Tourism and the Ministry of Health, makes a decision regarding the imported items for these respective sectors.

Stamp Duty (Amendment of Schedule) Order, 2013

- ▶ The Order makes a provision for similar treatment regarding the importation of PIR goods as occurs in the Customs Tariff Resolution.

General Consumption Tax (GCT) Deferral

Only designated manufacturers benefit from a GCT Deferral. With the exception of free zone (FZ) and special economic zone (SEZ) entities, this arrangement will no longer be offered upon the revision to

¹¹⁶ Education Tax, "National Housing Trust (NHT) Contributions, National Insurance Scheme (NIS) Contributions, Human Employment and Resource Training (HEART) Contributions." Tax Administration of Jamaica.

¹¹⁷ The application of the capital allowance reduces the proportion of a company's income against which corporate income tax will be charged. The Omnibus Incentives regime provides for an initial 20 percent allowance on capital expenditures related to construction, alteration and renovation of industrial buildings. Expenditures related to the purchase of an industrial building will not qualify for the initial allowance. Assets purchased on or after January 1, 2014 are written off in accordance with the new capital allowance regime.

¹¹⁸ The total dollar value of the tax credit incentive available in any one year to investors seeking to access this benefit will not exceed 0.25 percent of GDP of the previous year.

the GCT Act. A Customs Administration Fee (CAF) is also charged for all persons importing and exporting at a flat fee per import or export item (the flat USD fee varies depending on the product). The FZ and SEZ entities are also exempt from this payment.

Special Economic Zone (SEZ) Act

The SEZ Act, passed in December 2015, is intended to facilitate the development of globally competitive firms that will drive growth and development within the context of a logistics-centered economy.¹¹⁹ It is envisioned that SEZs will operate within a modern, integrated framework that is efficient and predictable, facilitates sustainable linkages in the domestic economy, supports technology transfers, business innovation, entrepreneurship and human capital formation, and catalyzes industrial development and economic growth in Jamaica.¹²⁰ Key features of the SEZ Act include:

- ▶ Removal of export requirements;
- ▶ Deliberate interaction with the local business community; and
- ▶ Establishment of an autonomous regulatory authority.

There is no export requirement under the SEZ Act; location within areas designated as SEZs will qualify operators and users for SEZ benefits. MSMEs are granted benefits in SEZs, though they must meet certain eligibility criteria (e.g. adequate business plans) to demonstrate that they have “sufficient development potential,” as well as specific pecuniary requirements. An SEZ Authority will manage all relationships between SEZ entities and government agencies. The SEZ Act is not yet in force as the SEZ Authority has yet to be established. Table I.5-12 outlines fiscal incentives under the SEZ Act:

Table I.5-12: Fiscal incentives under the SEZ Act

Tax Measures	Developer	Occupant	First Schedule
Corporate Income Tax Headline Rate of 12.5 percent (with an effective rate of approx. 7.5 percent)	✓	✓	4 (2) (a)
Asset Tax Relief	x	✓	2
Customs Duty Relief	✓	✓	3 (1)
Relief from Income Tax on Rental Income	✓	✓	4 (2) (b)
GCT Relief (on all goods and services entering the Zone)	✓	✓	5 (2) (Erroneously marked as 4 in the First Schedule)
Employment Tax Credit	✓	✓	4 (2) (d)
5 percent Promotional Tax Credit (R&D and training)	✓	✓	4 (2) (e, f)
Capital Allowance	✓	✓	-
Relief from Income Tax on Dividend	x	✓	4 (3) (a, b)
Stamp Duty Payable (SEZ Authority exempt from Stamp Duty)	50 percent	50 percent	7 (2) (a)
Relief from Transfer Tax	✓	x	8 (2)

¹¹⁹ Jamaica Ministry of Industry, Investment, and Commerce. “Tabling of the White Paper on Special Economic Zones.” (MIIC) Paper 116. 2015. Available at: http://www.miic.gov.jm/sites/default/files/pdfs/1523_2015%20Ministry%20Paper%20116.pdf.

¹²⁰ Ibid.

Tax Measures	Developer	Occupant	First Schedule
(SEZ Authority exempt from Transfer Tax)			
Environmental Levy Payable	✓	✓	-

Source: Ministry of Finance, Tax Policy Division.

A key difference between the former Free Zone regime and the SEZ Act is that companies previously enjoyed a 100 percent income tax exemption. Under the SEZ Act, companies will face a headline rate of 12.5 percent. However, with the Promotional Tax Credit (PTC), this can reduce the tax to as low as 7.5 percent. The PTC will be applied against expenditures related to training, research and development. Companies currently under the FZ status will be grandfathered and continue to pay the 0 percent income tax either until their transition to the SEZ regime is complete or until December 2019.

Urban Renewal (Tax Relief) Act

Companies in Special Development Areas benefit from Urban Renewal Bonds, a 32.3 percent investment tax credit, tax free rental income, and the exemption from transfer tax and stamp duties on the 'improved' property.

International Financial Sector

GoJ has recently enacted the Jamaica International Financial Services Authority Act and its associated legislative reform, which includes: an international holding companies act; a trust act; two partnership bills; a limited liability companies act; a segregated account companies act; and a trust and corporate service provider's bill.

International Trade

The trade facilitation regime is perhaps the best indicator of a country's commitment to a robust trading environment. A Trade Facilitation Task Force was established to manage Jamaica's commitments under the Trade Facilitation Agreement (TFA) negotiated by WTO members in December 2012, including reducing government bureaucracy by streamlining the trade facilitation procedures, reviewing and recommending the removal of various fees, and improving customs procedures. A comprehensive revision of the Trade Act will be required to bring it in alignment with the trade facilitation policy framework, which is currently being developed by the Trade Facilitation Task Force.

Related, the Trade Board is an agency under the Ministry of Industry, Commerce, Agriculture and Fisheries (MICAF), which will take the lead in making the necessary amendments to the legislation. The Trade Board assumes responsibility as the certifying authority for goods exported under the various trade agreements. In addition, it has responsibility for:

- ▶ WTO Agreement on Import Licensing;
- ▶ Issuing import and export licenses for specific items that may have a negative impact on the environmental, social or economic conditions of the country;
- ▶ Issuing certificates of origin for Jamaican exports under various preferential trade agreements; and
- ▶ Ensuring that Jamaica meets its international obligations under the WTO Agreement on Rules of Origin.

Trade Agreements

Jamaica is a party to bilateral, regional and multilateral trade agreements. As a CARICOM member state, Jamaica does not enter into trade agreements independently; instead trading arrangements are the result of regionally negotiated and signed agreements. Table I.5-13 lists the trade agreements that Jamaica is a party to, classified based on the scope and level of market access agreed by the trading parties. Specifically there are non-reciprocal (one-way), partial scope (limited application), customs unions, comprehensive free trade agreements (covering goods, services and a wide range of other issues), and multilateral agreements at the global level.¹²¹

Table I.5-13: Trade Agreements

Type of Trade Agreement	#	Agreement Title
Non-Reciprocal Agreements	4	CARIBCAN Duty Free Access to the Canadian Market (1986) The Caribbean Basin Initiative (CBI) Duty Free Access to the US market (1990/2000) CARICOM-Venezuela Trade and Investment Agreement (1994) UNCTAD Generalized System of Preferences (GSP)
Partial Scope Agreements	4	CARICOM-Colombia Trade, Economic and Technical Co-operation Agreement (1994) CARICOM-Cuba Trade and Economic Cooperation Agreement (2000) CARICOM-Costa Rica Free Trade Agreement (2004) CARICOM/ Dominican Republic Free Trade Agreement (1998)
Customs Union	2	Revised Treaty of Chaguaramas (2002) CARICOM Single Market (CSM) Duty Free Treatment (2002)
Comprehensive Free Trade Agreement	1	The CARIFORUM/EU Economic Partnership Agreement (EPA)
Multilateral	2	General Agreement on Tariffs and Trade (GATT) (1994) General Agreement on Trade in Services (GATS) (1994)

Source: Nathan Associates.

The manufacturing industry has the most to benefit under existing trade agreements. Most products manufactured in Jamaica have duty-free market access to U.S., Europe, Canada, CARICOM, Colombia, the Dominican Republic, and Venezuela by virtue of these trade agreements. While the CARIFORUM/EU Economic Partnership and CARICOM-Costa Rica agreements specify that goods manufactured in a FZ or SEZ have preferential market access, the remaining trade agreements do not clarify whether they will apply to goods in FZs and SEZs. If FZ or SEZ areas are considered an extrajudicial in Jamaica, goods manufactured in those areas could potentially be excluded from benefits provide by those trade agreements.

Labor Market Policies

Jamaica has a number of labor friendly laws, including the Employment (Termination and Redundancy Payments) Act. This Act makes provisions for employees who have no less than two years of continuous employment, who are dismissed on the grounds of "redundancy," and who are entitled to redundancy payment. Generally, workers who have worked up to ten years continuously are entitled to two weeks' payment for every year worked as well the requisite notice pay, while

¹²¹ "An Exporters Guide to Jamaica's Free Trade Agreements," Accessed on May 13, 2016. Available at: <http://www.tradeboard.gov.jm/tblweb/documents/TradeAgreement.pdf>

workers with over ten years' continuous employment are entitled to three weeks' payment plus notice pay. Jamaica still has no unemployment benefits for employees.

The relationship between employers, employees and their representative unions is governed by local legislation, regulations and policies, as well as, conditions set out by the International Labor Organization (ILO). Jamaica has been a signatory to the ILO since 1962.

The GoJ has established the Labor Market Reform Commission (LMRC) to develop strategies to reform and modernize the labor market, thereby improving productivity of the workforce. It is expected that the work of the LMRC will result in the development of mechanisms which will improve Jamaica's labor efficiency and productivity.

Recommendations

The GoJ has been proactive in its attempts to establish the policy and regulatory mechanisms require to enhance trade facilitation and to improve the skills of its workforce in order to support the development of the Jamaica Logistics Hub. This is reflected through government initiatives such as the Trade Facilitation Task Force, the Trade Board, and the SEZ Act. It is critical that the GoJ works in close collaboration with Jamaica's shippers' association and private sector stakeholders to implement reforms that will further remove policy and regulatory barriers that could otherwise inhibit investment in the Jamaica Logistics Hub. Based on our analysis of the enabling environment in Jamaica, Nathan recommends that the GoJ consider the actions:

- ▶ Streamline the development and implementation of a modernized single window system for SEZ users to carry out customs, taxes, and other administrative transactions;
- ▶ Through the Trade Facilitation Task Force promote policies that require government agencies to develop e-government portals to simplify and streamline administrative procedures, especially those related to customs and licensing;
- ▶ Through the Commissioner of Customs define a standard list of imported items to be duty free under the Productive Input Relief (PIR) of the Customs Tariff Resolution so such incentives can be advertised as part of the Jamaica Logistics Hub;
- ▶ Streamline final revisions of the Income Tax Relief Act to define the exact amount of incentives for pioneer industries, so that this incentive can be advertised to potential Jamaica Logistics Hub investors. It is recommended that the definition of the "pioneer industry" corresponds with the industry profiles that are recommended for the LHI;
- ▶ Reduce income taxes for SEZ companies to five percent for pioneer industries as defined under the Tax Relief Act;
- ▶ Maintain the Promotional Tax Credit of up to five percent under the SEZ Act for spending on training, research, and development;
- ▶ Assure the SEZ Act does not exclude SEZ companies from receiving benefits from existing trade agreements;
- ▶ Consider an additional SEZ income tax credit of for companies that invest in SEZ public utility infrastructure.

I.5-6 Industry Identification

Based on the results of the SWOT analysis and other findings in this chapter, Nathan conducted Multi-Criteria Analysis (MCA) in order to determine the industries with the greatest potential to invest in the Jamaica Logistics Hub as well as those supporting industries that the LHI should target in

order facilitate the formation of industry clusters. This section discusses the methodology used for the MCA and its findings.

Multi-Criteria Analysis (MCA)

To prioritize the potential viable industries identified in the SWOT analysis, Nathan undertook an Analytical Hierarchy Process (AHP), in this case relying on a MCA method. This technique develops a linear additive model to rank choices (here, viable industries) through score assignments against a list of criteria. This type of MCA method uses pairwise comparisons between criteria and between options (in this case viable industries are the options) to derive the weights and the scores, which generate the ranking of the options.¹²² This method not only provides an assessment as to whether a viable industry meets particular criteria, but also assesses to what degree each viable industry meets each criterion.

This method has previously been applied as a decision-making tool for complex scenarios that involve multiple factors, of which many cannot be quantified. A relevant example of its use was highlighted in a study undertaken by Ke-yu Zhu, Shan-lin Yang, and Wei Chen titled “An Innovative Orders-of-Magnitude AHPP Approach for Leading Industries Selection: Case study of Jiangbei Industrial Clusters in China.” In this study, thirty-three industries were evaluated using the AHP method in order to determine which of them would be best suited to operate in the Jiangbei industrial clusters. By employing this methodology, the researchers found that the modern logistics industry and the ship and marine equipment industry were best suited to operate in the location due in part to their ability to improve economic strength and enhance competitive advantages of the Jiangbei industrial clusters.^{123, 124} The next sub-sections explain each step of the AHP process that was applied to rank LHI industries.

Step 1: Determining Viable Industries

The trade flow analysis undertaken in Chapter I.2 and revisited previously in this section was used to identify potential industries for the Jamaica Logistics Hub. The selection of these industries was based on the following trade flows in terms of volume and total value:

- ▶ China to major ports in the US-East Coast
- ▶ Countries in the Latin America and the Caribbean region to major ports in the US-East Coast
- ▶ Jamaica to major ports in the US-East Coast

¹²² UK Department for Communities and Local Government. *Multi-criteria Analysis: A Manual*. London: The Crown, (2009), Available at: http://eprints.lse.ac.uk/12761/1/Multi-criteria_Analysis.pdf.

¹²³ Ke-yu Zhu, Shan-lin Yang, and Wei Chen. *An innovative orders-of-magnitude AHPP approach for leading industries selection: Case study of Jiangbei Industrial Clusters in China*. *Journal of Systems Science and Systems Engineering*, Vol. 23, Issue 1 (2014): 1-19.

¹²⁴ Other examples of similar uses of the AHP MCA method include the following:

Zhang, S., “Analysis of Area Leading Industry Selection.” *Economic Problems*, (2001): 22–24.

Zhu, Y., “Selection Benchmark Analysis of Area Leading Industry.” *Shanghai Economic Forum* 11 (2003): 24–26.

In this initial selection of industries, routes were selected by considering origins and destinations that have the largest cargo flows between the supply source and the demand point, relative to Jamaica being located along the path of the trade flows. In addition to the potential industries that were selected through the trade flow analysis, additional industries were added to the MCA list based on internal and external factors identified in the SWOT analysis, which indicated that such industries would be highly competitive in the LHI. Tables 1.5-14, 1.5-15, and 1.5-16 identify the top commodity flows; Table 1.5-17 identifies the additional industries that emerged from the SWOT analysis.¹²⁵

Table I.5-14: Top Commodity Flows from China to US (East Coast)

HS Group	HS Code	Commodity	Value (USD)	Weight (mt)
Nuclear Reactors, Boilers, Etc.; Parts	8415 and 8418	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	1,183,398,041	241,750.34
Electric etc.; Sound Equip; TV Equip; Pts	8516 and 8528	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt and TV Receivers, INCL Video Monitors & Projectors	2,440,973,332	304,562
Vehicles, Railway And Parts etc.	8708 and 8712 and 8711	Parts & Access For Motor Vehicles, and Motorcycles (INCL Mopeds) & Cycles With Aux Motor, and Bicycles & Other Cycles (INCL Del Tricycle) No Motor	1,607,738,676	521,741
Articles Of Steel	7321 and 7326	Stoves, Ranges etc., Non-electric Domestic & Iron & Steel and Articles of Iron or Steel, NESOI	965,778,386	336,157.27

Source: UN-COMTRADE, Nathan Associates.

Table I.5-15: Top Commodity Flows from Jamaica to US (East Coast)

HS Group	HS Code	Commodity	Value (USD)	Weight (mt)
Ores, Slag And Ash	2606	Aluminum Ores And Concentrates	125,314,928	5,446,192.00
Edible Vegetables & Certain Roots & Tubers	0714	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	18,613,868	9,617.51
Miscellaneous Preparations	2103	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	10,802,589	3,464.97
Beverages, Vinegar	2208	Ethyl Alcohol, Underneath, Und. 80% Alcohol; Spirit Beverage	9,488,770	2,966.66
Prep Nuts Or Other Plant Parts	2008	Fruit, Nuts Etc. Prepared Or Preserved NESOI	4,313,583	964.32

Source: UN-COMTRADE, Nathan Associates.

Table I.5-16: Top Commodity Flows from Latin America to US (East Coast)

HS Group	HS Code	Commodity	Value (USD)	Weight (mt)
Minerals, Fuels, Oils	2709	Crude Oil from Petroleum and Bituminous Minerals	13,275,588,623	20,518,109.04
Articles Of Iron Or Steel	7326	Articles of Iron or Steel, NESOI	32,471,771	11,122.01
Ores, Slag And Ash	2606	Aluminum Ores And Concentrates	479,198,280	17,748,439.31

¹²⁵ Classified using the Harmonized System (HS) discussed in Footnote 34.

HS Group	HS Code	Commodity	Value (USD)	Weight (mt)
Salt, Sulphur, Earth & Stone, Lime & Cement	2501	Salt incl. Table & Dntrd., Pure Sodium Chloride	373,090,135	17,858,391.89
Prep Vegetables, Fruit, Nuts Or Other Plant Parts	2007	Jams, Fruit Jellies, Marmalades Etc., Cooked	79,286,575	76,516.54

Source: UN-COMTRADE, Nathan Associates Inc.

Table I.5-17: Other Top Commodities and Services with Potential for Value-Added Activities based on SWOT Analysis Factors¹²⁶

HS Group	HS Code	Commodity	Value (USD)	Weight (mt)
Optic, Photo Etc., Medic Or Surgical Instruments Etc.	9018 and 9022	Medical, Surgical, Dental or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	299,577,901	17,896.04
Pharmaceutical Products	3006 and 3004	Pharmaceutical Goods, and Medicaments NESOI, Mixed Or Not, In Dosage Etc.	74,101,121	2,491.50
Business services, health, financial/insurance. Legal/real estate, hotels, and misc. repairs	9958 and 9813	Assembly and distribution services of gen commodities, and General warehousing and storage	N/A	N/A
business services, and Agriculture, Construction, Trans, Electric/ Gas/ Sanitary, Eng. & Mgmt. & Envir. Quality	9837	Refrigerated warehousing and storage	N/A	N/A

Source: UN-COMTRADE, Nathan Associates.

Selection of Additional Industries based on the SWOT Analysis

Several strengths and Opportunities for the LHI identified earlier in this chapter would make additional commodities and services attractive to foreign investors. Such commodities and services, as listed in Table I.5-17, are likely to thrive in the LHI due primarily to the following reasons:

- ▶ Jamaica has the eighth highest container throughput in the Latin America and the Caribbean;
- ▶ Skilled labor at lower rates than in most cities in the North East US;
- ▶ Jamaica's central geographical location;
- ▶ GE's presence in the northeast region of the US could make manufacturing and assembly of medical equipment an attractive value added service in the LHI;
- ▶ Significant containerized cargo flows from China to US-East Coast present opportunities for industries involved in value added services;
- ▶ Pharmaceuticals lie amongst the top commodities in terms of total value of goods flowing from Europe to Latin America, which Jamaica could capture;
- ▶ Businesses that are less polluting; COP21 will influence growth of these business opportunities;

¹²⁶ Values (USD) and Weights (mt) shown in Table I.5-17 correspond to trade flows from China to US (East Coast)

- ▶ Refrigerated warehousing and storage infrastructure would help make several commodities, such as pharmaceutical products and perishable goods more attractive;
- ▶ Opportunity for Jamaica to capture vehicle parts from Germany that are headed to US-Est Coast to engage in value added activities;
- ▶ Existing presence of motorcycle and automobile assembly activities.

Step 2: Criteria Selection

Six criteria were selected to be used in the MCA in order to determine the ranking of industries that were selected in Step 1. These criteria were selected because they represented the most important determinants of success for industries to succeed in Jamaica Logistics Hub and because they are closely aligned with the vision of the LHI. Each criterion falls into one of four success factors for realizing the LHI vision. The six selected criteria are listed below their respective success factor categories.

Internal SWOT Factors (Strengths and Weaknesses)

- ▶ Competitive advantages
- ▶ Policy, legal, and regulatory frameworks

External SWOT Factors (Opportunities and Weaknesses)

- ▶ Trade flows

Economic Impacts

- ▶ Long-term employment generation
- ▶ Potential revenue generation

Social Impacts

- ▶ Contributes to improving technical capacity of population

Step 3: Weighting Criteria

Step 3 consisted of ranking the criteria selected in Step 2 through assigning weights to each of them. These criteria weights were later used to determine the ranking of industries. In order to determine the criteria weights, a pairwise comparison matrix was applied. This matrix was completed through asking the question, “to what degree is criterion x a more (or less) important determinant for achieving the vision of the LHI than criterion y?” Table I.5-18 below shows the resulting criteria weights and their respective rankings based on these weights. The pairwise comparison matrices used to attain these criteria weights along with detailed explanations of the calculations made are found in Appendix I.5.2 as screen shots from a MS Excel work-sheet.

Table I.5-18: MCA Criteria Ranked According to Assigned Weights

Rank	Criteria	Weight
1	Revenue Generation	0.223
2	Long Term Employment Generation	0.207
3	Policy, Legal, and Regulatory Framework	0.193
4	Contributes to Improving Technical Capacity of Population	0.179
5	Competitive Advantages	0.105
6	Trade Flows	0.092

Source: Nathan Associates.

Step 4: Assigning Weights to Industries

By applying the AHP MCA method, Nathan used the same pairwise comparison technique that used to assign weights to criteria to assign weights to industries. A pairwise comparison matrix of industries was created for each of the criteria. This way, when determining industry weights against each criterion, the question asked was “to what degree would each industry be favored by each criterion relative to the other industries?” The pairwise comparison matrices used to attain the industry weights are found in Appendix I.5.2.

Step 5: Attaining Industry Scores to Determine Industry Rankings

Industry weights attained from each of the six matrices in Step 4 were then multiplied by each criterion weight attained in Step 3. Then, these resulting industry weights that were attained for each of the 6 criteria were aggregated under each industry to attain a final score per industry. The calculations matrix used for attaining industry scores and rankings can be found in Appendix I.5.2. Table I.5-19 shows the final ranking of the potential viable industries that resulted from the MCA.

Table I.5-19: Potential Viable Industry Ranks

Rank	Industry	Score
1	Pharmaceutical Goods, and Medicaments NESOI, Mixed Or Not, In Dosage Etc.	0.0989
2	Parts & Access For Motor Vehicles, and Motorcycles (INCL Mopeds) & Cycles With Aux Motor, and Bicycles & Other Cycles (INCL Del Tricycle) No Motor	0.0973
3	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Receivers, INCL Video Monitors & Projectors	0.0943
4	Medical, Surgical, Dental or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.0866
5	Assembly and Distribution Services of General Commodities, and General Warehousing and Storage	0.0861
6	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	0.0796
7	Ethyl Alcohol, Underneath, Und. 80% Alcohol; Spirit Beverage	0.0681
8	Aluminum Ores And Concentrates	0.0579
9	Stoves, Ranges etc., Non-electric Domestic & Pts, Iron & Steel and Articles of Iron or Steel, NESOI	0.0575
10	Crude Oil from Petroleum and Bituminous Minerals	0.0546
11	Refrigerated Warehousing and Storage	0.0478
12	Jams, Fruit Jellies, Marmalades Etc., Cooked	0.0373
13	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.0372
14	Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.0368
15	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.0311
16	Salt incl. Table & Dentrd, Pure Sodium Chloride	0.0290

Source: Nathan Associates.

MCA Results

Top Potential Viable Industries

Based on the results of the MCA, the top industries by commodity and by service are presented in Tables 1.5-20 and 1.5-21.

Table I.5-20: Top 5 Industries by Commodity

Rank	Criteria
1	Pharmaceutical Goods and Medicaments NESOI, Mixed Or Not, In Dosage Etc.
2	Parts & Access For Motor Vehicles, and Motorcycles (INCL Mopeds) & Cycles With Aux Motor, and Bicycles & Other Cycles (INCL Del Tricycle) No Motor
3	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Receivers, INCL Video Monitors & Projectors
4	Medical, Surgical, Dental or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt
5	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts

Source: Nathan Associates.

Table I.5-21: Top Industries by Service

Rank	Criteria
1	Assembly and distribution services of gen commodities, and General warehousing and storage
2	Refrigerated warehousing and storage

Source: Nathan Associates.

The section below identifies specific industry clusters based on the industries recommended in this section for the Jamaica Logistics Hub. Three main industry clusters and four supporting industry clusters were identified. The three primary industry clusters and four supporting clusters are included in the next section.

I.5-7 Improving Competitiveness

Based on the results of the industry analysis this section below details the recommended industry clusters most suited to take advantage of Jamaica's strategic position and capitalize on its comparative advantages. This section also provides recommendations on industrial space requirements for each recommended industry cluster, as well as general recommendations for needed policy, legal and regulatory improvements.

Recommended Industry Clusters

As explained by Porter, et al., clusters are “geographic concentrations of related industries and associated institutions.”¹²⁷ To define industry clusters and their linkages, Nathan considered

¹²⁷ Delgado, Mercedes, Michael E. Porter, and Scott Stern, “Defining Clusters of Related Industries,” National Bureau of Economic Research, 2014.

multiple factors, including Marshall's three drivers of agglomeration associated with cost productivity advantages to firms, which include input-output linkages, labor market pooling, and knowledge spillovers.¹²⁸ Most of the cluster linkages used in this analysis are derived from the cluster linkages established by Porter, et al. in the National Bureau of Economic Research's paper, "*Defining Clusters of Related Industries*."¹²⁹

Since such cluster linkages are established in NAICS codes, Nathan relied on concordance tables from the US Census Bureau to translate each NAICS industry into its equivalent HS codes. Once critical cluster links were identified, Nathan grouped industries under clusters following a modified version of the cluster definitions from the US Economic Development Administration's Innovation Project.¹³⁰ The results of this exercise yielded three primary industry clusters and four supporting clusters, which are provided in the lists below.

Main Industry Clusters

- ▶ Electrical equipment, appliance, and component manufacturing (light manufacturing)
- ▶ Biomedical / biomechanical
- ▶ Transportation and logistics

Supporting Industry Clusters

- ▶ Education and knowledge creation
- ▶ Energy, construction, engineering, and utility services
- ▶ Business and financial services
- ▶ Chemicals, plastics, and primary metals
- ▶ Agribusiness, food processing and technology

Nathan recommends that priority is given to assigning space for and fully developing the three main recommended clusters in the Jamaica Logistics Hub. Further discussion of this and description of the clusters is included below.

Cluster 1: Electrical Equipment, Appliance, and Component Manufacturing (Light Manufacturing) Cluster

Cluster One is most critical to development of the Jamaica Logistics Hub. This cluster is characterized by light manufacturing and assembly of household electronic products, automotive parts and accessories, motorcycles and their respective components, and industrial machinery used for light manufacturing. Many of the components produced in this cluster would serve as inputs for products manufactured in the biomedical / biomechanical cluster, which would benefit from locating adjacent to or in close proximity to this cluster.

¹²⁸ Marshall, Alfred, "Principles of Economics," (London: Macmillan and Co. 8th ed.), 1920. Available at: <http://eet.pixel-online.org/files/etranslation/original/Marshall,%20Principles%20of%20Economics.pdf>.

¹²⁹ Delgado et al, 2014.

¹³⁰ "About the Innovation Project," US Economic Development Administration. Available at: <http://www.statsamerica.org/innovation/about.html>.

Table I.5-22: Industry Cluster One

HS Group (Level 2)	HS Code	Commodity
84: Nuclear Reactors, Boilers, Machinery Etc.; Parts	8415	Air Conditioning Machines (temp & Hum Change), Pts
	8418	Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts
	8463	Machine Tools for Working Metal, NESOI
	8468	Machines, Solder Etc., Gas Surf Temper Machines, Pt
	8479	Machines Etc. Having Individual Functions NESOI, Pt
	8427	Fork-Lift Trucks, Other Works Trucks With Lifts Etc.
	8428	Lifting, Handling, Loading & Unload Machines NESOI
85: Electric Machinery etc.; Sound Equip; TV Equip; Pts	8516	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt
	8528	TV Receivers, INCL Video Monitors & Projectors
	8501	Electric Motors and Generators (No Sets)
	8507	Electric Storage Batteries, Including Separators, Parts
	85 41	Semiconductor Devices, Light-Emit Diodes Etc., Pts
	8534	Printed Circuits
87: Vehicles, Except Railway Or Tramway, And Parts etc.	8508	Electromechanical Tools, Working In Hand, Parts
	8708	Parts & Access For Motor Vehicles
	8712	Motorcycles (INCL Mopeds) & Cycles With Aux Motor
73: Articles of Iron and Steel	8711	Bicycles & Other Cycles (INCL Del Tricycle) No Motor
	7322	Radiators, Air Heaters Etc., Non-electrical & Parts, Iron & Steel
40: Rubbers & Articles Thereof	4010	Conveyor or Transmission Belts of Vulcanized Rubber

Source: UN-COMTRADE, Nathan Associates.

Cluster 2: Biomedical / Biomechanical Cluster

This cluster groups two of the sets of industries that scored the highest in the MCA, “pharmaceutical goods / medicaments” and “medical, surgical, dental or vet instruments / x-ray etc. apparatus; tubes, panels, screen, etc.” This cluster would benefit from close proximity to the light manufacturing cluster due to the sharing of multiple electrical components, such as electric motors and generators, semiconductors, and circuits. Forming a biomedical / biotechnical cluster would be beneficial given that it pairs two industries with fast growing global demand and high value impact. It also would provide incentives for Jamaica to invest in training and education in life science fields (particularly pharmacology and medicine).

Table I.5-23: Industry Cluster Two

HS Group	HS Code	Commodity
90: Optic, Photo Etc., Medic Or Surgical Instruments Etc.	9018	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt
	9022	X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt
30: Pharmaceutical Products	3006	Pharmaceutical Goods
	3004	Medicaments NESOI, Mixed Or Not, In Dosage Etc.

Source: UN-COMTRADE, Nathan Associates.

Cluster 3: Transportation and Logistics Cluster

Nathan recommends a Transportation and Logistics Cluster be located on or adjacent to the property of Kingston’s major ports and airports. This cluster would provide a wide array of services, including product assembly, distribution, general and refrigerated warehousing and storage, ship and truck maintenance and repair, and aircraft maintenance, repair, and overhaul. These services are critical for the successful development of any logistics hub or special economic zone.

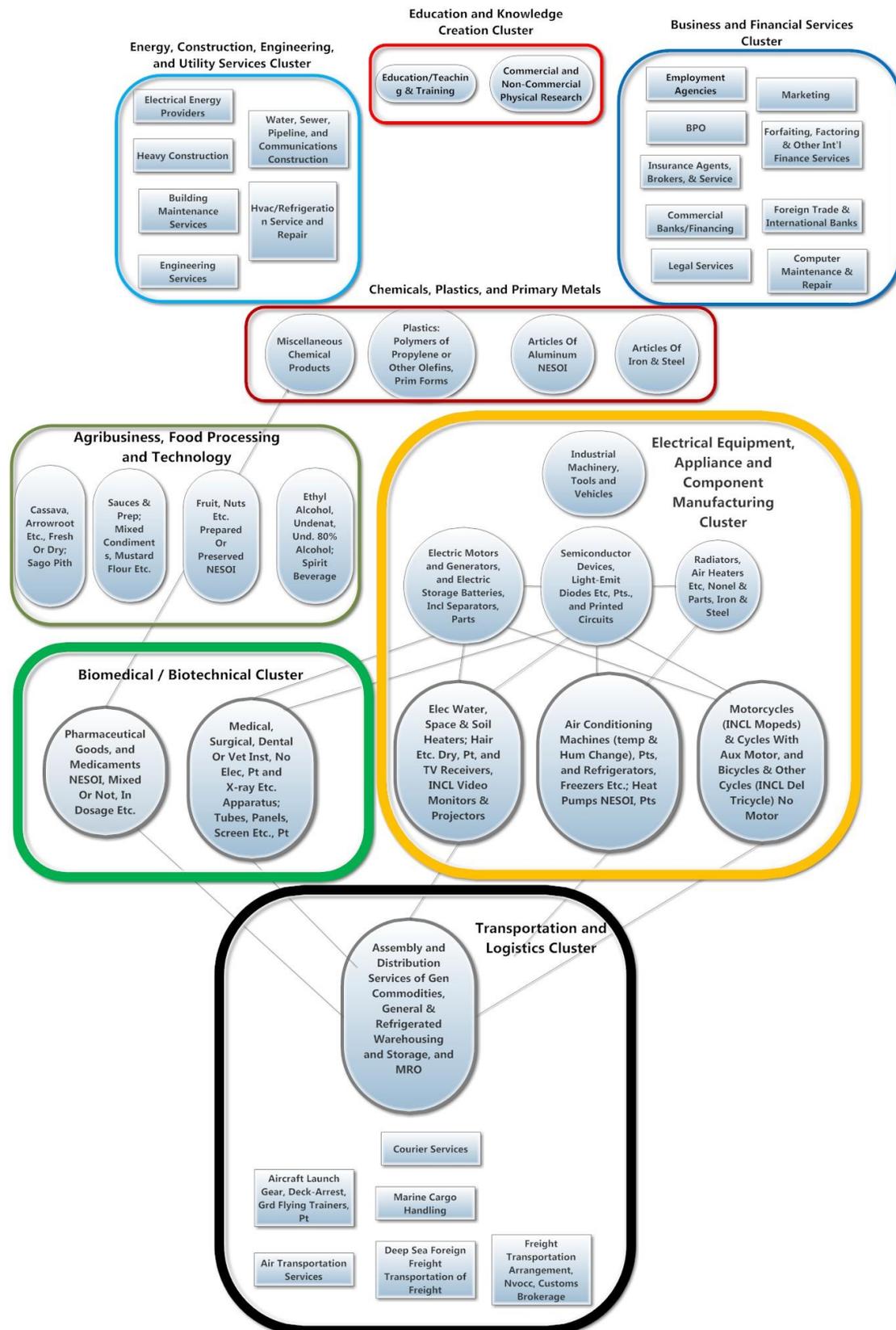
Table I.5-24: Industry Cluster Three

HS Group	HS Code	Commodity
99: Business services, health, financial/insurance. Legal/real estate, hotels, and misc. repairs business services	9958	Assembly and distribution services of gen commodities
98: Agriculture, Construction, Trans, Electric/ Gas/ Sanitary, Eng. & Mgmt. & Environmental Quality	9813	General warehousing and storage
	9837	Refrigerated warehousing and storage
	9845	Marine Cargo Handling
	9847	Air Transportation, Scheduled
	9848	Air Courier Services
	9841	Deep Sea Foreign Freight Transportation of Freight
	9852	Freight Transportation Arrangement, NVOCC, Customs Brokerage
88: Aircraft, Spacecraft, & Parts Thereof	8805	Aircraft Launch Gear, Deck-Arrest, Grd. Flying Trainers, Pt
86: Railway Or Tramway Locomotives, Rolling Stock, Track Fixtures & Fittings, Signals	8609	Containers for one or More Modes of Transport

Source: UN-COMTRADE, Nathan Associates.

Figure I.5-3 depicts the recommended industry clusters for the LHI. The figure shows individual industries grouped into their respective clusters (displayed as colored squares) along with their most relevant cluster linkages (displayed as grey lines).

Figure I.5-3: Industry Cluster Map for the Jamaica Logistics Hub



Industrial Space Requirements

Nathan also considered approximate space requirements for the industries in the industrial clusters identified in this section. Space requirements were developed for two scenarios (a “base” and a “high” scenario), which are discussed further in Chapter I.6. The two scenarios estimate space requirements for the years 2021, 2030, and 2035, and are based on the cargo forecasts conducted in Chapter I.2, as well as on truck transport connectivity between KCT and the Caymanas SEZ. The recommended required infrastructure for the Jamaica Logistics Hub to be implemented in three phases is detailed in Tables 1.5-25, 1.5-26, and 1.5-27. Table 1.5-28 provides estimates on the number of employees required for each industry cluster over the three phases of development. Estimates are provided as ranges, where the specific number is dependent on variables such as forecast scenario, extent of automation, union requirements, and other local work practice factors. Despite the fact that land requirements recommendations in this section are limited to industrial uses, we recommend that sufficient additional land is reserved for developing mixed use commercial and office uses and for residential uses within the land adjacent to CSEZ, which is part of the Caymanas Estate Development Area (CEDA). With this in mind, we recommend that of the total development, approximately 70% of space reserved throughout the 3 phases of development is allocated for industrial uses. The additional non-industrial land adjacent to CSEZ land should accommodate residential units as well as space for retail and office space for supporting industries to the recommended LHI industries. We recommend that new residential and commercial land use represents 10% and 20% of the total new development respectively.

Table I.5-25: Phase I (Present to 2021)

Land / location:
Develop 80 to 121.4 hectares of undeveloped lands adjacent to the Port of Kingston
Develop at least 10 and up to 20 hectares of land reserved for light manufacturing in the Caymanas SEZ, depending on the forecast scenario
Land allocation
50 percent for port-centric warehousing and logistics space; approximately 3,000-4,000 employees
50 percent for port-centric light manufacturing
<ul style="list-style-type: none"> • 10 percent biomedical/biomechanical manufacturing industries; approximately 1,100-1,600 employees • 90 percent for electrical equipment, appliance, and component manufacturing (light manufacturing) industries; approximately 10,000-14,500 employees

Table I.5-26: Phase II (2021 – 2030)

Land / location
Develop an additional 15 to 30 hectares of land reserved for light manufacturing in the Caymanas SEZ (for a total of 25 to 50 hectares depending on the forecast scenario)
Land allocation
50 percent for port-centric warehousing and logistics space; approximately 400-900 additional employees
50 percent for port-centric light manufacturing;
<ul style="list-style-type: none"> • 10 percent for biomedical/biomechanical manufacturing industries; approximately 250-800 additional employees

- 90 percent for electrical equipment, appliance, and component manufacturing (light manufacturing) industries; approximately 2,400-6,800 additional employees

Table I.5-27: Phase III (2030 – 2035)

Land / location
Develop an additional 7 to 14 hectares of land reserved for light manufacturing in the Caymanas SEZ
Land allocation
50 percent for port-centric warehousing and logistics space; approximately 300-450 additional employees
50 percent for port-centric light manufacturing;
<ul style="list-style-type: none"> • 10 percent for biomedical/biomechanical manufacturing industries; approximately 120-180 additional employees
<ul style="list-style-type: none"> • 90 percent for electrical equipment, appliance, and component manufacturing (light manufacturing) industries; approximately 1,050-1,650 additional employees

Table I.5-28: Total Employee Estimates by Phase

Phase I: Present to 2021
14,100 – 20,100 direct
2,800 - 4,000 supporting industries
16,900 – 24,100 total
Phase II: 2021 – 2030
17,100 – 28,600 direct
3,400 – 5,700 supporting industries
20,500 - 34,300 total
Phase III: 2030 – 2035
18,600 – 30,800 direct
3,700 – 6,100 supporting industries
22,300 – 36,900 total

Recommendations on Policy, Legislation, and Regulation

Based on the analysis undertaken in Section 5.5, stakeholder interviews, and the online survey completed by existing and potential investors, Nathan determined that the following objectives should be met by the GoJ in order to facilitate successful development of the Jamaica Logistics Hub.

- ▶ Simplified customs procedures
- ▶ Streamlined logistics services
- ▶ Significant increase in population with higher education

To achieve these objectives, Nathan recommends that the GoJ prioritize the following:

- ▶ Through the Trade Facilitation Task Force promote policies that require government agencies to develop e-government portals to simplify and streamline administrative procedures,

especially those related to customs and licensing. The Customs Act should legalize simplified paperless procedures in order to facilitate trade;

- ▶ Streamline the development and implementation of a modernized “single window’ system for SEZ users to carry out customs, taxes, and other administrative transactions;
- ▶ Through the Commissioner of Customs define a standard list of imported items to be duty free under the Productive Input Relief (PIR) of the Customs Tariff Resolution that is aligned with the recommended industry clusters for the Jamaica Logistics Hub;
- ▶ Reduce income taxes for SEZ companies by at least five percent for pioneer industries, as defined under the Tax Relief Act;
- ▶ Maintain the Promotional Tax Credit of up to five percent under the SEZ Act for spending on training, research, and development;
- ▶ Ensure that the SEZ Act does not exclude SEZ companies from receiving benefits from existing trade agreements;
- ▶ Consider an additional SEZ income tax credit for companies that invest in SEZ public utility infrastructure;
- ▶ Increase spending on higher education and technical degrees with particular focus on life sciences and engineering.

In addition to the above recommendations, the following list of key success elements for SEZs, based on global best practices, should be considered by the GoJ and could be applied to the Jamaica Logistics Hub.

Recommendations Based on Global Best Practices for SEZs

To understand the best approach to SEZ development in Jamaica, Nathan assessed SEZs globally to identify key elements for successful implementation and operations. The resulting best practices and lessons learned from these SEZs suggest the following:

- ▶ Development of a successful SEZ requires a long time horizon. Further, the nature of the development is uncertain. Project sponsors should be flexible and adapt to uncertainty, focusing on those elements that have a high probability of success.
- ▶ Committed financial support of the sponsors (government as well as private sector) is a critical to ensure the project is initiated, implemented, and completed.
- ▶ The existence of fiscal incentives or low leasing rates is important, but not a determinant factor. Rather, competent authorities facilitating the entire process of approvals and permit-granting required to start and facilitate operations are key determinants in the success of SEZ projects. Therefore, an efficient independent autonomous zone authority is required.
- ▶ SEZs should offer a tangible value proposition to attract tenants and develop business that extends beyond a strategic location and efficient infrastructure and logistics. SEZs must offer core value to prospective tenants—low costs, skilled labor, efficient transport links, first class reliable utilities at competitive cost, and/or an advantageous location for production and consumption regions.
- ▶ In their value propositions, Jamaican SEZs should differentiate themselves from regional competition. Differentiating factors might include availability of competitively priced and skilled labor; efficient SEZ administrators; access to raw materials; access to land for light industrial processing; access to well-developed urban centers (housing, education health, entertainment, etc.), and proximity to world-class transport infrastructure and logistics.
- ▶ A clear master plan and project implementation plan by stages is required, particularly for marketing purposes.

- ▶ A portion of initial funding must be used to promote the project and to provide incentives to attract initial “anchor” users.
- ▶ Promotion efforts should focus on attracting firms that are market leaders to become the anchors in the SEZs.
- ▶ A flexible, incremental approach to the development of the zones must be taken. Large upfront investments in infrastructure are often misdirected. Funds may be better spent through provision of incentives to attract tenants and infrastructure that is directed to their specific needs, rather than speculative up-front investment in bricks and mortar.
- ▶ SEZs require substantial available land to attract investors. Additionally, SEZs tend to incorporate large areas of existing development.
- ▶ Even smaller projects take considerable time to develop. For greenfield sites, a period of 20 or more years is not unreasonable to develop 1,000 to 2,000 hectares. As a general rule, the development of a zone is implemented in stages, with the typical increment on the order of 100 hectares. Recently a number of exceptionally large zones have been proposed, but these are usually planning concepts reflecting the availability of large tracts of land rather than a demand driven.

Promotion of Industrial Sectors and Sub-Sectors

It is imperative that the GoJ develop a strategic promotion strategy to attract international and local investors to the Jamaica Logistics Hub. The multi-pronged promotion strategy should seek to target investors in the top industries identified in this chapter. The strategy should begin through the development of a compelling business case articulated in the Jamaica Logistics Hub value proposition. The proposition should clearly communicate its competitive advantages over other logistics hubs in the region.

The strategy should also include an international awareness campaign to market the Jamaica Logistics Hub to the global logistics industry. It is critical that the marketing strategy effectively communicate the advantages of the Jamaica Logistics Hub to the specific industries identified in this chapter.

The following are key elements recommended for a successful marketing strategy:

- ▶ Promotion engagements should be strategic and target specific investors in the top industries as identified in this chapter;
- ▶ Target five “anchor investors” with the ability to bring high level visibility to Jamaica should or more decide to establish operations in the hub;
- ▶ Utilizes Jamaica’s Foreign Service Offices (FSO) to target and engage potential investors overseas;
- ▶ Work to increase investment by those multinational corporations which are already operating in Jamaica;
- ▶ Promote and incentivize publication of articles written by opinion leaders in industry and published in magazines, journals and electronic media that highlight the value of the Jamaica Logistics Hub;
- ▶ Increase participation in selected industry events such as conferences, to engage in speaking engagements and business networking;
- ▶ Implement a targeted publicity campaign in international markets through social media;
- ▶ Engage the private sector to develop collaborative PPP strategy;

- ▶ The GoJ and relevant private sector entities should develop joint-marketing materials and a public relations campaign to promote the Jamaica Logistics Hub globally;
- ▶ This joint marketing/PR effort should focus on communicating the value proposition of the Jamaica Logistics Hub and opportunities available to investors. Such efforts should involve a shared cost, joint participation model;
- ▶ Examples of possible private sector entities to include in these efforts are Kingston Wharves, KTFL, Caribbean Maritime Authority, CHEC, and CMA-CGM Logistics;
- ▶ The Jamaica Logistics Hub master plan should be a key component of all marketing materials.

Value Proposition

With the section above in mind and based on client feedback, Nathan developed the value proposition below to communicate the four pillars of Jamaica’s LHI and the value offered by the Jamaica Logistics Hub to potential investors.

Jamaica’s LHI Value Proposition

“The global logistics gateway offering the internationally competitive environment to connect your business to the world.”

The Jamaica Logistics Hub offers:

- ▶ Strategic access and proximity biggest global markets
- ▶ Skilled and scalable labor
- ▶ Enabling transportation and logistics infrastructure
- ▶ An attractive business environment for value added activities
- ▶ Strategic SEZ planning for industry clusters
- ▶ Light manufacturing cluster
- ▶ Biomedical / biomechanical cluster
- ▶ Transportation and logistics cluster

I.5-8 Conclusion

The results of the industry analysis indicate that, with the right investments in infrastructure and logistics, coupled with requisite policy and regulatory improvements, Jamaica will be positioned to market itself as a global logistics hub.

Jamaica’s ongoing and anticipated investments in transportation and logistics infrastructure, including the privatization and expansion of the KCT and related port-centric logistics projects, should be prioritized given their importance to attracting new investors and facilitating industrial development. In addition to these priorities, secondary infrastructure investments, including those in roads, energy, and airports, should be made along with complementary investments in labor force training and education, strategic packaging of SEZ projects, and provision of 3PLs, among others. Key potential growth areas for investment were also identified, including pharmaceutical products, motorcycle assembly, automotive distribution, automotive spare parts, manufacturing of household

electronics, and light manufacturing. To build on Jamaica's comparative advantages, investments must also be made in education, in particular in life sciences and technology.

Further, the GoJ must continue to improve e-government services, which in turn will help streamline licensing, land registration, and customs procedures. Once the Jamaica Logistics Hub is able to attract one or more anchor industries, Jamaica's ease of doing business and access to credit will facilitate the formation of industry clusters by attracting related industries. This will in turn motivate the GoJ to make other improvements, such as to its ICT infrastructure.

The commodities that may be of most interest to industries located in the Jamaica Logistics Hub are those with the highest trade flow volumes and values as identified through our analysis (e.g., electric water, space, and soil heaters; TV receivers; parts and accessory for motor vehicles), as well as intermediate products that may be imported to Jamaica for value-added activities (e.g., assembly of automobiles and motorcycles) and subsequently exported to the US and Latin America as finished products.

Additional commodities that may be of most interest to industries located in the Jamaica Logistics Hub were recommended based on strengths and opportunities identified in the SWOT analysis. Such include pharmaceutical products, and medical equipment. While the largest shares of commodities flowing from Latin America and Jamaica to the US-East Coast are primary products (such as minerals), a significant flow of food and beverage commodities provides the Jamaica Logistics Hub with opportunities to engage in further value-added activities in the food processing and packaging industries.

Through a Multi-Criteria Analysis, the team identified the key industries and industry clusters that are most suited to take advantage of Jamaica's strategic position and capitalize on comparative advantages. Key industries organized by commodity include.¹³¹

- ▶ "Pharmaceutical Goods, and Medicaments NESOI, Mixed or Not, In Dosage Etc."
- ▶ "Parts and Access for Motor Vehicles, and Motorcycles (INCL Mopeds) and Cycles With Aux Motor, and Bicycles and Other Cycles (INCL Del Tricycle) No Motor"
- ▶ "Elec Water, Space and Soil Heaters; Hair Etc. Dry, Pt, and TV Receivers, INCL Video Monitors and Projectors"
- ▶ "Medical, Surgical, Dental or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt"
- ▶ "Air Conditioning Machines (temp and Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts"

The three primary industry clusters are light manufacturing, biomedical/biomechanical, and transportation and logistics. Nathan recommends that priority be given to assigning space for and fully developing the three main recommended clusters in the Jamaica Logistics Hub. Space requirements for the Logistics Hub, including the Caymanas Special Economic Zone, were developed. The following chapter explains the methodology used to determined space requirements.

¹³¹ Industries are displayed in Harmonized System (HS) Codes. As described by the United Nations International Trade Statistics Knowledge Base, HS is an international nomenclature for the classification of products. It allows participating countries to classify traded goods on a common basis for customs purposes.

That chapter also assesses the potential for industrial development within the Caymanas Special Economic Zone.

Lastly, with respect to the enabling environment, Nathan recommends several specific interventions, including promotion of policies that require government agencies to develop e-government portals to simplify and streamline administrative procedures, especially those related to customs and licensing; streamlining the development and implementation of a modernized “single window” system for SEZ users to carry out customs, taxes, and other administrative transactions; defining a standard list of imported items to be duty free under the Productive Input Relief (PIR) of the Customs Tariff Resolution that is aligned with the recommended industry clusters for the Jamaica Logistics Hub; reducing income taxes for SEZ companies by at least five percent for pioneer industries, as defined under the Tax Relief Act; maintaining the Promotional Tax Credit of up to five percent under the SEZ Act for spending on training, research, and development; and ensuring that the SEZ Act does not exclude SEZ companies from receiving benefits from existing trade agreements.

Part I.6 Caymanas Special Economic Zone Industry Analysis

In line with the vision of the Logistics Hub Initiative (LHI), the Caymanas Special Economic Zone (CSEZ) greenfield project is a proposed industrial and economic zone that is part of the larger Caymanas Estate Development Area (CEDA). CEDA is a wider development zone slated for mixed-use economic and industrial development, including recreational areas and residential areas in addition to the CSEZ. CEDA has a total area of 4,331.76 hectares, of which 566.56 hectares are reserved to support the SEZ. The site is currently owned by the Urban Development Corporation (UDC) and is located between Kingston and Spanish Town in St. Catherine’s parish. Caymanas is less than 15 kilometers from Port of Kingston and 33 kilometers from Norman Manley International Airport (NMIA). Caymanas is also a point of convergence for the major road networks in the Kingston area. The site’s comprehensive development and strategic location offers promising synergistic opportunities to support the vision of the Logistics Hub Initiative (LHI). The analysis that follows in this chapter– based on the cargo flow and industry analyses undertaken for the Chapters I.2 and I.5 respectively – assesses the potential for industrial development at the CSEZ. It relies on the results of the industry analysis presented in Chapter I.5 to identify industries and industry clusters that provide the greatest potential for CSEZ specifically. It also considers the cargo flow analysis presented in Chapter I.2 to determine the market share of the cargo flows projected for the LHI that the CSEZ may be able to capture for value-added activities. Through these analyses, this chapter determines the cargo facility requirements for the CSEZ and compares the proposed infrastructure investments at the CSEZ with those of other planned facilities to make a preliminary assessment of likely competitiveness. Our analysis also considers the findings of the World Bank’s report, “An Initial Assessment of Options for Private and PPP Development in the Context of Jamaica’s Global Logistics Hub Initiative and New SEZ Regime,” which provides a preliminary assessment on potential participation of private investors in the development of the CSEZ. This is complemented by a review of documents provided by the MICA and UDC as well other documents gathered by Nathan along with information collected during interviews of key stakeholders in Jamaica. The chapter concludes with a summary of our findings and a brief description of the CSEZ value proposition and how it relates to the LHI value proposition and Jamaica’s overall vision to position the country as a global logistics hub. Before proceeding it is important to note that the content in this chapter represents a pre-feasibility level analysis of the business potential for the CSEZ and thus does not include engineering design, environmental assessment, or financial analysis. A firm has been separately contracted to conduct a feasibility study that will more fully examine the CSEZ’s market demand to determine its infrastructure requirements, develop a master plan based on those requirements, conduct financial and economic analyses to determine the project’s financial viability and, if viable, propose a recommended structure for private sector participation. Figure I.6-1 summarizes the task flow utilized for this chapter.

Figure I.6-1: Caymanas Special Economic Zone (CSEZ) Assessment Task Flow

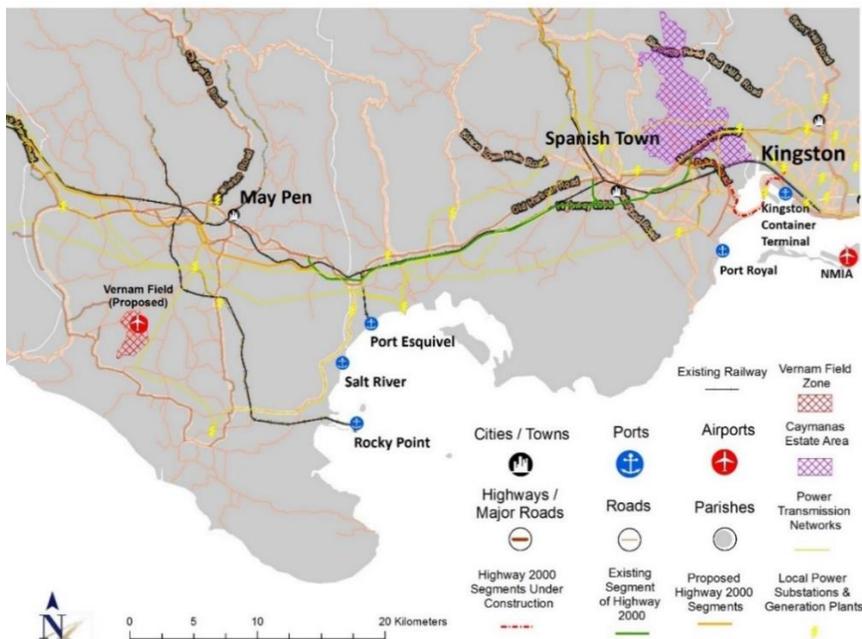


Source: Nathan Associates.

I.6-1 Background

The location that would comprise the CSEZ can be seen in Figure I.6-2 below as the checkered area between Spanish Town and Kingston. As noted above, it is owned by UDC and represents the largest greenfield site available for development in greater Kingston with proximity to both the Port of Kingston and population centers within and near Kingston. The proposed CSEZ site is located north and south of the Mandela Highway, with sites located in the north and south of CEDA. UDC has recently committed 200 acres of the CSEZ land (north of Mandela Highway) to Factories Corporation of Jamaica (FCJ) for economic zone development. According to the *CSEZ Initial Assessment of Options for Private and PPP Development in the Context of Jamaica’s Global LHI and New SEZ Regime*” by the World Bank, the yearly lease of a Standard Factory Building (SFB) in Jamaican public free zones ranges between US\$52.42/m² and US\$69.97/m².¹³² However, even though Jamaica’s rates are lower than those in various competing countries in the region (including Dominican Republic, Costa Rica, and Colombia), once the CSEZ is developed the lease rates of SFB rates are likely to be higher than the ones in Jamaica public free zones because they will reflect market prices.¹³³ A request for proposals for the site’s development was issued in 2012. Although bidders submitted proposals, the bidding process itself was not approved by the GoJ. Figure I.6-3 shows the UDC land-use plan for Caymanas Estates. The CSEZ itself is designated for industrial use and shown in purple. The development plan indicates that the remaining available land in the Caymanas Estate is to be designated for a mix of residential, recreational, and green space uses. In total, 46 percent of the CEDA is designated for residential, commercial, recreational and industrial uses, 54 percent for forest and wetland reserves, and 12 percent for light industry use. Table I.6-1 provides a detailed breakdown of the proposed land use distribution.

Figure I.6-2: Map of Kingston, Caymanas Estate, and Related Infrastructure

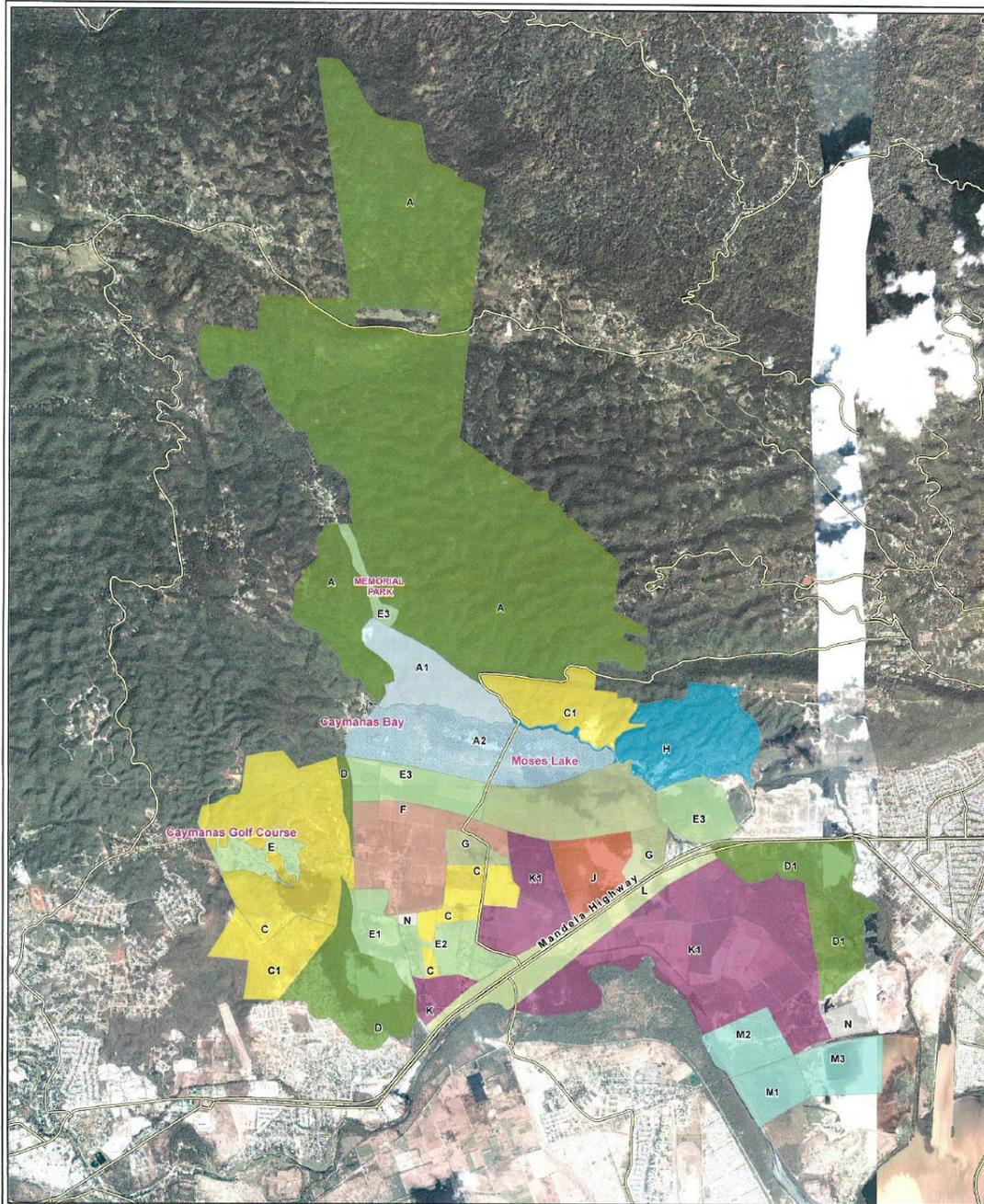


Source: Nathan Associates.

¹³² Erdmann, Andrea. “Caymanas Special Economic Zone: An Initial Assessment of Options for Private and PPP Development in the Context of Jamaica’s Global Logistics Hub Initiative and New SEZ Regime,” The World Bank Group. June, 2015.

¹³³ Ibid

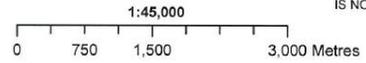
Figure I.6-3: Proposed Land Use for the CSEZ



Legend

Proposed Landuse	E1 Recreation (Polo)	K Light Industry/Manufacturing	— Main Road Network
C Residential (High Income)	E2 Recreation (Studfarm)	K1 Enterprise Zone	
C1 Residential (Mixed incomes)	E3 Recreation (Park)	H Mining & Extraction	
F Mixed Use - Village	G Agriculture	M1-M3 Sewage Treatment	
A2&S (S&D) Forest, Woodland, Wetland	L Landscaped Buffer	N Installation	
E Recreation (Golf Course)	J Mega Sports Complex	A1 JDF	
		Moses Lake	

PROPOSED LAND USE
Caymanas Estate Development Plan
 St. Catherine, Jamaica W.I.



Projected Coordinate System: JAD 2001
 Projection: Lambert Conformal Conic
 Datum: WGS 1984

THIS MAP IS THE PROPERTY OF UDC AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY UDC.



Table I.6-1: Caymanas Proposed Land Use Distribution

Land Use	Acres	Hectares	Percentage of total
Residential	1,240	502	11.6
Mixed use – Village development	440	178	4.1
Forest, woodland and wetland	5,295	2,143	49.5
Recreation	942	381	8.8
Agriculture	264	107	2.5
Landscape buffer	272	110	2.5
Mega sports complex	72	29	0.7
Light industry/manufacturing (overall)	1,295	524	12.1
Light Industry/Manufacturing	69	28	
Enterprise Zone	1,226	496	
Mining and extraction	405	164	3.8
Sewage treatment (within boundary)	185	75	1.7
Installation	49	20	0.5
JDF Barracks	245	99	2.3
Total	10,704	4,332	100
Sewage treatment (outside boundary)	369	149	

Source: Prepared by Nathan Associates based on data received from UDC.

For development of the north site, UDC recommends that the area be utilized for clean industries, such as light manufacturing and assembly, distribution activities, business process outsourcing (BPO), and information, communications, technology (ICT) industries. Areas designated as K1 in Figure I.6-3 are intended for an enterprise zone or a logistics park. The World Bank has indicated that the area south of the Mandela Highway is unsuitable for food processing due to waste-related projects also intended for the area.

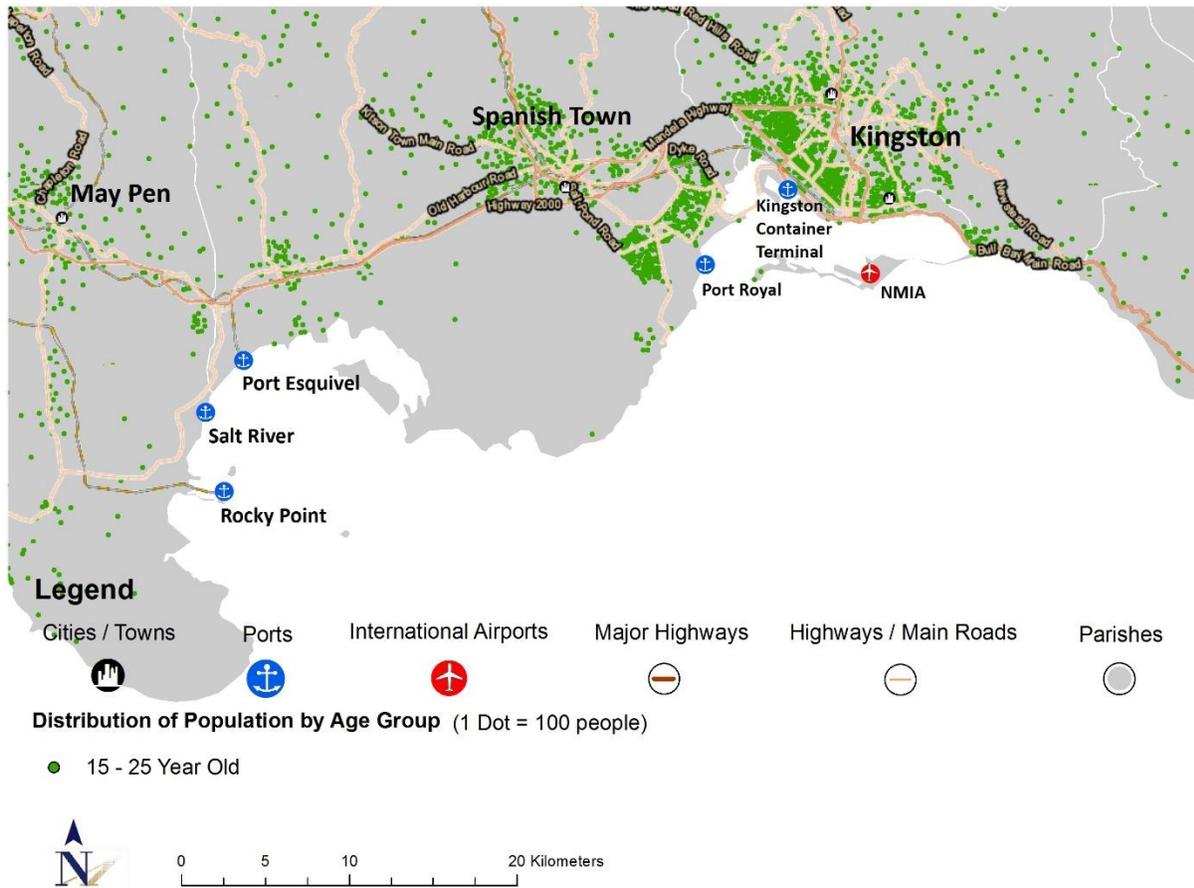
As indicated in Figure I.6-4, the CSEZ’s proximity to population centers – Portmore (population 182,000), Spanish Town (population 160,000), and Kingston (population 600,000) – provide it a potential labor pool between the ages of 15 and 25 years old. Thus, the CSEZ if developed would have access to a relatively sizable labor pool and provide economic benefits and jobs to the surrounding populations.

Challenges and Next Steps for CSEZ Development

Key challenges for development of the CSEZ were previously identified in the World Bank assessment. These include lack of infrastructure and utilities for power generation, water, waste treatment, flood mitigation infrastructure, and sufficient road capacity. The development of the CSEZ is still in its early stages. Figure I.6-5 outlines subsequent steps necessary for the rational development of the area prior to construction.

The forthcoming feasibility study is essential to determine industry sectors and identify companies to participate in CSEZ development, evaluate site and infrastructure needs, propose phases for the development of infrastructure, estimate capital investment costs, and determine the project’s overall feasibility.

Figure I.6-4: Population Distribution by Age Group, 15 to 25 Years Old



Source: Nathan Associates.

Figure I.6-5: Phases for CSEZ Development



Source: Nathan Associates.

I.6-2 Industry Analysis

The LHI industry analysis undertaken in Chapter I.5 identified the key industries (organized by commodities and services) as well as supporting industries and industry clusters most suited to take advantage of Jamaica's strategic position and capitalize on comparative advantages. These industries are described in Table I.6-2 and 1.6-3.

Table I.6-2: Industries by Commodity¹³⁴

Rank	Industry (Commodity)
1	Pharmaceutical Goods , and Medicaments NESOI, Mixed Or Not, In Dosage Etc.
2	Parts and Access For Motor Vehicles, and Motorcycles (INCL Mopeds) and Cycles With Aux Motor, and Bicycles and Other Cycles (INCL Del Tricycle) No Motor
3	Elec Water, Space and Soil Heaters; Hair Etc. Dry, Pt, and TV Receivers, INCL Video Monitors and Projectors
4	Medical, Surgical, Dental or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt
5	Air Conditioning Machines (temp and Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts

Source: Nathan Associates.

Table I.6-3: Industries by Service

Rank	Industry (Service)
1	Assembly and distribution services for general commodities, and general warehousing and storage
2	Refrigerated warehousing and storage

Source: Nathan Associates.

Based on the analysis conducted for the LHI in general, three main industry clusters and four supporting industry clusters were identified. The three primary industry clusters are described below, and four supporting clusters are listed for reference. Also included below is a discussion of complementary clusters.

Main Industry Clusters for the LHI

1. Light Manufacturing (Electrical Equipment, Appliance, and Component Manufacturing) Cluster

This cluster is the most critical for the development of the LHI. It is the largest cluster and consists of a majority of the top-ranked recommended industries identified through the analysis undertaken in Chapter I.5. This cluster is characterized by light manufacturing and assembly of household electronic products and motorcycles, their respective components, and industrial machinery used for light manufacturing of these products. Many of the components produced in this cluster would serve

¹³⁴ Industries are displayed in Harmonized System (HS) Codes. As described by the United Nations International Trade Statistics Knowledge Base, HS is an international nomenclature for the classification of products. It allows participating countries to classify traded goods on a common basis for customs purposes. Available at: <http://unstats.un.org/unsd/tradekb/Knowledgebase/Harmonized-Commodity-Description-and-Coding-Systems-HS>

as inputs for products manufactured in the Biomedical / Biomechanical Cluster discussed below, which would benefit from being locating adjacent to or in close proximity to this cluster.

2. Biomedical / Biomechanical Cluster

This cluster groups two of the sets of industries that scored the highest in the multi-criteria analysis discussed in Chapter I.5, Pharmaceutical Goods / Medicaments, and Medical, Surgical, Dental or Vet Instruments / X-ray Etc. Apparatus; Tubes, Panels, Screen, Etc. This cluster would benefit from close proximity to the Light Manufacturing Cluster due to the sharing of multiple electrical components, such as electric motors and generators, semiconductors, and circuits. Forming a Biomedical / Biotechnical Cluster would be beneficial given that it pairs two industries with fast growing global demand and high value impact. It also would provide incentives for Jamaica to invest in training and education in life science fields (particularly pharmacology and medicine).

3. Transportation and Logistics Cluster

Nathan recommends a Transportation and Logistics Cluster to be located on or adjacent to the property of Kingston's major ports and airports. This cluster would provide a wide array of services, including product assembly, distribution, general and refrigerated warehousing and storage, ship and truck maintenance and repair, and aircraft maintenance, repair, and overhaul. These services are critical for the successful development of any logistics hub or special economic zone.

Supporting Industry Clusters for the LHI

There are several LHI complementary industry clusters that are intended to support main industry clusters. These are intended to support workforce requirements, infrastructure development and maintenance, business transaction processing, and manufacturing inputs. These include:

1. Education and Knowledge Creation Cluster
2. Energy, Construction, Engineering, and Utility Services
3. Business and Financial Services Cluster
4. Chemicals, Plastics, and Primary Metals Cluster

Complementary Clusters Specific to CSEZ

In addition to the main and supporting industry clusters identified in Chapter I.5 for the LHI in general, there are additional complementary clusters that would specifically be pursued for the CSEZ. While most industries cited proximity to the KCT as a top priority when assessing the potential to locate to the CSEZ¹³⁵, agribusiness-related companies, such as food processing companies, prioritized locating near the agricultural source of raw materials. The industry analysis undertaken for the LHI did not include an Agribusiness and Food Processing cluster among the top recommended clusters, it should be noted that this cluster is considered a complementary cluster for CSEZ that could be established in a specialized agro-park closer to areas of agricultural development. This agro-park should be located within the CEDA so it can share logistics services with industries locating in the CSEZ.

¹³⁵ As determined from the inputs provided by the private sector, including analysis from of the World Bank assessment, industry interviews conducted by Nathan, and the investor/user survey.

Review of Existing Recommendations

Below is a brief summary of industries that were recommended for the CSEZ in the documents included as part of the literature review.

“Caymanas Special Economic Zone: An Initial Assessment of Options for the Private and PPP Development in the Context of Jamaica’s Global Logistics Hub Initiative and New SEZ Regime”

Prepared by the World Bank Group and funded by the Public-Private Infrastructure Advisory Facility (PPIAF) for the MICAF of the GoJ, this report provides “strategic advice to the Government of Jamaica” on PPP alternatives for developing the CSEZ. The report also includes a list of industries with potential to locate in CSEZ, which are listed in Table I.6-4.

Table I.6-4: World Bank Identified Sectors Willing to Locate to the CSEZ

Industry	Description	Sub-sectors likely to locate in CSEZ
Shipping, logistics and warehousing	Third party logistics service providers, distributors, cargo consolidators/de-consolidators, warehousing, open storage	Pharmaceuticals, automobiles, heavy equipment, 3PL, freight forwarders, reverse logistics, open warehouses
Non-food manufacturing and assembly	Packaging and labeling, pharmaceuticals, automotive assembly, electronics, heavy equipment, paper and medical devices.	Pharmaceuticals, packaging and labeling, automotive assembly, electronics, heavy equipment assembly, paper, medical devices
Food processing	Research and development, niche gourmet products, co-packing facilities	Niche gourmet products, research and development, co-packing facilities
Repair and refurbish	Appliance warranty centers, use autos	Used automobiles, appliance warranty centers
ICT/BPO	Call centers, contact center, back office services	Call center, contact center, back office support
Education	Universities, college, training centers, knowledge city, research and development	Universities, training center, city of knowledge, research + development

Source: The World Bank.¹³⁶

Caymanas Special Economic Zone: A Logistics Park, Business Concept, Ministry of Industry, Investment and Commerce

MICAF prepared a paper about the CSEZ and its role in the LHI. The document covers topics surrounding government objectives, a SWOT analysis, the role of Jamaica as a distribution hub of the Americas, the Caymanas Estate Development Plan, considerations for the CSEZ, potential customers and industries, and supporting infrastructure, among others. Potential industries identified in the report for Caymanas include:

- ▶ High Tech Manufacturing and Computer Industries
- ▶ Auto Parts and Automobile Industries (Damaged vehicle repairs and accessorizing)
- ▶ Electronic and Medical Equipment Industries
- ▶ Retail Consumer Goods Industry
- ▶ Transportation and Logistics Industry (3 and 4PLs, CEP, etc.)
- ▶ Warehousing and Distribution Centers

¹³⁶ Erdmann, Andrea. “Caymanas Special Economic Zone: An Initial Assessment of Options for Private and PPP Development in the Context of Jamaica’s Global Logistics Hub Initiative and New SEZ Regime,” The World Bank Group. June, 2015.

- ▶ Fashion and Garment Industries
- ▶ Aviation and Ship Spares Industries

Caymanas Estate Development Plan

Prepared in 2010 by the UDC, this report presents a broad development concept for UDC's land use distribution to maximize opportunities for the Caymanas Estate area. The report recommends and lists the following sectors and industry clusters:

Sectors:

- ▶ Information and communications technology (ICT)
- ▶ Manufacturing and agro-processing
- ▶ Creative industries (such as film and TV production and advertising)
- ▶ Research and Innovation (such as institutes and business incubation centers)

Industry clusters:

- ▶ Electronics assembly plants
- ▶ Light manufacturing facilities (crafts, agro-processing, etc.)
- ▶ Software development, telecommunications and information technology
- ▶ Pharmaceuticals
- ▶ Logistics and warehousing
- ▶ Small business incubation centers
- ▶ Research and Development
- ▶ Support and administrative services

Further, an enterprise zone was proposed to be zoned and designated as follows:

- ▶ ICT Zone: For software development, telecommunications/co-Location sites, logistics, biotechnology, business process outsourcing (BPOs), and IT/security consultancy (NOC).
- ▶ Industrial Zone: For agro-processing, food processing, manufacturing – furniture, garment (high-end), pharmaceutical operations, and assembly plants for electronics and IT.
- ▶ Creativity and Innovation Design Centre
- ▶ Film Studio and Back-Lot Complex: For film studios for motion picture and television production, and area for content development.
- ▶ Institute for Research and Development
- ▶ Incubation Centre: For new businesses
- ▶ Warehousing Zone

Table I.6-5 presents a comparative table of the industry sectors and clusters that were proposed for the CSEZ in the studies listed above as well as industry clusters and sectors that were proposed in Chapter I.5. All of the studies recommend light manufacturing and clean industries for Caymanas.

Table I.6-5: Comparison of Proposed Sectors and Industry Clusters by Different Studies

Suggested Category by Nathan	Nathan Potential Industries for LHI (2016) ¹³⁷	World Bank CSEZ Initial Assessment (2015)	MIIC CSEZ: A Logistics Park, Business Concept	UDC Caymanas Estate Development Plan (2010)
Industry (commodity)	<ul style="list-style-type: none"> Pharmaceutical goods and medicaments Parts and Accessories for motor vehicles and motorcycles Elec Water, Space and Soil Heaters; Hair Etc. Dry, Pt, and TV Receivers, INCL Video Monitors and Projectors Medical, Surgical, Dental or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt Air Conditioning Machines (temp and Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts 	<ul style="list-style-type: none"> Non-Food Manufacturing Pharmaceutical Automotive Electronics Heavy equipment Paper Medical devises 	<ul style="list-style-type: none"> High Tech manufacturing and computer industries Auto parts and automobile industry (damage vehicles and accessories) Electronic and medical equipment industries Fashion and garment industries Aviation and ship spares industries 	<ul style="list-style-type: none"> Light manufacturing Pharmaceutical
Industry (service)	<ul style="list-style-type: none"> Assembly and distribution of general commodities, and general warehousing and storage Refrigerated warehousing and storage 	<ul style="list-style-type: none"> Shipping, logistics and warehousing 3PL, distributors, consolidators, warehousing, open storage Non-food assembly Packaging and labeling, Automotive Assembly Food processing R&D, niche gourmet products, co-packing Repair and refurbishment Appliance warranty centers, used autos 	<ul style="list-style-type: none"> Transportation and logistics industry Warehousing and distribution centers 	<ul style="list-style-type: none"> Assembly plants – electronics Logistical planning and warehousing
Industry Clusters	<ul style="list-style-type: none"> Light manufacturing Biomedical Transport and logistics 	<ul style="list-style-type: none"> Non-Food Manufacturing and Assembly Shipping, logistics and warehousing Food processing Repair and refurbishment 		<ul style="list-style-type: none"> Software development, ICT Small business incubator center

¹³⁷ Industries are displayed in HS Codes.

Suggested Category by Nathan	Nathan Potential Industries for LHI (2016) ¹³⁷	World Bank CSEZ Initial Assessment (2015)	MIIC CSEZ: A Logistics Park, Business Concept	UDC Caymanas Estate Development Plan (2010)
Supporting Industry Clusters	<ul style="list-style-type: none"> • Education and knowledge creation • Energy, construction, engineering and utility services • Business and financial services • Chemicals, plastics, and primary metals 	<ul style="list-style-type: none"> • ICTB/BPO • Call and contact centers, back office services • Education 	<ul style="list-style-type: none"> • Retail consumer goods industry 	<ul style="list-style-type: none"> • General Support services
Other Potential Complementary Industry Clusters	<ul style="list-style-type: none"> • Agribusiness and Food Processing 			

Source: Nathan Associates.

Examples of Successfully Integrated Manufacturing and Mixed Use Land Development

Given that the collective recommendations of the studies cite light manufacturing industries, it is worth exploring other examples that have successfully integrated mixed-use land developments with light industries in an urban setting. An important requirement for industries locating in these types of zones is that their activities have no or minimal impact on surrounding properties through loud noises, vibration, noxious fumes, or other hazardous byproducts.

These kinds of industries typically include final-stage or clean manufacturing, wholesaling, and warehousing and distribution. The following light industries should serve as targets for such developments:¹³⁸

- ▶ Laboratories
- ▶ Light manufacturing and repair establishments
- ▶ Lumberyards
- ▶ Vehicle dealerships
- ▶ Distribution centers

The list below includes similar SEZ examples, which have clean industries located in urban areas:

- ▶ **Panama Pacifico** (Republic of Panama): This is a special economic zone with similar land use characteristics which includes residential, industrial, recreational, landscape. The main industry sectors located in this zone include logistics, value added manufacturing (light manufacturing), and ICT services.
- ▶ **Fulton County** (Atlanta, USA): Located within an urban environment, this site is promoting the development and use of existing buildings for food processing, high tech and manufacturing industries.

¹³⁸ Cotter, Dan. "Putting Atlanta Back to Work: Integrating Light Industry into Mixed-Use Urban Development" Georgia Tech Enterprise Innovation Institute 2012. Available at: <http://stip.gatech.edu/wp-content/uploads/2012/10/STIP-Dan-Cotter.pdf>.

- ▶ **Dholera Special Investment Region** (Gujarat, India): This mixed-use industrial and urban development is focused on ecofriendly industries for automotive and auto components, heavy engineering, medical devices and equipment, electronics industry, and a logistics park.
- ▶ **Shannon Special Economic Zone** (Ireland): This zone includes a variety of companies in the aircraft MRO and technology industries.
- ▶ **Logistics Parks in India:** Multiple Free Zones and SEZs have major demand from the following industries:
 - ▶ Automobile industry
 - ▶ Electronics and electrical industry
 - ▶ Textiles industry
 - ▶ Machinery and engineering services
 - ▶ Chemicals and pharmaceuticals
 - ▶ Food processing industry
 - ▶ Manufacturing SEZ's
 - ▶ Agricultural Sector
 - ▶ Retail Sector
 - ▶ Cargo export and import services

Table I.6-6 shows the sectors targeted by specific logistics parks in India.

Table I.6-6: Demand Sectors for India's Free Zones and Special Economic Zones

Location	Demand sectors
NCR Delhi	Industry (auto, textile, electronics, machine & engineering, SEZ's), retail and agriculture
Mumbai	Industry (electronics, pharma, textiles, auto components), retail, agriculture, export & import cargo
Chennai	Industry (auto, electronics, textiles, SEZ), retail, export & import cargo
Kolkata	Agriculture, export & import cargo, retail
Bangalore	Industry (electronics, textile, auto), retail, agriculture
Hyderabaad	Retail, industry (pharma)
Pune	Industry (electronics, auto, textile/garment), retail
Vishakhapatnam	Export & import cargo, industry (chemicals & pharma, SEZ) agriculture.

Source: Nathan Associates Inc. with data from Renaissance Infra Realty.

I.6-3 Recommendations for Site Development

Development of logistics parks is a lengthy undertaking. It involves a level of investor risk, requires a lengthy payback period for returns to investors, requires substantial government support for the development of utilities and provision of tax incentives and other fiscal benefits, and must be driven by demand. Industrial property in logistics parks and SEZs worldwide is used for a variety of purposes, including light-industrial activities and assembly, manufacturing, storage and distribution of material, parts, semi-finished and finished goods.

In the U.S. and much of Western Europe, major industrial parks are dominated by warehousing and distribution users. By contrast, in parts of Asia and the Pacific, manufacturing plays a far more

important role at industrial parks.¹³⁹ Further, companies with special property requirements or a desire for production flexibility tend to develop their own facilities, while companies leasing properties look for flexible tenure structures. Occupiers, developers and investors in industrial property are becoming more aware of environmental issues, and thus, also consider sites developed with minimal environmental impacts. Major warehouse facilities in Europe and the U.S. have an area of at least 46,450 square meters and may extend up to 92,900 square meters.¹⁴⁰

At the Warehousing Education and Research Council's (WERC) conference in April 2003, Arnold Maltz, Ph.D., an associate professor at Arizona State University, indicated that many warehouse facilities are beginning to resemble light manufacturing plants by performing value-added services. The activities that these facilities perform are increasingly becoming more important than the storage function of warehouses. These services include product configuration, finishing, packaging, labeling, ticketing, pricing, and creation of shelf-ready products, all at company owned-and-operated facilities, as well as at facilities operated by third parties.

Companies seeking to identify an appropriate location for a warehouse or logistics facility tend to seek out locations that minimize total logistics costs (transports, warehouse, and inventory) and where third party logistics or other supporting activities are available at or near the facility.

Recommendations

With all of the above in mind, Nathan recommends that the site is developed using standard factory buildings (SFB) that are pre-built "Class A", with roof heights of nine to 13 meters, dimensions of 60 to 85 meters, and floor capacities of five to six ton per square meter. Occupiers of industrial facilities normally look for modern space standards. As previously noted, logistics parks are capital intensive and demand driven. There are several examples around the world demonstrating developing phases for similar large pieces of property. As seen in Table I.6-7, first development phases of 80+ hectare projects range between 20 to 30 percent of total project. A similar development scenario is expected for CSEZ.

Table I.6-7: Industrial Development Agreed Investments versus First Phases Completed

	Logistics Park	Country	Agreed	Total Hectares	Proposed Development (SQ meters)	First phases Completed (SQ meters)	% Completion
1	Panama Pacifico	Panama	2007	88	440,000	152,200	34.6%
2	Clésud Distribution Park	France	1997	278	600,000	106,700	17.8%
3	Diamond Business Park Łódź	Poland	1998	12	51,000	46,116	90.4%
4	Napa Logistics Park	USA	2015	88	269,400	60,000	22.3%
5	DP World London Gateway Logistics Park	UK		226	859,000	29,408	3.4%

Source: Nathan Associates.

¹³⁹ See King Sturge, "Global Trends in Industrial Parks," January 2002. Available at: [http://inweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/\\$file/industrial%20parks.pdf](http://inweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/$file/industrial%20parks.pdf)

¹⁴⁰ Ibid.

Table I.6-8 provides further insights on development specifications to consider for the CSEZ, based on preferences and concerns of industry stakeholders. Location preferences indicate that shipping, logistics and warehousing, as well as non-food manufacturing and assembly industries will prefer to locate within the 121 hectares adjacent to KCT that are available for development. There are two primary reasons that support this logic; (i) due to the cost reductions of logistics efficiencies from port centric activities, and (ii) because the yearly lease rates of SFB in the CSEZ are expected to be higher than public free zone rates at the land adjacent to KCT.¹⁴¹

Table I.6-8: Industry Stakeholder Preferences and Concerns on SEZs Concerns about the CSEZ

Industry Sector	Preference	CSEZ Concern
Shipping, logistics and warehousing	Preference to locate near or on land available adjacent to KCT	Extra cost of cargo movement
Non-food manufacturing and assembly	SFB of 3,000, 5,500 and 14,000 square meter, would locate in CSEZ, nevertheless preference is Near or on KCT	<ul style="list-style-type: none"> • See CSEZ as a wishful development and not a short term project (theoretical development) • Industrial unrest • Pharmaceutical concern about discharge waste
Food processing	World standard buildings, 1400 to 3800 square meter of building space, strict guidelines for food industry standards. Tend to locate near agricultural raw materials. Therefore, such industries would prefer to locate in CSEZ.	Low-lying land with drainage problems
Repair and refurbishment	SFB and/or open lot	Law for used cars needs to be changed

Source: “Caymanas Special Economic Zone: An Initial Assessment of Options for Private and PPP Development in the Context of Jamaica’s Global Logistics Hub Initiative and New SEZ Regime.”

I.6-4 Transport Connectivity

As mentioned earlier, the CSEZ is located northwest of KCT, and provides the possibility of direct access to the port due to its close proximity and railway right of way. The current road connection options are as follows:

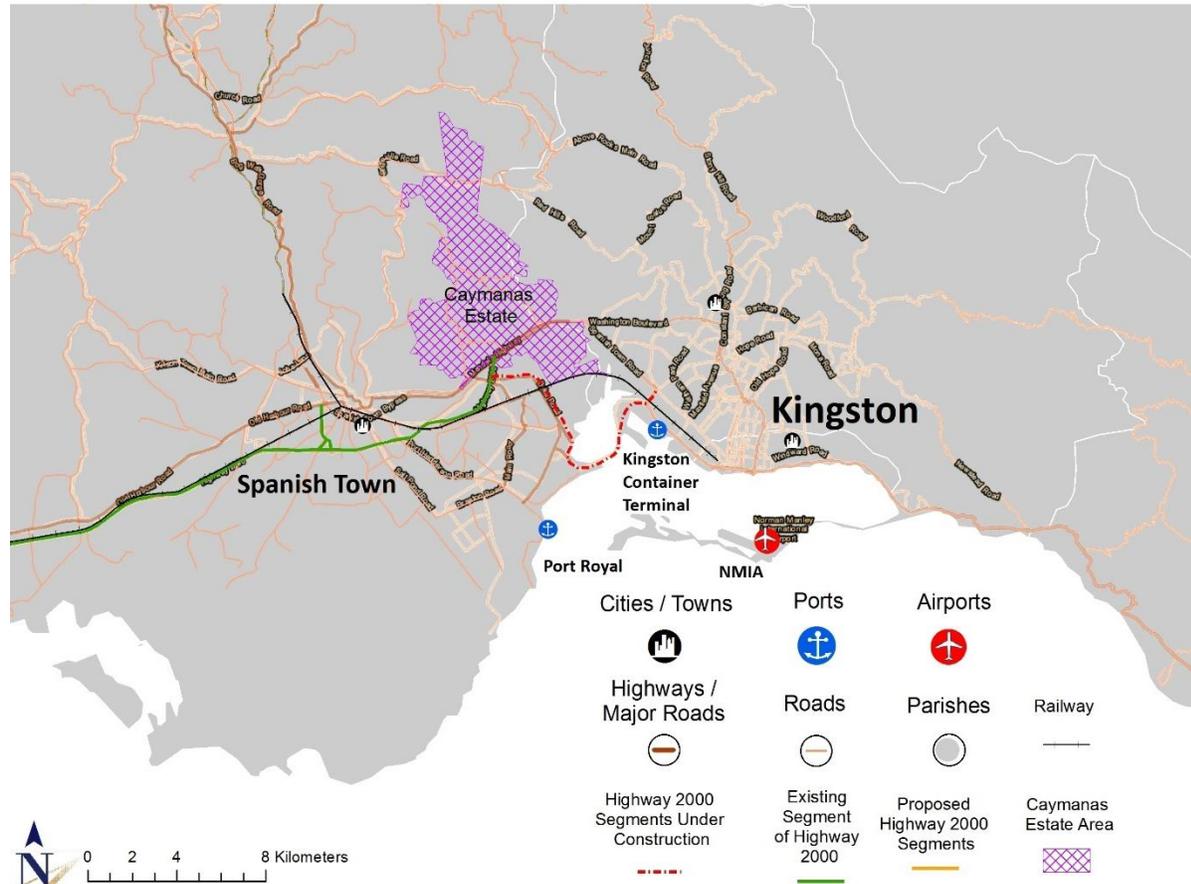
- ▶ 5.5 to eight miles (nine to 13 kilometers) away from KCT via Mandela Highway, with plans to widen the highway to six lanes;
- ▶ Upgrading the Dyke Road to connect Caymanas south site with the port, reducing the distance to 2.5 miles (four kilometers);
- ▶ Converting the old railway into a direct access road link between KCT and CSEZ

The World Bank recently developed an interim business case for *Jamaica Railways Rehabilitation Concession*. The report indicates that remnants of the Jamaica Rail Corporation lines run along the southern border of the proposed CSEZ, near the proposed sewage plants. This rail line is depicted in

¹⁴¹ Erdmann, Andrea. “Caymanas Special Economic Zone: An Initial Assessment of Options for Private and PPP Development in the Context of Jamaica’s Global Logistics Hub Initiative and New SEZ Regime,” The World Bank Group. June, 2015.

Figure I.6-6. Although the report stated that a rail link between KCT and CSEZ is not commercially viable,¹⁴² the rail right of way could be paved and converted into a fenced-in dedicated road, which could be utilized as a direct access link for trucks between the port and the CSEZ. The road would thus be considered either port property or CSEZ property, and would subsequently form part of the designated customs area in order to be operationally feasible.

Figure I.6-6: Kingston Transportation Network



Source: Nathan Associates.

I.6-5 Regulatory Framework Analysis

Jamaica’s SEZ Act was approved in early 2016 with the aim to modernize the current regime, conform to WTO rules, and transform the country into a global logistics hub. The new regime created the SEZ Authority. This authority will need to be supported by complementary regulations in order to perform its function as the regulatory entity for Jamaica’s SEZs. According to the SEZ White Paper prepared by the SEZ Steering Committee, the new regime includes measures for maximizing linkages between SEZ users with respect to customs. As a legislative tool supporting the LHI, the SEZ Act

¹⁴² World Bank Group, “Jamaica Railways Rehabilitation Concession – Interim Business Case.” Draft Report to the Development Bank of Jamaica. June 2013.

must incentivize investments in industry sectors leveraging the country's position to achieve this initiative. CSEZ, as well as all other SEZ's in the country will benefit from the SEZ Act.

The SEZ Act intends to create an enabling environment in which globally competitive firms will relocate to Jamaica, which in turn will drive the development of the LHI. It is envisaged that SEZs will operate within a modern, integrated framework that is efficient and predictable, facilitates sustainable linkages in the domestic economy, supports technology transfers, business innovation, entrepreneurship, human capital formation, and catalyzes a higher level of transformation in the industrial and social landscape of the country.¹⁴³ Key features of the SEZ Act include:

- ▶ Removal of export requirements;
- ▶ Deliberate interaction with the local business community; and
- ▶ Establishment of an autonomous regulatory authority.

SEZ Act outlines important fiscal incentives for investors willing to establish operations SEZs. These include:

- ▶ Corporate income tax headline rate of 12.5 percent (with and effective rate of approximately 7.5 percent under certain conditions),
- ▶ Asset tax relief,
- ▶ Customs duty relief,
- ▶ Relief from income tax on rental income,
- ▶ GCT relief (on all goods and services entering the zone),
- ▶ Employment tax credit,
- ▶ Promotional tax credit,
- ▶ Capital allowance,
- ▶ Relief from income tax on dividend,
- ▶ Stamp duty payable exemption,
- ▶ Relief from transfer tax and environmental levy payable.

Recommendations on those SEZ Act regulations that could benefit future development of SEZs in Jamaica are included in Chapter I.5.

The following points outline the regulatory challenges faced by the CSEZ:

- ▶ Adapting or reformulating customs practices under this new SEZ regime in order to attract investors, including the treatment of goods sold in SEZ will be challenging. The Customs Act amendments, including those expected to apply to the SEZ Act, are currently being considered by Parliament.
- ▶ The approach to private sector participation in the development of SEZ's, and in this particular case, of the CSEZ, are not yet defined. The feasibility study should recommend the optimal development options for CSEZ to the GOJ. It is anticipated that all individual SEZs, including the CSEZ, will be developed under Jamaica's new PPP program. PPP development specifications for CSEZ have not yet been defined, and there are several scenarios to consider, as indicated in the World Bank report. These include:

¹⁴³ "Jamaica Ministry of Industry, Investment, and Commerce. "Tabling of the White Paper on Special Economic Zones." (MIIC) Paper 116. 2015. Available at: http://www.miic.gov.jm/sites/default/files/pdfs/1523_2015%20Ministry%20Paper%20116.pdf.

- ▶ A joint venture with Factories Corporation of Jamaica;
- ▶ Long-term lease concession with a private developer, with no financial contribution from the government;
- ▶ Long-term lease concession with a private developer, with limited financial contributions from the government;
- ▶ Long-term lease or sale of land to a private developer, without a concession agreement.
- ▶ There is a precedent for a bidding process for Caymanas that was never approved by the Cabinet.

I.6-6 Cargo Demand Projections

As detailed in Chapter I.2, Nathan developed long-term cargo forecasts for the LHI. This forecast estimates the total cargo that the Jamaica Global Logistics Hub Special Economic Zones could expect to attract, based on the relative advantages of the island. In addition, the team extracted 6%, which represents the percentage of cargo handled in Jamaica that is consumed locally, of the total TEUs forecasted for the LHI for the Biomedical and the Light Manufacturing clusters. This forecast considered cargo flows from the following three industry clusters as identified in industry analysis:

- ▶ Biomedical / Bio-Mechanical;
- ▶ Light Manufacturing; and
- ▶ Transportation and Logistics.

Table I.6-9: Summary of LHI Cargo Demand Projections (TEU), 2016-2035

Industry Cluster	2016	2017	2018	2019	2020	2021	2030	2035
Biomedical equipment	11,877	12,447	13,044	13,670	14,326	15,014	21,994	27,191
Light Manufacturing	267,326	275,613	284,157	292,966	302,048	311,411	465,074	479,647
Share Destined for Local Consumption	16,752	17,284	17,832	18,398	18,982	19,586	29,224	30,410
LHI Total	279,203	288,080	297,201	306,636	316,374	326,426	487,068	506,838

Source: Nathan Associates. See “Projected Cargo Volume to Jamaica by Cluster” in Chapter I.2.

Cargo Allocation Factors

Several factors were considered prior to determining how to best allocate the projected cargo flows to the CSEZ:

- ▶ The industries and industry clusters recommended in Chapter I.5 generally align with the recommendations made in the World Bank’s initial assessment for the CSEZ, the MIIC CEZ logistics park business concept document, and in the UDC Caymanas Estate Development Plan.
- ▶ The World Bank’s initial assessment indicates that both logistics and manufacturing companies prefer to be located near a port facility and that KCT would be preferred in the

case of Jamaica.¹⁴⁴ The report also indicates that agricultural-related and food processing companies are willing to locate near agricultural sources, making CSEZ a suitable option for industries within this sector.

- ▶ The distance between the CSEZ and KCT is approximately 5.5 to eight miles (nine to 13 kilometers). It is estimated that this will add approximately USD\$100 to USD\$150 per container to transport costs between the CSEZ and the port¹⁴⁵.
- ▶ The Port Authority of Jamaica (PAJ), as well as Kingston Wharves Limited, are developing additional near-port facilities for logistics, warehousing, and light manufacturing (value-added activities). As well, there exists the possibility to utilize the Tinson Pen Aerodrome to help satisfy future demand.

Based on the cargo forecast for the LHI, we estimated a market share for the CSEZ. To do so, we considered the following variables. (Note that non-cargo producing industries, such as BPO, ICT, office parks, etc., are not included in the forecast.)

- ▶ **Situational analysis of the region where CSEZ is located:** A situational analysis of the proposed CSEZ was conducted to determine estimates of both current and future logistics requirements. This analysis relied on the data contained in previous chapters of this report, the World Bank’s initial assessment of the CSEZ, the Caymanas Estate Development Plan, the MIIC Caymanas SEZ: logistics park business concept, and interviews during Nathan’s field trip to Jamaica with current and potential stakeholders.
- ▶ **Existing and pipeline projects for the LHI:** As noted in Chapter I.3, Nathan conducted a review and assessment of existing pipeline projects. This was complemented by the industry analysis detailed in Chapter I.5. In determining relevant existing and pipeline projects Nathan considered the proximity to transportation nodes (highway, rail, ports, and airports), and size and available warehouse infrastructure (current and planned). Only projects for which at least an initial assessment or pre-feasibility study had been conducted were considered. There is risk of overinvestment in SEZs that could dissuade private developers’ participation.
- ▶ **Assessment of readiness for the CSEZ versus existing and pipeline logistics parks:** Nathan assessed each of the current and pipeline special economic zones, summarized each site’s logistics assets, shortcomings, and conducted an estimate of needed improvements at each site that considered both time and cost. Findings are detailed in Table I.6-10.
- ▶ **Strengths and Weaknesses:** Nathan compared strengths and weaknesses of CSEZ and other Logistics Parks.. Findings are detailed below Table I. 6-10.

Table I.6-10: Comparative Assessment of Readiness the CSEZ versus other Logistics Parks

Criteria	CSEZ	Kingston Wharves Limited	PAJ
Speed of implementation			
Development timeframe / status	5 - 10 years	Under construction phase	Targeted to start in 2016, Five year implementation

¹⁴⁴ Erdmann, Andrea. “Caymanas Special Economic Zone: An Initial Assessment of Options for Private and PPP Development in the Context of Jamaica’s Global Logistics Hub Initiative and New SEZ Regime,” The World Bank Group. June, 2015.

¹⁴⁵ Interviews during Nathans Associate meetings in Jamaica

Criteria	CSEZ	Kingston Wharves Limited	PAJ
Transport Infrastructure Accessibility			
Port	5.5 to 8 miles to port	Port-centric project	Port-centric project
Highway	Mandela Highway divides the property	Port Kingston Causeway	Port Kingston Causeway
Rail	JRC line run along CSEZ southern border	Near site railway	Near site railway
Air	33 km away from NMIA	20 km away from NMIA	22 km away from NMIA
Utility and Asset Infrastructure			
Existing Assets	Not yet constructed	15,000 sq mt of multipurpose warehousing space to increase existing capacity ¹⁴⁶	80 hectare logistics park
Drayage Costs - Port	USD\$100-150	Minimum - none	Minimum - none
Communication	Not yet available	All services available	All services available
Power	Not yet available	Service available	Service available
Water	Not yet available	Service available	Service available
Wastewater Treatment	Not yet available	Service available	Service available
Land availability	Sufficient land available for development (524 hectares potentially)	Limited	121.4 hectares of land available for expansion
Other	Major risk of flooding	N/A	Tinson Pen Aerodrome can be an area for potential expansion
Comparison of Strengths and Weaknesses			
Strengths	<ul style="list-style-type: none"> 80 hectares of available space for logistics and light manufacturing WB recommended lease rates for CSEZ will reflect market price 	<ul style="list-style-type: none"> Preferred site for shipping and logistics companies Port-centric development 	<ul style="list-style-type: none"> 121.4 hectares of port-centric undeveloped lands Port-centric development
Weaknesses	<ul style="list-style-type: none"> Utility infrastructure not yet developed; requires a long and expensive development phase Additional transportation costs 	<ul style="list-style-type: none"> Reaching full capacity occupancy (according to World Bank initial assessment of CSEZ) 	

Source: Nathan Associates.

CSEZ Forecasts

Through considerations of the aforementioned variables and the comparison above, Nathan developed two demand forecast scenarios: a “base” scenario and a “high” scenario, which are further detailed in the subsections below. The base- and high-case scenarios for the share of cargo flows that could be captured by the CSEZ are based on the trade flow analysis detailed in Chapter

¹⁴⁶ Data accessed from <http://kingstonwharves.com.jm/warehousing-logistics/>.

I.5. The output of this forecast is the percentage share of TEUs forecasted for the LHI that is estimated will be captured by the CSEZ for the three main industry clusters identified above. The forecast for the share of TEUs allocated to the transportation and logistics cluster is included and was calculated by adding the share of TEUs allocated for the biomedical and light manufacturing industry clusters. Table I.6-11 summarizes the CSEZ demand forecast projections under the two scenarios. Information on land allocation requirements for each cluster can be found in Chapter I.5.

CSEZ Forecast Methodology:

1. The preference of shipping, logistics and warehousing (pharmaceutical, automobiles, heavy equipment, third party logistics service providers, climate controlled warehousing, regular warehousing, open storage, reverse logistics and transit hub is to have facilities on or near KCT, near port facilities.¹⁴⁷
2. A 10,000 square-meters warehouse that is 9.5 meters' high (lower part) could store between 220 to 280 forty-foot standard (dry) containers, estimating 55 CBM usable capacity per container, and the equivalent of 5,000 to 8,500 pallets, depending on the storage system. While considering a cargo dwell time of 30 days for logistics and light manufacturing, this means that a hectare of warehouse can store 2,640 to 3,360 forty foot standard containers (dry) per year (or between 5,280 to 6,720 TEU/year).
3. The above space requirement of 5,280 to 6,720 TEU/year pertains to warehousing for storage purposes only. Because for each hectare of industrial space (including both warehousing for storage and manufacturing space) we apply a 50% share of warehousing for storage and a 50% share of manufacturing space, each hectare of industrial space can only fit half the amount required for storage (a total of 2,640 to 3,360 TEUs/year, or 3,000 TEUs in average).
4. Our forecast estimate for 2021 is 326,426 TEU with a total industrial space requirement of 109 ha. Applying the same logic as above, a total of 162 ha and 169 ha of industrial land use will be required by 2030 and 2035 respectively.
5. Assume full utilization of existing 16 available hectares of warehouse space in the LHI. Additional warehouse and industrial land use space will be required in Jamaica to accommodate forecasted LHI flows.¹⁴⁸
6. Assume that PAJ is able to develop at least 80 ha of its 121 ha adjacent to KCT (50% warehousing, 50% manufacturing) by 2021. Our estimate shows that least 10 additional hectares of industrial space would be required in the CSEZ.
7. Assuming 100% utilization in existing warehouse space and in the 121 ha adjacent to KCT by 2030 and 2035, our estimate shows that least 25 and 32 additional hectares of industrial space would be required in the CSEZ, respectively.
8. CSEZ must invest in developing basic infrastructure first, in order to be “developer ready”: wastewater treatment plant, water supply, power supply, and drainage.¹⁴⁹

¹⁴⁷ Erdmann, Andrea. “Caymanas Special Economic Zone: An Initial Assessment of Options for Private and PPP Development in the Context of Jamaica’s Global Logistics Hub Initiative and New SEZ Regime,” The World Bank Group. June, 2015.

¹⁴⁸ According to JFC the warehouse utilization, in 2015, was 81%.

¹⁴⁹ Erdmann, Andrea. “Caymanas Special Economic Zone: An Initial Assessment of Options for Private and PPP Development in the Context of Jamaica’s Global Logistics Hub Initiative and New SEZ Regime,” The World Bank Group. June, 2015.

Table I.6-11: CSEZ Forecast of Industry Clusters (in TEUs per year)

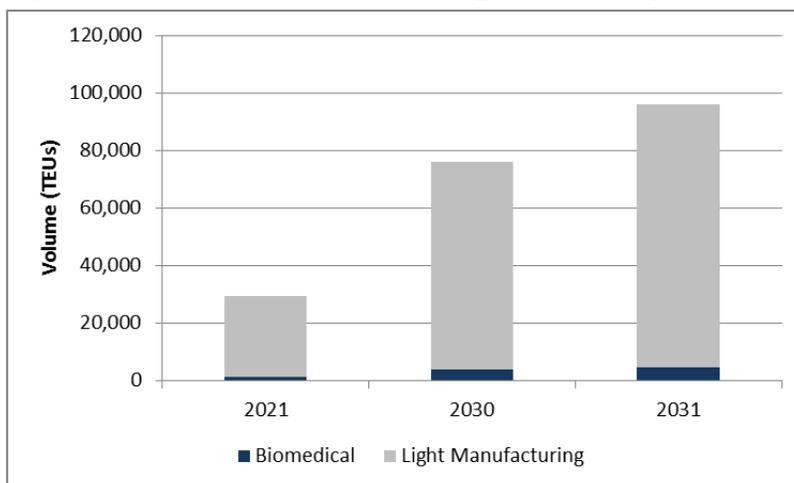
	2021	2030	2035
Base Scenario			
Biomedical	1,471	3,803	4,791
Light Manufacturing	27,953	72,264	91,046
Logistics ¹⁵⁰	29,425	76,068	95,838
Total CSEZ	29,425	76,068	95,838
Estimated required development (ha)	10	25	32
High Scenario			
Biomedical	2,943	7,607	9,584
Light Manufacturing	55,908	144,529	182,092
Logistics	58,850	152,136	191,676
Total CSEZ	58,850	152,136	191,676
Estimated required development (ha)	20	50	64

Source: Nathan Associates.

Base Scenario

This scenario assumes that the first phase of development of the CSEZ occurs over a five-year period. It was developed assuming that industries would be provided preference to locate to land available in or near the KCT versus locating to the CSEZ. Also taken into account is the fact that the CSEZ must develop basic infrastructure. Further assumptions were made that initial development at Caymanas would be on the north site (space committed to FCJ) and that some industries are not necessarily required to be located near port facilities. The scenario also assumes that the Mandela Highway is widened to six lanes to avoid truck traffic congestion. Finally, the scenario assumes that 10 percent to 20 percent of the total logistics and utility infrastructure at the CSEZ is developed during a five-period with completion in 2021. Hence, the forecast period begins in 2021. Figure I.6-7 shows the base scenario projected volumes.

Figure I.6-7: Base Scenario for CSEZ Cargo Demand Projection, 2021-2035



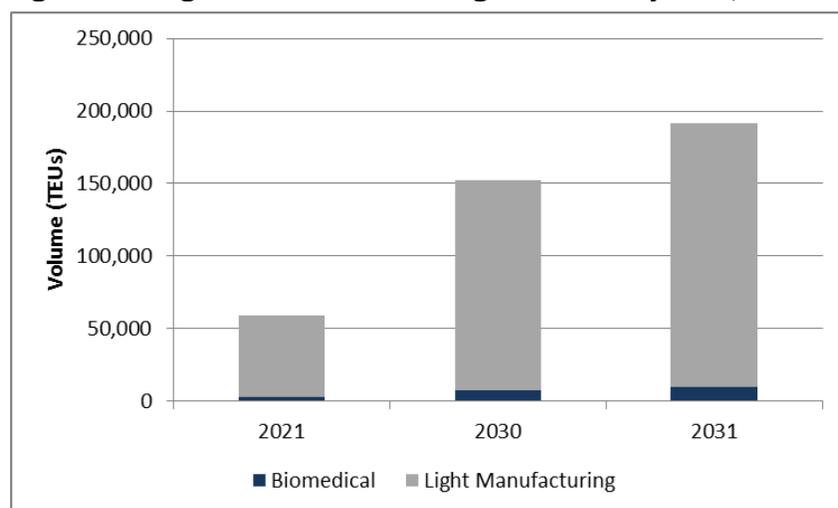
Source: Nathan Associates.

¹⁵⁰ Warehousing & Logistics cluster space requirements are accounted for within the Biomedical and manufacturing clusters.

High Scenario

This scenario assumes that the first phase of development of the CSEZ occurs over a five-year period. It also assumes that all improvements and widening of the Mandela Highway are completed and that the aforementioned rail right of way is converted into a highway dedicated for truck traffic. This would connect the KCT and CSEZ directly, making the zone an extension of the KCT and exempting cargo transiting between the two facilities from any customs procedures. Lastly, the scenario assumes that 30 percent of the logistics and utility infrastructure at the CSEZ is developed during a five-year period with completion in 2021. Under these assumptions, a larger share of industries chooses to locate in CSEZ due to its highly improved accessibility from KCT. Hence, the forecast period begins in 2021. Figure I.6-8 shows the high scenario demand projections.

Figure I.6-8: High Scenario for CSEZ Cargo Demand Projection, 2021-2035



Source: Nathan Associates.

I.6-7 Conclusions

While developing port-centric facilities are currently being prioritized given that new operators' logistics and industrial facilities will naturally seek locations closest to a port, outside locations for development of logistics and manufacturing zones, such as the CSEZ, also represent an important component of the GoJ's SEZ strategy and the LHI. The ability of the LHI to attract the industries discussed in this chapter and in Chapter I.5 – biomedical, light manufacturing, and transportation and logistics – will ultimately depend on the availability of labor at competitive prices and accessible industrial-zoned land.

With sufficient infrastructure investment and access to a competitively priced labor market, it is estimated that the CSEZ could capture up to five percent of cargo flows by 2035 in the base case and up to 11 percent of cargo flows by 2035 in the high case for the aforementioned industries. The development of an SEZ at Caymanas would satisfy both requirements, providing the space requirements needed to meet the demand projections discussed in the section above and a location near population centers from which labor could be sourced.

The value proposition below in Table I.6-12 is intended to communicate the competitive advantage that industries would gain from locating their operations at the CSEZ and from alignment with the vision of the Global Logistics Hub. It logically extends from the value proposition for the LHI

discussed in the conclusion for Chapter I.5 and is based on the results of the market analysis undertaken in this chapter.

Table I.6-12: CSEZ Value Proposition

“The Caymanas Special Economic Zone: A modern and sustainable port-centric facility at the heart of the Global Logistics Hub.”

Invaluable benefits include:
▶ Up to 524 hectares of greenfield land for industrial and other development
▶ Direct access to the Kingston Container Terminal
▶ Modern, state of the art, environmental-friendly facilities suitable for light manufacturing and logistics industries
▶ Access to skilled and scalable labor
▶ State of the art residential, commercial, and recreational facilities.

Part I.7 Results of the Market Study

Jamaica is in the process of fulfilling its vision to become a Global Logistics Hub. It can do so by capitalizing on its geographic advantages and market opportunities in logistics and transshipment serving major trade corridors. With port expansion and complementary logistics facilities already underway, Jamaica can leverage these assets to move beyond transshipment and attract investments in value-added industries with access to a potential consumer market of about 600 million people in the region. Jamaica is poised to insert itself into the global supply chain as the trend towards the shipment of intermediate goods continues to increase.

However, Jamaica's role is not guaranteed as there are emerging rivals in the region that are also developing logistics-like hubs. Therefore, it is incumbent upon Jamaica to determine its role within the supply chain and identify the areas in which it is most competitive. Enhancing competitiveness itself involves a complex set of factors: the ease of the regulatory regime, the existence of reliable and cost effective infrastructure, an integrated system for receiving, processing, and shipping goods, competitive utility rates, global transport connectivity, and human capital availability.

The first part of this project sought to assess the markets and identify constraints towards achieving Global Logistics Hub status, specifically the underlying market demand and in areas where Jamaica is most competitive, especially vis-à-vis its emerging rivals.

Vision

The first task was to create a Vision Statement for the LHI that provides the end-state condition following the course of the hub's development. The statement was created through a workshop that included a range of stakeholders, both private and public, to elicit views on what the vision statement should reflect given global events and Jamaica's foreseen role and position in the world's global trading system. During the session and through an iterative process, the following consensus-built vision statement was formulated:

Jamaica, the global logistics gateway interconnecting the Americas to the world.

This vision statement sets the direction for developing the LHI. It provides stakeholders a unified approach for realizing the vision, progressing from an island in the midst of global trade flows to one that becomes the gateway for these trade flows, while adding value along the way. This statement is both clear and powerful enough to induce action while recognizing Jamaica's unique advantages and market potential.

These considerations and overall vision were integral in the subsequent tasks, including exploring the opportunities denoted by relevant trade corridors, identifying conditions constraining competitiveness, examining planned projects and implications for the LHI, and defining the economic clusters relevant to the LHI as well as the Caymanas special economic zone. The results of these analytical tasks serve as a basis for the second part of the project, which is focused on the "how to" strategy of making this vision become reality, while backed by analytical results.

Demand

Chapter I.2's Trade Flow Analysis provided a demand assessment derived from trade flows relevant to Jamaica and the region. The assessment included maritime trade flows defined by Jamaica's own trade, trade between Jamaica and the Caribbean and Latin American regions, and inter-regional trade as defined between the Caribbean and other world regions. Additionally, the air cargo market trades that are relevant to Jamaica were also explored as well as Jamaica's current air connectivity. The results of the trade flow analysis show that Jamaica has the potential to capture substantial trade that will engender a host of activities associated with freight handling, value-added, and light manufacturing activities. With improved performance in transport and logistics services, Jamaica can expect to insert itself into the global supply chain for certain trade flows.

More specifically, the analysis shows that Jamaica can be processing over 0.63 million TEUs and 1.01 million TEUs in cluster-related volumes by 2020 and 2035, respectively. Total container volumes increase substantially with the addition of transshipment traffic, with 1.63 million TEUs and 2.0 million TEUs by 2020 and 2030, respectively. This forecast assumes that the JLHI will be successful in providing competitive logistics services and an improved business enabling environment that supports the successful settlement of light industry and distribution centers as well as an enhanced trade facilitation approach by Customs. The key is that the cargo reflected in the forecasts is already being served by other countries, so for Jamaica to attract it, it needs to offer better conditions than the other countries. To become more attractive, Jamaica needs to increase connectivity and reliability, which will occur with increased transshipment volumes, and reduced costs and time through improved road, air, port, and logistics services.

While future air cargo volume prospects are not as impressive or even vital for Jamaica to become a successful logistics hub, Kingston's airports can offer a complementary freight option for high-value-low-weight, perishable, and time-sensitive products, particularly if air connectivity can be improved. This can be achieved with NMIA improvements in the short-to-medium term with a BOT arrangement with a global airport operator.

Supply

Moving to the internal supply of services, the Pipeline Chapter analyzes the current and planned projects related to initiatives that can support the vision of the LHI. Jamaica already has substantial logistics-related assets: a very well developed maritime transport sector (including two competitive and efficient terminals in Kingston among many other specialized terminals), three international airports, an expanding road network, existing free trade zones and others under development, access to globally-connected IT services, and utilities. There is also a long list of potential projects related to Jamaica's LHI that were reviewed. From our analysis, the following pipeline projects have been classified as strategic and were recommended for implementation within a 5-year horizon and prioritized as follows:

12. KCT concession-related improvements;
13. KWL dredging, rehabilitation, and equipment investment;
14. PAJ 80-hectare Port-Centric Logistics Park development with private sector;
15. Caymanas SEZ construction and development based on UDC land-use suggestions;
16. Railway right of way near CSEZ for conversion to a dedicated truckway connecting KCT directly with Caymanas SEZ;

17. Education and training initiatives, including changing the Caribbean Maritime Institute status to a Maritime University and providing logistics services training at the HEART Trust NTA training agency;
18. KWL Total Logistics Facility warehouse construction;
19. JP Cold Storage Facility infrastructure investment;
20. NMIA privatization, including modifications to the capital structure; and
21. North South Link of the Highway 2000 Project and South Coast Highway (Harbor View to Portland Highway) investments.

For the longer term planning horizon, key projects include the planning and development of an additional container terminal in the Kingston area (such as the development of Port Augusta); reserving the area for an additional airport in the future (such as the Vernamfield International Airport and Cargo Hub); and pursuing complementary initiatives to prepare for providing higher-value logistics related activities (such as facilitating activities to become an international financial hub).

Competitive Position

Through a benchmarking analysis, in which Jamaica's was assessed relative to eight other countries in the region, Jamaica's current standing places it in the lower quarter of relative competitiveness. This benchmark analysis was conducted on the basis of 38 indicators that are categorized in four pillars, including infrastructure, business environment, human capital, and technology. However, it is highly likely that Jamaica will move up the rankings given ongoing logistics asset development, particularly with port expansion, Customs modernization, and warehousing development currently underway and the logistics improvements these will bring. The model's application also shows that Jamaica can move up to the top quarter ranks assuming improvements in infrastructure and technology categories, serving to inform strategies needed to establish itself as a logistics hub. The improved scenario analysis also shows that Jamaica can make significant gains in the Infrastructure and Technology pillars if it focuses attention on improving certain infrastructure and IT.

The main areas where Jamaica can improve its infrastructure ranking are by improving maritime and air connectivity and improving the logistics chain. The maritime liner connectivity will likely improve in the short term with the concession of KCT, and air connectivity levels can improve with recent developments in Jamaica's bilateral air agreements. Jamaica also has an opportunity to harness technological opportunities on the island since there is a high capacity for access to technology.

Once Jamaica has begun its transformation into a global hub, there are longer term opportunities to invest in education and training to continue to evolve the hub to the next phase and serve higher value global supply chain activities in production, design, marketing, logistics and finance. Some of these efforts are underway with recently passed legislation to facilitate the creation of an international financial services center.

The benchmarking analysis is also complemented with a qualitative comparison of the characteristics and investment plans of the major logistics assets in Jamaica and competitor countries. The assessment revealed that many competitor countries are investing in infrastructure to increase their logistics capacity and many have port, airport, and free zone development areas that are in close proximity. However, there is also concern that Caribbean ports are headed in the direction of overcapacity; this could be true for Jamaica as well given our forecasts and capacity availability after ongoing improvements in Kingston. Unlike many other rival countries, however, Jamaica has the commitment of major mainline carriers that benefit from location in Kingston. Given

the investment commitment, it is highly unlikely that Jamaica would lose these mainline carriers to rival countries.

Industries

The industry analysis showed that with the right investments in infrastructure and logistics, coupled with requisite policy and regulatory improvements, Jamaica will be positioned to market itself as a global logistics hub. The industry analysis was conducted using inputs from the other analytical tasks as well as an analysis of Jamaica's investment trends and a local and international investors' survey.

The commodities that may be of most interest to industries located in the Jamaica Logistics Hub are those with the highest trade flow volumes and values as identified through our analysis (e.g., electric water, space, and soil heaters; TV receivers; parts and accessory for motor vehicles), as well as intermediate products that may be imported to Jamaica for value-added activities (e.g., assembly of automobiles and motorcycles) and subsequently exported to the US and Latin American markets as finished products. Additional commodities that may be of most interest to industries located in the LHI were recommended based on strengths and opportunities identified in the SWOT analysis, such as pharmaceutical products and medical equipment. While the largest shares of commodities flowing from Latin America and Jamaica to the US-East Coast are primary products (such as minerals), a significant flow of food and beverage commodities provides the LHI with opportunities to engage in further value-added activities in the food processing and packaging industries.

Through a multi-criteria analysis, we identified key industries and industry clusters that are most suited to take advantage of Jamaica's strategic position and capitalize on comparative advantages. Key industries organized by commodity include¹⁵¹:

- ▶ "Pharmaceutical Goods, and Medicaments NESOI, Mixed or Not, In Dosage Etc."
- ▶ "Parts and Access for Motor Vehicles, and Motorcycles (INCL Mopeds) and Cycles With Aux Motor, and Bicycles and Other Cycles (INCL Del Tricycle) No Motor"
- ▶ "Elec Water, Space and Soil Heaters; Hair Etc. Dry, Pt, and TV Receivers, INCL Video Monitors and Projectors"
- ▶ "Medical, Surgical, Dental or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt"
- ▶ "Air Conditioning Machines (temp and Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts"

The three primary industry clusters are light manufacturing, biomedical/biomechanical, and transportation and logistics. Nathan recommends that priority be given to pursuing and assigning space for these clusters in the Jamaica Logistics Hub. Space requirements for the Logistics Hub, including the Caymanas Special Economic Zone, were also provided.

It should be noted that to achieve these goals, Jamaica must enhance its competitiveness, which is no easy feat. While Jamaica, with its modernized marine terminals, has the underpinnings needed for attaining global logistics hub status, it is at a disadvantage given its current institutional and regulatory and enabling environment. Nathan recommends several specific interventions, including

¹⁵¹ Industries are displayed in Harmonized System (HS) Codes. As described by the United Nations International Trade Statistics Knowledge Base, HS is an international nomenclature for the classification of products. It allows participating countries to classify traded goods on a common basis for customs purposes.

promotion of policies that require government agencies to develop e-government portals to simplify and streamline administrative procedures such as the implementation of a modernized “single window’ system for SEZ users.

Development of Caymanas SEZ

The Caymanas Special Economic Zone (CSEZ) represents an important component of the GoJ’s SEZ strategy and is an ideal area to develop a major logistics hub node. Using the information and analysis from the general market study and a review of existing studies, we provided a pre-feasibility assessment of the Caymanas SEZ. The consensus reached is that CSEZ should focus on light (clean) manufacturing, followed by biomedical equipment and transportation and logistics.

With sufficient infrastructure investment and access to a competitively priced labor market, it is estimated that the CSEZ could capture up to five percent of cargo flows by 2035 in the base case and up to 11 percent of cargo flows by 2035 in the high case for the aforementioned industries. This means a total of 95,838 and 191,676 TEUs in the base case and high case, respectively. The development of an SEZ at Caymanas would satisfy both requirements, providing the space requirements needed (which is 32 hectares for the base case and to 64 hectares for the high case, respectively, by 2035) to meet the demand projections discussed in earlier in the report and a location near population centers from which labor could be sourced.

Looking Forward

Key to Jamaica’s success is the provision of efficient and reliable logistics services, which in turn will serve as the backbone for industrial development. This part of the project was a key input into the master plan configuration. The master plan incorporates the potential demand for the LHI globally as provided in the trade flow analysis and the expected demand from the industries identified in the Industry Analysis. The projects were vetted against the existing and planned projects that have been identified in the Pipeline Chapter and in consideration of the regional competitive landscape as provided in the Benchmarking Analysis. Part II of this report also includes an analysis of both structural and non-structural gaps that are required to be filled in order to fully implement the LHI. A comprehensive implementation strategy follows the master plan and gap analysis in order to help guide Jamaica towards the vision of becoming a “*global logistics gateway interconnecting the Americas to the world.*”

Part II Introduction

The global economy is undergoing a significant transformation. Productivity and output are increasingly driven by knowledge embedded in people and technology. Market dynamics, infrastructure and human capital needs, and basic economic organization are all changing in accord with what is needed for improved global competitiveness; the changing dynamics can have implications for the role of countries in the global trading system. The emerging global trading system means that factories do not have to produce goods in their final form at factory locations. Instead, the distributed manufacturing paradigm, where raw materials are decentralized and the final product is manufactured, assembled, and distributed closer to the final customer than in centralized manufacturing, has replaced the traditional highly-centralized manufacturing paradigm. To a great extent, material supply chains have been replaced with digital ones to enable the emergence of distributed manufacturing.

Noted management expert Peter Drucker has said that one of the greatest challenges facing companies is “to bring the outside in” – in effect, to see ourselves as others see us or want us to be. The same can be said for countries – that is, in order to capture or expand markets, countries have to see factors weighing in on location decisions in the way the customer does.

Businesses seek to geographically position themselves in the global economy where it makes sense to do so, particularly where costs to produce and distribute goods are lower than their prevailing conditions. So if countries see themselves as others see them, but they also see the market factors as prospective customers do, then countries can expect to capture economic growth opportunities provided they mitigate factors that hinder competitive advantage.

Logistics has been declared by Jamaica as a priority for achieving sustainable economic growth through the country’s Logistics Hub Initiative (LHI). While Jamaica has large assets that provide existing and prospective businesses important advantages, the Port of Kingston and the connectivity the port enables being two examples, there are challenging conditions in Jamaica, particularly in the areas of GDP growth, fiscal health, and high unemployment that indicate that Jamaica’s economy has struggled to adapt to the new global economic realities. However, Jamaica has seen the challenge and has enlisted international economics consulting firm Nathan Associates Inc., supported by global planning and engineering firm Louis Berger, to assist in the development of a master plan and development strategy that will require realigning goals and strategies in accord with these perspectives. Realignment normally means a government-wide call-to-action to dramatically enhance Jamaica’s Logistics Hub Initiative value proposition¹⁵²:

¹⁵² The LHI value proposition was developed by the Nathan team as a component of the Phase Report’s Chapter 5 to communicate the four pillars of Jamaica’s LHI and the value offered by the Jamaica Logistics Hub to potential investors.

Jamaica's LHI Value Proposition

"The global logistics gateway enabling an internationally competitive environment to connect your business to the world."

The Jamaica Logistics Hub offers:

- ▶ Strategic access and proximity biggest global markets
- ▶ Skilled and scalable labor
- ▶ Enabling transportation and logistics infrastructure
- ▶ An attractive business environment for value added activities
- ▶ Strategic SEZ planning for industry clusters
- ▶ Light manufacturing cluster
- ▶ Biomedical / biomechanical cluster
- ▶ Transportation and logistics cluster

Following the guidance of this Part 2 of the project, and the accompanying development strategy, Jamaica's LHI will offer strategic access and proximity to global markets, a skilled and scalable workforce, and Special Economic Zones (SEZ) to support industry clusters. The proposed transportation and logistics infrastructure as well as the Caymanas and Vernamfield concept plans included within this report will support the LHI's value proposition to offer an internationally competitive environment to connect businesses to world markets.

The Master Plan is presented in two parts, together embodying Part 2. The first addresses the land use requirements given the results of Part 1 (the Market Assessment). The second, presented as the Gap Analysis, identifies the varying needs that have to be addressed to attain the LHI vision.

Part II.1 Land Use Master Plan

The LHI master plan along with the identified infrastructure improvements build upon the work undertaken in the first part of this project, particularly with reference to both demand- and supply-driven development. Demand-driven requirements over a 20-year planning horizon are based on the traffic forecasts presented in the Part 1. Supply-driven development accounts for the cluster effects that can be generated by industrial development and rival firm location decisions spurred by “first-mover” firm decisions to relocate to a new market.

While the land use detailed in this master plan is driven by market demand, it is assumed that as demand-driven development occurs (in fact, it is already underway in Jamaica), supply-driven projects will ramp up. In fact, although the traffic volumes associated with the pipeline projects identified in Part 1 were forecast to 2035, supply-driven development will initiate well before that time horizon. Thus, the planning concepts highlighted in detail in this chapter are contingency-based, with facilities recommended to accommodate projected demand, but with sufficient flexibility so as to allow planners to respond to changing conditions as industry reacts to development in Jamaica.

This master plan then identifies locations for port and airport operations and facilities upgrades, logistics, industrial, institutional, and residential land uses as well as primary and secondary roadway networks and railroad improvements. The projects included within the master plan are presented in the LHI facilities connectivity map, subarea maps, concept plans for the Caymanas Estate Development Area and Vernamfield Airport City, and the Phasing Land Use Master Plan concept layouts, as presented in Figures II.1-1 to II.1-18.

The sections that follow include an overview of the overall project and site selection methodology and descriptions for each proposed project. We also present the selected LHI proposed projects through a set of infrastructure drawings and land use and phasing maps. Each of these drawings and maps includes a thorough description of the functions of each project as it relates to the LHI, as well as its respective land requirements by land use and building type.

II.1-1 Project and Site Selection

The projects and sites included within the master plan were selected based on the findings presented in Part 1 of the Jamaica LHI Market Analysis and Master Plan, interviews with stakeholders, including potential land developers and government ministries, prior development concepts, as well as each project’s geographic location and its potential to support development of the LHI.

Part I Pipeline Projects

Part I of the Jamaica LHI Market Analysis and Master Plan assessed the underlying market demand and identified constraints that can limit Jamaica’s ability to become a global logistics hub. The analysis identified pipeline projects recommended for implementation within a 5-year time horizon. Pipeline projects are those that have been identified as strategic, which will support the vision of the LHI. These projects were prioritized as follows:

1. Kingston Container Terminal (KCT) concession-related improvements;
2. Kingston Wharves Terminal (KWL) dredging, rehabilitation, and equipment investment;
3. Port Authority of Jamaica (PAJ) 80-hectare port-centric logistics park development with private sector participation;
4. Caymanas SEZ construction and development based on Urban Development Corporation (UDC) land-use suggestions;
5. Railway right-of-way near Caymanas SEZ for conversion to a dedicated highway connecting KCT directly with Caymanas SEZ;
6. Education and training initiatives, including rebranding the Caribbean Maritime Institute to the Maritime University, providing logistics services training at the HEART Trust NTA training agency, and constructing a campus in the Caymanas Estate offering degree and certificate programs in logistics-related fields;
7. KWL Total Logistics Facility warehouse construction;
8. JP Cold Storage Facility infrastructure investment;
9. Norman Manley International Airport (NMIA) privatization, including modifications to its capital structure;
10. Highway improvements: north coast highway improvements (A1; Ocho Rios to Montego Bay), north south link of the Highway 2000 Project and south coast highway (Harbor View to Portland Highway) investments;
11. Expansion of air cargo warehouses and cold storage facilities at Sangster International Airport (SIA).

These pipeline projects were further refined following a team site visit to present Part 1 findings and are identified in Figures II.1-1 through II.1-18. Proposed projects included in the master plan are further described in Section II.1.2 below.

II.1-2 Master Plan Projects

To advance Jamaica's competitive position as a preferred Western Hemisphere transshipment hub, improvements to seaports, airports and landside logistics centers are required as outlined within this master plan. Economic activities and projects that support and encourage growth must connect logically within an improved transportation system that adds efficiency and capacity for the movement of goods, services, and people. These elements together comprise the master plan; project descriptions are provided below for each proposed project. Additionally, master plan elements are shown graphically for the following:

- ▶ Jamaica Logistics Hub Facilities Connectivity
 - Full build-out of all LHI projects planned
 - Phased layouts throughout 4 phases for supply-driven development
- ▶ Jamaica Logistics Hub Subarea Maps
- ▶ Concept Land Use Plans:
 - Caymanas Estate Development Area (CEDA)/Special Economic Zone (CSEZ)
 - Phased layouts throughout 4 phases for both supply-driven and demand-driven development
 - 3D rendition of land use plan
 - Vernamfield (VF)
 - Phased Layouts throughout 4 phases for supply-driven development
 - 3D rendition of land use plan

JLHI Logistics and Facilities Connectivity Improvements

The proposed LHI facilities connectivity plan (Figure II.1-1) captures major logistic hub components within a network of existing and improved routes. The Kingston area's large population and infrastructure density anchor the southern portion of the logistics hub, which extends to include the area between the Caymanas Estate and Vernamfield as an economic corridor. Planned improvements to and links between SEZs within the corridor include the Norman Manley International Airport, Caymanas and extends west to Vernamfield, an airport city planned for longer-term growth. New highway interchanges will connect the south coast and north coast highways, and improved facilities will enhance cargo and passenger operations for the Ian Fleming International Airport east of Ocho Rios, and for the Sangster International Airport at Montego Bay.

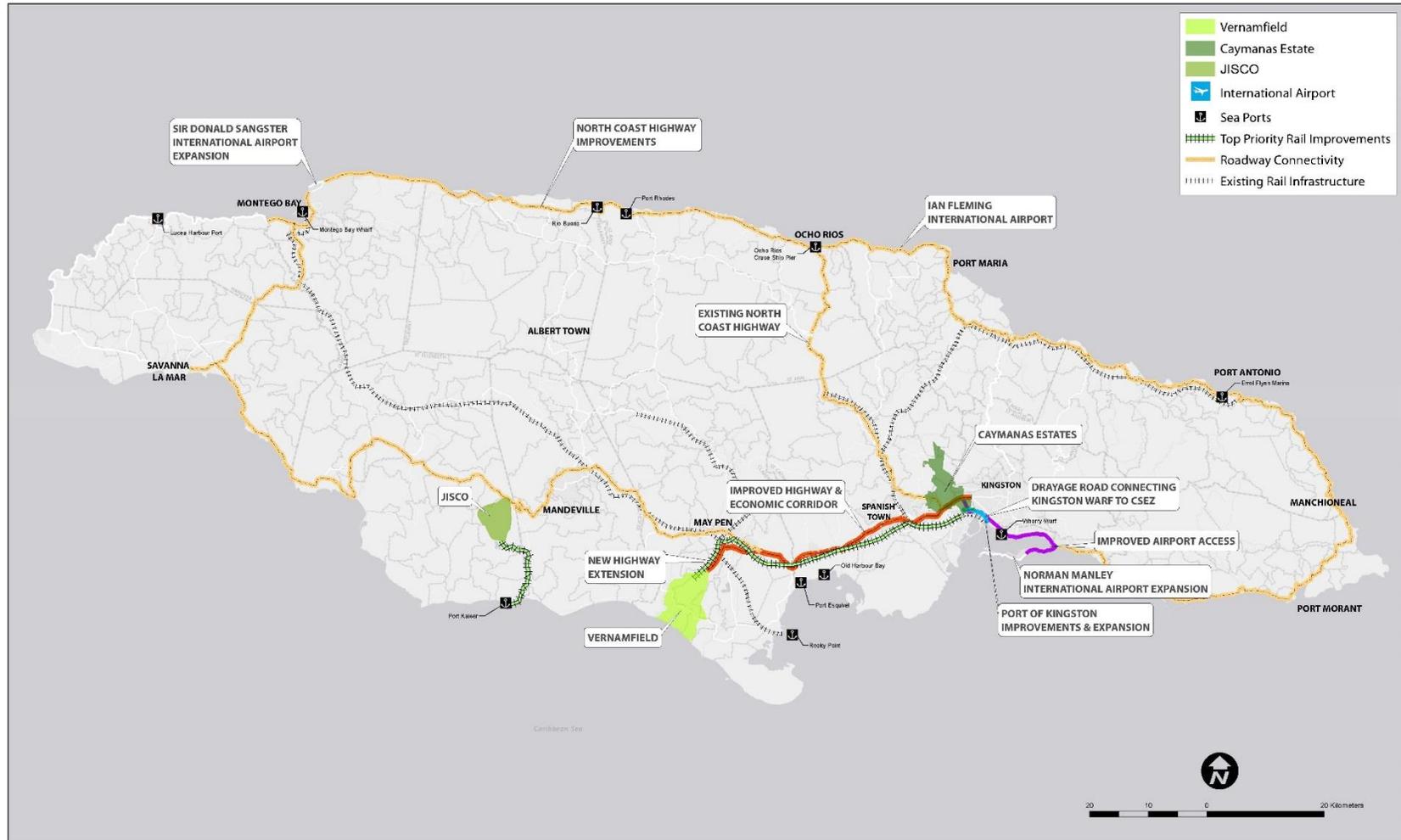
The Part 1 market study and projections will drive demand-based development priorities, including connectivity between major SEZs. Accordingly, demand-driven development has been phased with the first phase (short-term) corresponding to 2021, the second (mid-term) to 2030, and the third (long-term) to 2035. Additional smaller projects will spin off to support other economic zones and communities across Jamaica. Some master plan initiatives, such as Jamaican Railroad revitalization and new towns (portions of Caymanas and the Vernamfield aerotropolis) are not shown as demand-driven elements completed during this phased demand-driven development plan; however, as explained in the gap analysis, such developments – the result of supply-driven synergies – are likely to begin before 2035.

A series of phasing layouts along with approximate percentages of hectares to be developed by the end of each phase are included below to show how supply-driven development of LHI projects could occur over a 30-year time horizon:

- ▶ 10 years: approximately 35% of LHI development;
- ▶ 20 years: approximately 65% of LHI development;
- ▶ 25 years: approximately 85% of LHI development; and
- ▶ 30 years: approximately 100% of LHI development;

Supply-driven development is also shown in greater detail for the CSEZ and the Vernamfield aerotropolis development (Figures II.1-2 – II.1.5) for each of four development phases. Further details regarding subarea logistics and master plan elements, including improved connections for highway, rail and airports are included in the following subsections.

Figure II.1-1: LHI Facilities Connectivity Map

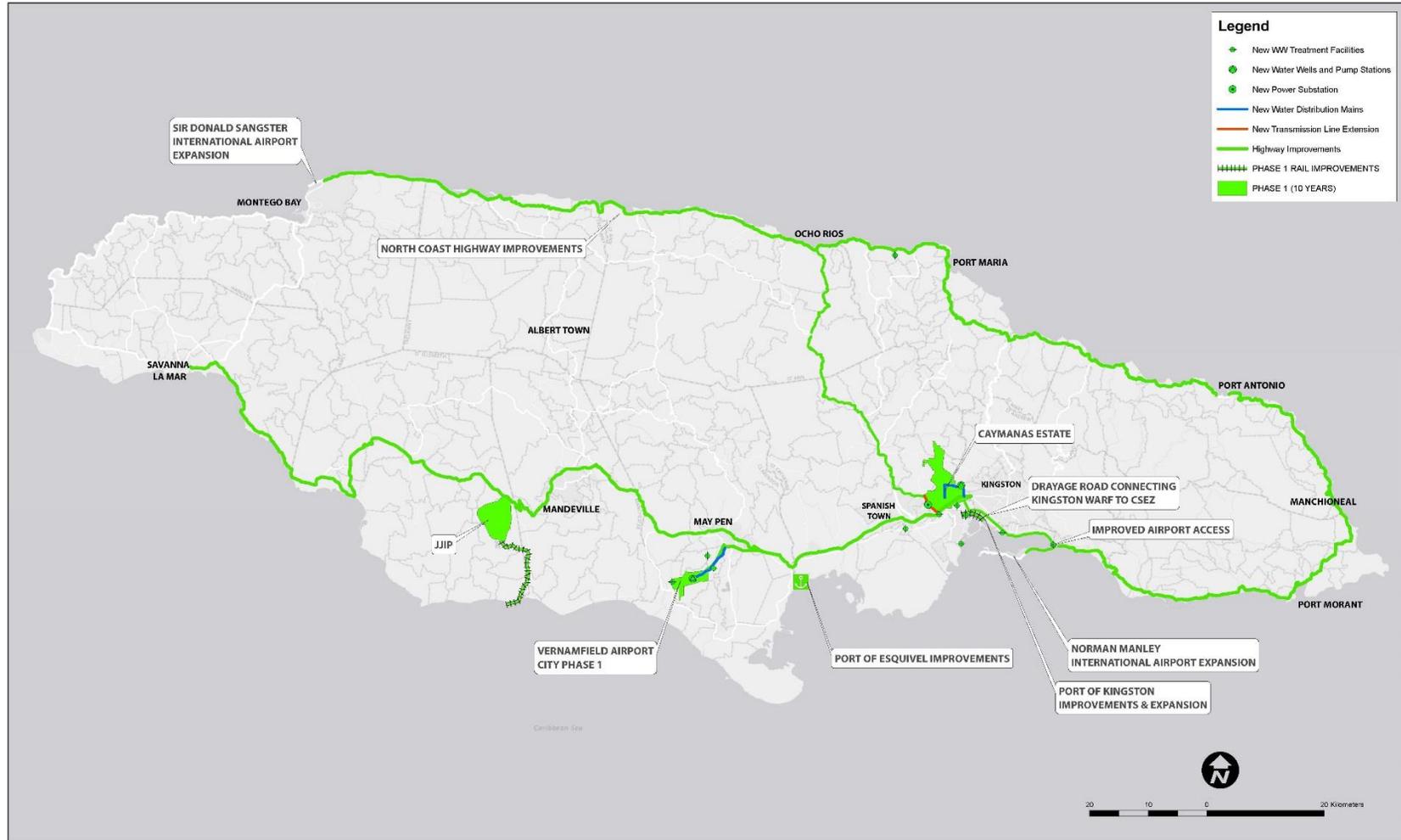


JAMAICA LOGISTICS HUB FACILITIES CONNECTIVITY MAP



Source: BergerABAM

Figure II.1-2: Phasing Layout: Supply-Driven Development for Phase 1



SUPPLY-DRIVEN DEVELOPMENT PHASE 1



Source: BergerABAM

Figure II.1-3: Phasing Layout: Supply-Driven Development for Phase 2

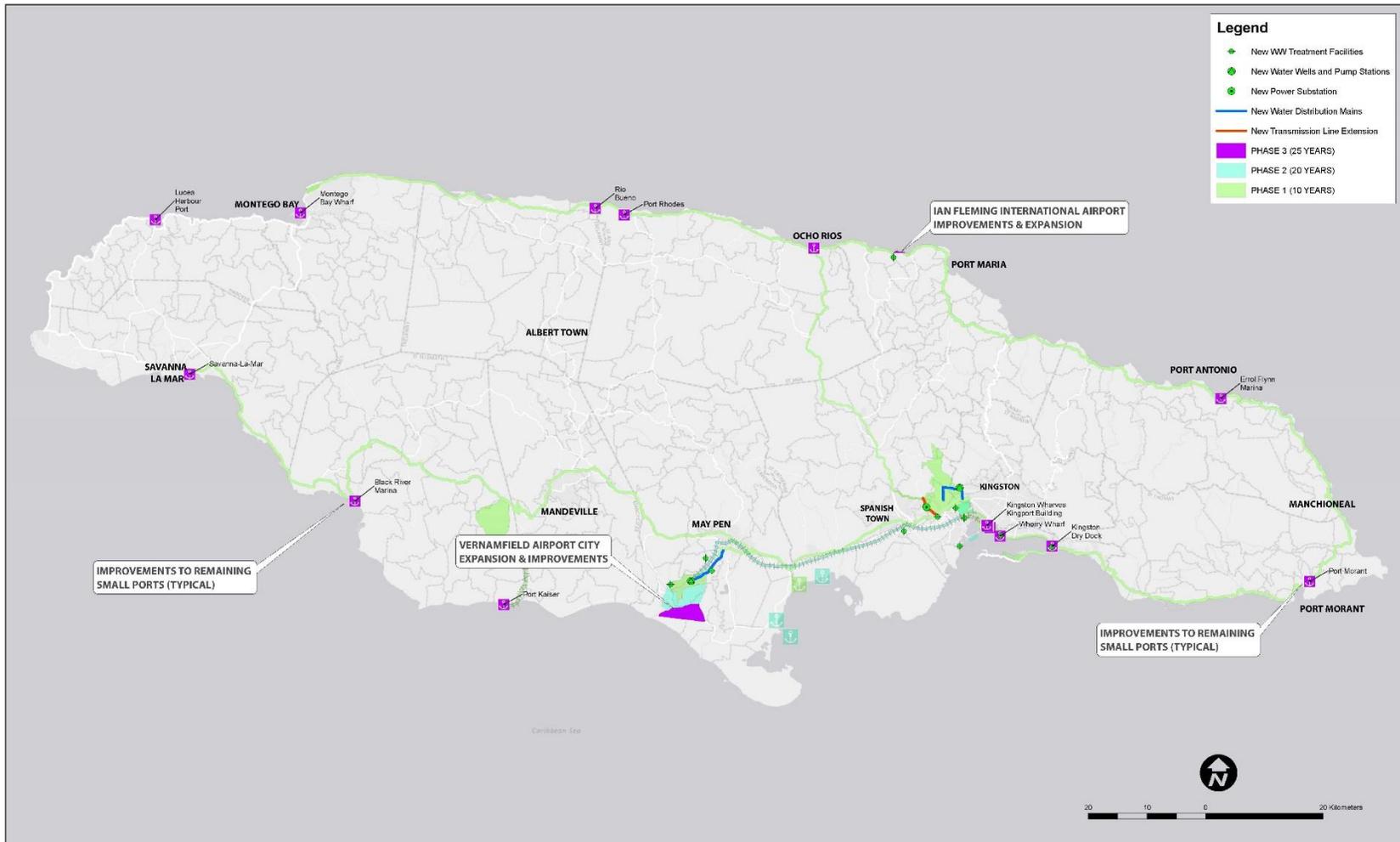


SUPPLY-DRIVEN DEVELOPMENT - PHASE 2



Source: BergerABAM

Figure II.1-4: Phasing Layout: Supply-Driven Development for Phase 3

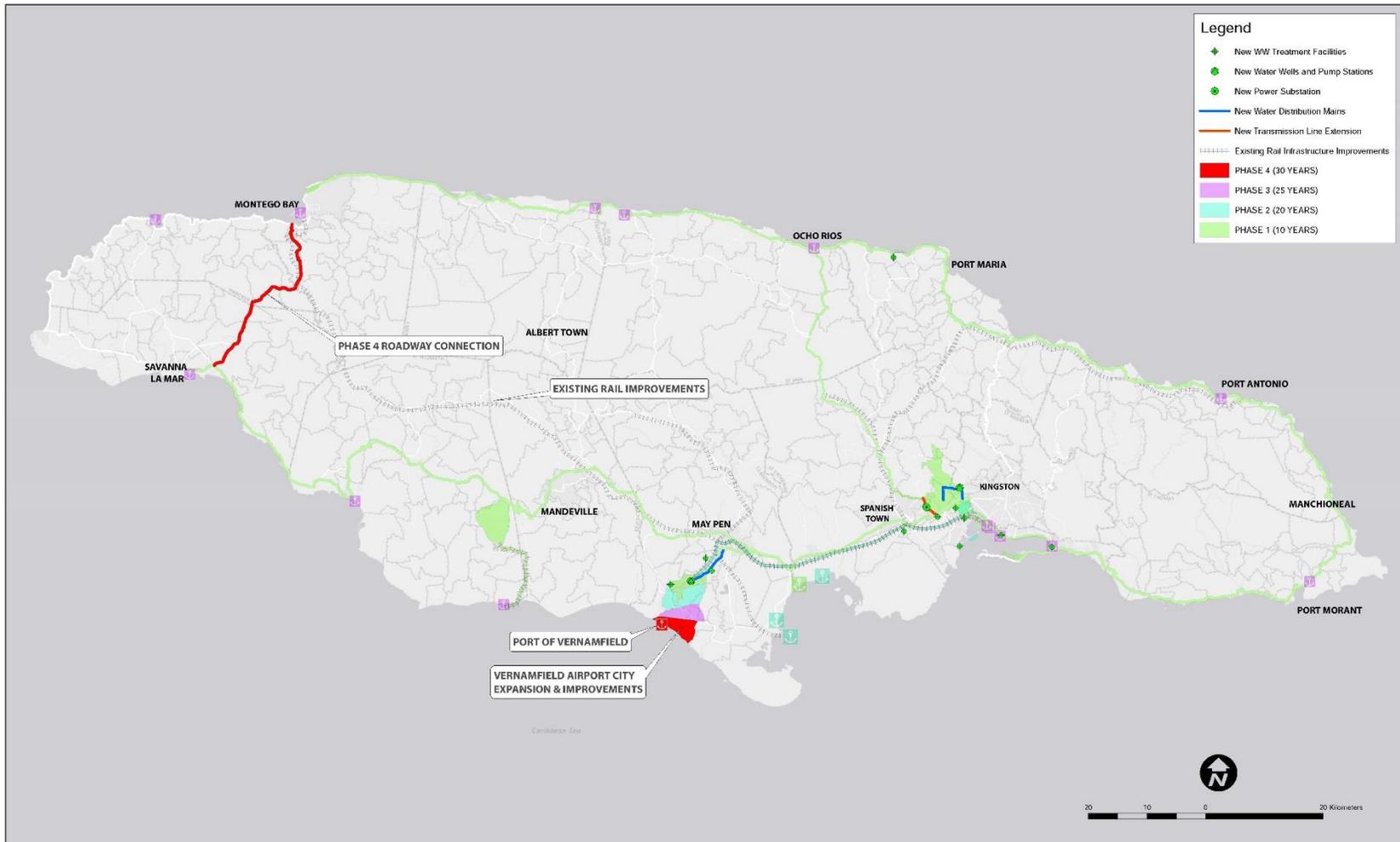


SUPPLY-DRIVEN DEVELOPMENT - PHASE 3



Source: BergerABAM

Figure II.1-5: Phasing Layout: Supply-Driven Development for Phase 4



SUPPLY-DRIVEN DEVELOPMENT - PHASE 4



Source: BergerABAM

Kingston Economic Corridor

Significant improvements are included in the master plan to expand passenger and cargo capacity at Norman Manley International Airport (NMIA), and cargo shipping at Kingston Container Terminal (KCT) (Figure II.1-6). Additional container shipment capacity is proposed through expansion of the wharf at Port Augusta and a new seaport at Vernamfield. These improvements are further described below. An economic corridor consisting of land, highway and rail improvements is envisioned to support economic activity from Kingston and Vernamfield.

Highway

Mandela Highway to Norman Manley International Airport

A new arterial roadway from the Mandela Highway to the Norman Manley Airport would utilize the existing rail corridor and surface streets and/or alternative routes to reduce travel times. This route would extend from the Mandela Highway at the existing interchange under construction, through the southern Caymanas Special Economic Zone (CSEZ) to the terminus of the rail corridor south to Port Royal Street. Capacity improvements would be required on the existing roadways connecting to the airport via Port Royal Street and Norman Manley Boulevard. An expensive direct route with less existing system impacts (possibly a second phase to the above surface street improvements) could connect from the terminus of the rail line at Pechon Street near Ocean Boulevard to the airport via a bridge or causeway traversing the Kingston Harbor. This route would dramatically reduce travel time for passenger and cargo travel between the CSEZ and the Norman Manley International Airport. The portion of the railroad right-of-way between the southern CSEZ and the KCT would be dual purpose with a dedicated cargo drayage road (fenced and separate from the new express arterial road to the airport) extending the customs area for truck transport and value-added logistics activity at the CSEZ. Improvements to the existing bridge between the CSEZ and the wharf, plus additional right-of-way acquisition would accommodate the width required for both the drayage road and a separate public highway providing direct public access to/from Caymanas and Port Kingston, which would provide connection to the proposed air cargo facilities at NMIA via the Kingston Harbor Causeway.

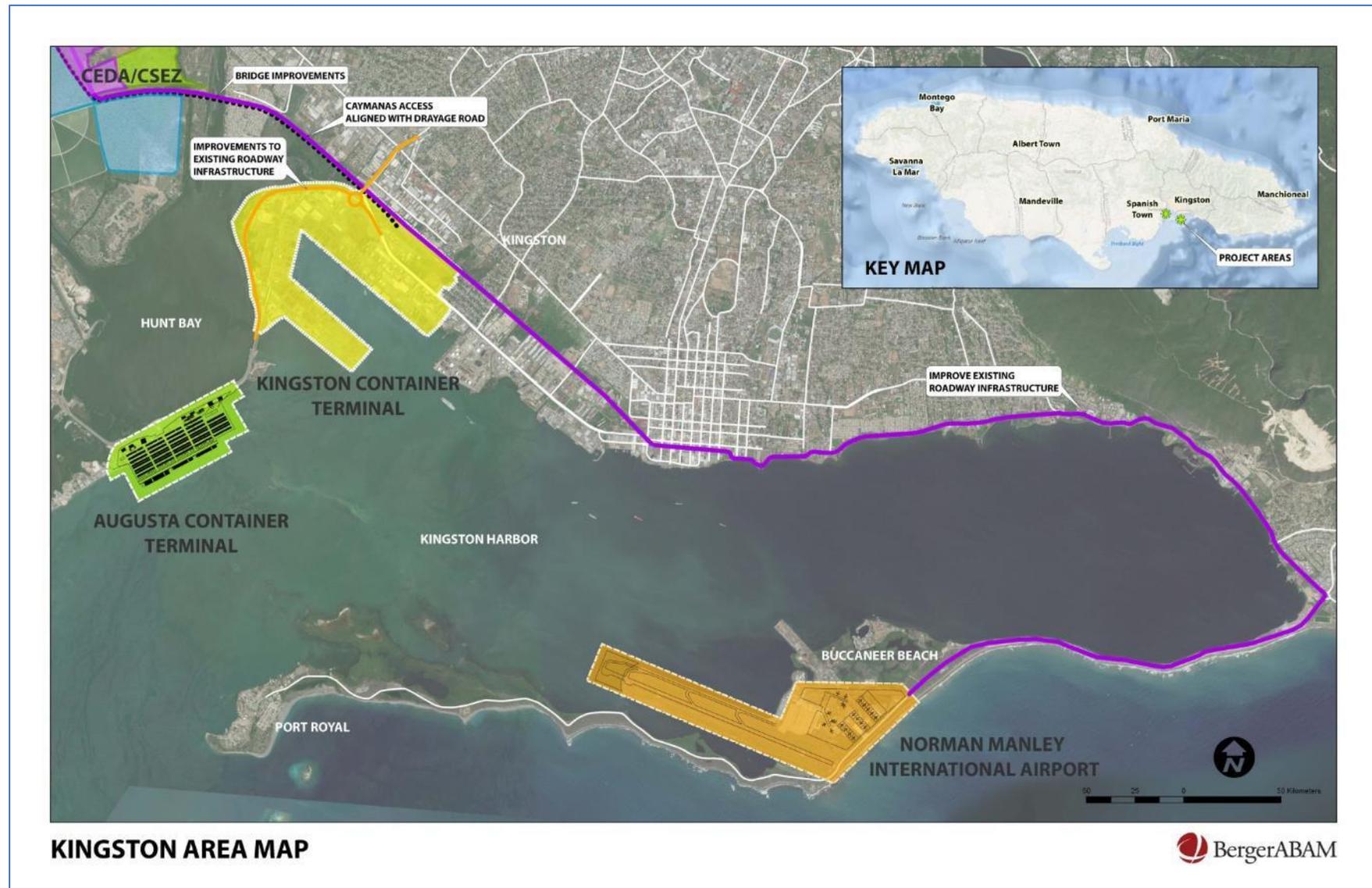
Mandela Highway to Caymanas Special Economic Zone (CSEZ)

A new interchange and improvements to the Mandela Highway are currently underway. This will result in separated grade interchange access to the northern portion of the CSEZ. Additional access to the north coast highway is included in the master plan. Two new interchanges (e.g. mega interchange) are proposed on the west side of the CSEZ to connect the south coast and north coast highways. These interchanges will connect the Mandela Highway from Kingston and Spanish Town to the north coast highway (and the CSEZ), thus eliminating the need to use local surface routes to access the north coast and vice versa (later addressed in Figures II.1-7 and II.1-8, CSEZ Concept Plan).

North Coast to South Coast

Highway improvements are required to better connect the north coast economic zones with the Kingston economic corridor. To achieve this, highway improvements are proposed to the existing highway south from Montego Bay to Savanna la Mar on the southwest coast, and extending east to Vernamfield, and Kingston. A new interchange on the south coast highway is required to serve Vernamfield as a new airport city. For further details, please refer to the “Gap Analysis” section of this report.

Figure II.1-6: Kingston Area Map



Railroad

The Jamaican railroad system ceased operations in 1992. However, the Jamaican Railroad Corporation operates or leases segments of the line, which remain active for bauxite mining and occasional education tours. Although significant investment would be required to revitalize the railroad, all required rights-of-way exist, and reuse of some or all of the system could serve airport and seaport activity. Rail is a high priority between the CSEZ and the proposed airport city at Vernamfield, and between Vernamfield and KCT. Once the airport is established with a commercial carrier, passenger and cargo traffic will be generated resulting in new airport-driven logistics and jobs for the Kingston economic corridor. Stakeholders expressed numerous concepts for railway improvements, including a tourism link or “rum train” to accommodate tours from Montego Bay to the Appleton Rum Factory, and long-term improvements to move cargo and passengers from Vernamfield to Kingston and from Montego Bay to Kingston. In addition, a higher speed commuter rail could be developed on a new route and grade to strengthen mobility, air freight, tourism, and employment across Jamaica’s growing south coast economic corridor. Apart from and beyond the 20-year demand-driven forecast horizon (detailed in the market projections forecast in Part I), revitalization of all or part of Jamaica’s railroad system could be further assessed in order to support the logistics hub to carry passengers and cargo between economic zones. The Government of Jamaica should take into consideration available and soon to be completed studies when taking decisions on rail system revitalization. These include the World Bank’s interim business case on the Jamaica Railways rehabilitation concession¹⁵³, as well as a more recent business case analysis that is being finalized by Herzog.

Caymanas Estate Development Area Concept Plan

The Caymanas Estate Development Area (CEDA) is an approximately 4,300-hectare area located less than 15 kilometers northwest of the Port of Kingston and 33 kilometers northwest of NMIA. The CEDA is a point of convergence for major road networks in the Kingston area and is strategically located to support the LHI vision. Within the CEDA, approximately 566.56 hectares are set aside for the Caymanas Special Economic Zone (CSEZ). Through the concept planning process, approximately 2,300 hectares within the CEDA were identified as developable with the remaining hectares (from Moses Lakes northward) located on a storm runoff drainage area that is below steeper terrain, and best suited to remain as open space. Two concept plans were developed for the 2,300-hectare area that incorporate the CSEZ, as well as supporting residential, mixed use, and institutional development. The distribution of land uses proposed in the concept plans is based in part on the analysis for the CSEZ included in the Part 1 market analysis. It is estimated that the CSEZ could capture up to five percent of demand-driven cargo flows by 2035 in the base case and up to 11 percent by 2035 in the high case for target industries such as biomedical, light manufacturing, and warehousing/logistics. The concept plans provide for the high case demand-driven development, as well as supply-driven development for a 30-year phased master plan. Development of the CSEZ would provide the industrial space required meeting demand-driven projections in a location well served by highway and potential rail access, near the Kingston Container Terminal and Norman Manley airport, and near population centers for required for labor, while providing an essential

¹⁵³ World Bank Group, “Jamaica Railways Rehabilitation Concession – Interim Business Case.” Draft Report to the Development Bank of Jamaica. June 2013.

platform for further supply-driven development. The concept plans focus on the physical and economic connections of the CEDA with Kingston Wharf. A dedicated, secured drayage road will be constructed from the customs facility at the Kingston Wharf to the industrial area south of Mandela Highway and will provide the main linkage from the port to the CSEZ, simplifying the logistics of transporting cargo from the waterfront to the processing centers. Additionally, the connectivity improvements identified above within the CEDA are also included in each concept plan. The concept plans identify a mining area north of Mandela Highway to be retained and supported through the proposed new developments in the area. Approximately 659 acres (267 hectares) of land north of the highway are owned by China Harbor Engineering Company Ltd. (CHEC), as illustrated in both concept plans. CHEC is in the initial phases of a market research, feasibility study, and master planning process for its property at Caymanas Estates, and has indicated its interest in developing a “new town,” with residential, recreational, commercial, office and mixed-use real estate developments. Finally, green spaces are interspersed throughout the concept plans, providing buffers, and needed storm-water management, as well as areas for recreation, including a proposed sports stadium, and a large swath of existing wetlands is protected to the east. An expanded water treatment plant, already under design, is located to the south and the Riverton Solid Waste Facility is located to the east of the planned northern expansion of the treatment plant. The water treatment plant and solid waste facility both have potential environmental risks and negative impacts on the CSEZ as outlined in the CSEZ Feasibility Study conducted by International Development Group LLC (August, 2017). In order to mitigate these potential impacts, a 1,500-foot buffer is included on the concept plans. The only use proposed in the buffer is the intermodal yard for rail-to-truck connectivity to the Wharf, as this use would be less sensitive to potential nuisance conditions related to the water treatment and solid waste facilities than other LHI industries.

Key Development Typologies

Within each type of land use at CSEZ (or at Vernamfield, see below), specific types of development will vary, as will such factors as site area, building size, building height, and employment density. For purposes of computing average population and housing densities, Table II.1.-1 presents the assumed development typologies.

Table II.1-1: Development Typologies

Development Type	Site Area, hectares	Building Size, square meters	Building Height, meters	Square Meters per Employee	Approximate No. of Tenants ¹
Light Industrial	5 - 15	5,000 - 30,000	8 (1 floor)	15 - 25	40
R&D / Industry (Flexible)	5 - 10	2,000 - 20,000	12 (2 floors)	20 - 30	30
Logistics / Air Cargo	10 - 20	5,000 - 30,000	12 (1 floor)	50 - 60	50
Warehouse / Distr. Center	20 - 40	20,000 - 50,000	12 (1 floor)	50 - 60	30

¹Total number of Tenants considers Caymanas, Vernamfield, and other development areas

Source: BergerABAM

CSEZ Value Proposition

The development of the concept plans described below was guided by the CSEZ Value Proposition formulated in Part I.

“The Caymanas Special Economic Zone: A modern and sustainable port-centric facility at the heart of the Global Logistics Hub.”

Invaluable benefits include:

- ▶ Up to 524 hectares of greenfield land for industrial and other development
- ▶ Direct access to the Kingston Container Terminal
- ▶ Modern, state of the art, environmental-friendly facilities suitable for light manufacturing and logistics industries
- ▶ Access to skilled and scalable labor
- ▶ State of the art residential, commercial, and recreational facilities

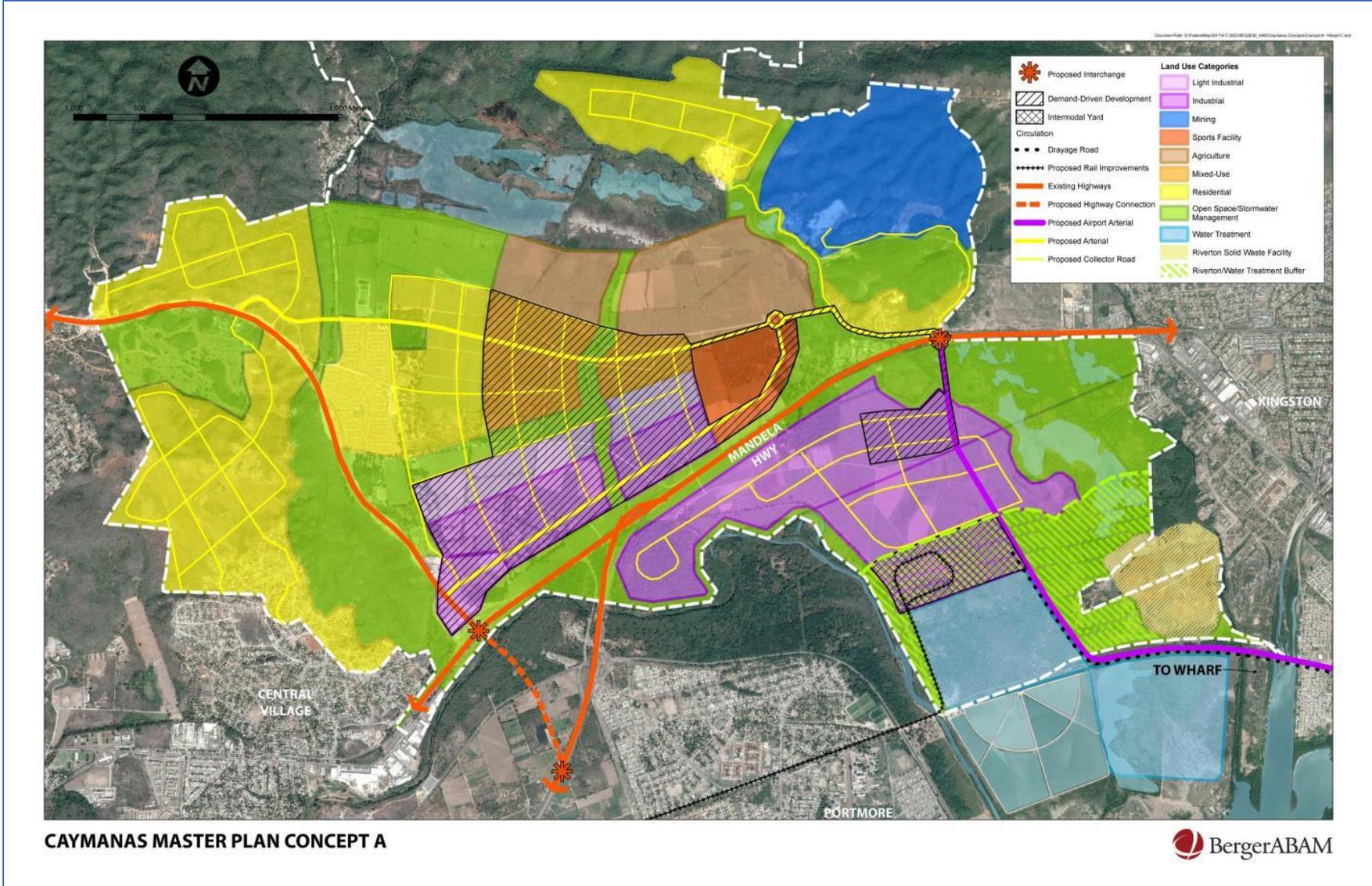
Caymanas Estate - Concept A

Concept A for the CEDA (Figure II.1-7), proposes new interchange access for Mandela Highway and North Coast Highways, an intermodal yard for rail-to-truck transport to the Wharf, and an arterial expressway to NMIA. The plan identifies and incorporates existing developments and private land holdings, and is based on a grid-street pattern, providing safe and efficient movement of both goods and people within Caymanas Estates. The roadway locations included in the concept plan are conceptual and based on extensions of existing roadways, as well as a review of available documents and aerial photography. Final roadway alignments will require additional topographic analysis in conjunction with future development. The intensity of land use decreases gradually from east (logistics, assembly, light industrial and existing mining) to west (mixed-use and residential) and the proposed sports center is centrally located. Green space is dispersed throughout the area, creating opportunities for storm-water management and recreation. Land currently occupying commercial and community uses, including the police station, northwest of the proposed eastern Mandela Highway Interchange is proposed as open space, as those existing uses are anticipated to be relocated within the CEDA. Based on a planning-level land-use analysis, the total development capacity for Concept A is demonstrated in Table II.1-2, reflecting a full buildout of the 524 hectares available for light industrial and mixed-use lands. The amount of development well exceeds the demand-driven projections provided in the Part 1 market study with the remaining capacity devoted to future supply-driven developments. The number of jobs per hectare of development is based on an average of the building typologies indicated above; housing and population estimates are based on 20 housing units per hectare, with an average of three persons per family. Mixed-use areas are assumed to include 50 percent housing at a density of 62 units per hectare and 50 percent employment uses at 49 jobs per hectare. Industrial areas are assumed to include 25 jobs per hectare and light industrial 37 jobs per hectare. Figure II.1-9 presents the Caymanas Estate Concept A by supply-driven development phases.

Table II.1-2: Development Capacity (Caymanas Estate - Concept A)

Land Use	Development Capacity (Jobs, Households, Population)
Jobs - Industrial Lands	7,868
Jobs - Light Industrial Lands	1,775
Jobs - Mixed Use Lands	1,760
Total Jobs	11,403
Housing - Residential Lands	9,021
Housing - Mixed Use Lands	2,200
Total Housing	11,220
Total Population	33,661
Population Density	5.7/acre or 14.1/hectare

Figure II.1-7: Caymanas Estate Land Use Plan- Concept A



Source: BergerABAM

Caymanas Estate - Concept B

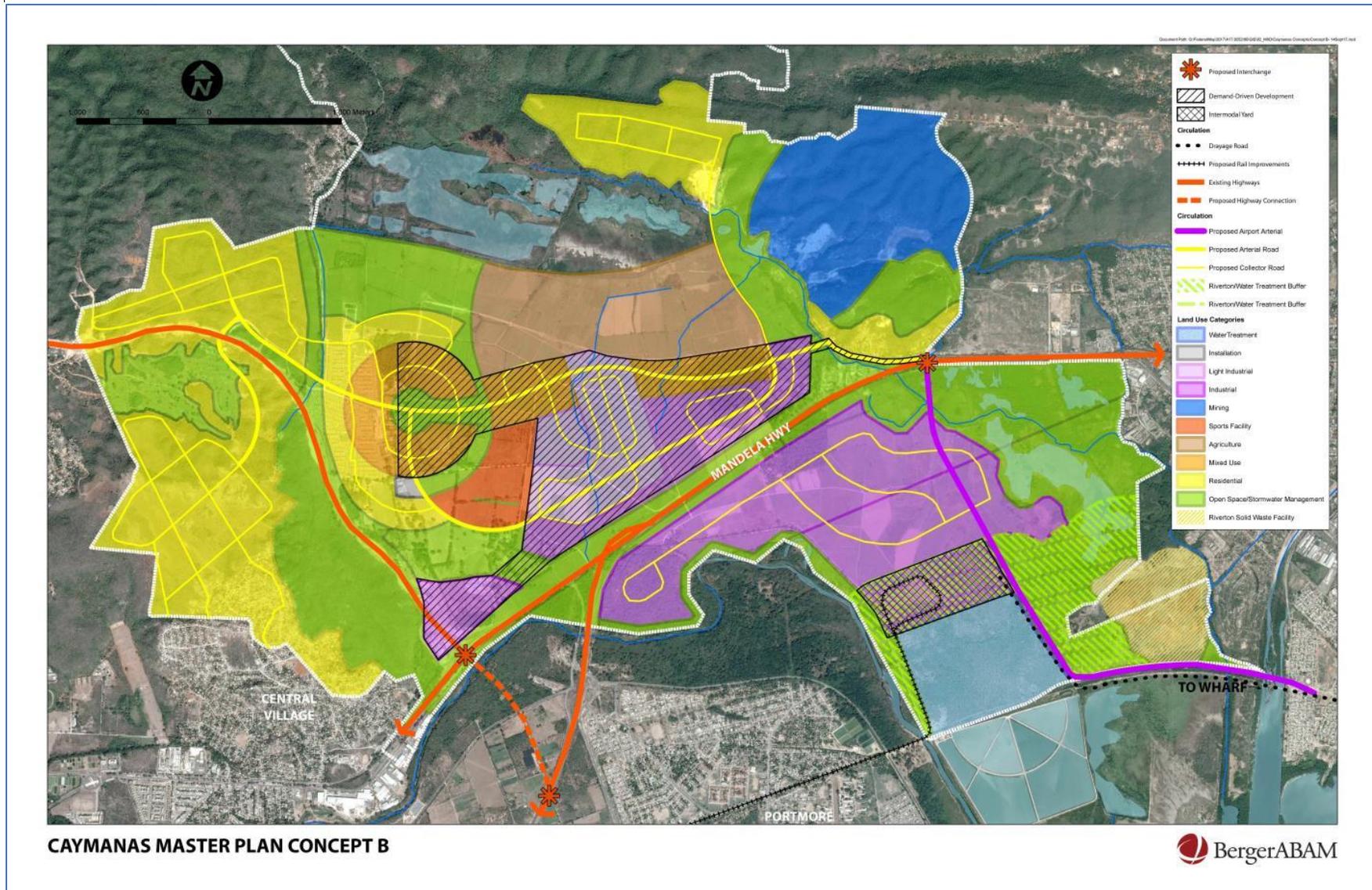
Concept B (Figure II.1-8) proposes similar highway and connectivity improvements as was discussed for Concept A. Concept B is based on radiating blocks originating from a circular mixed-use development that includes and incorporates part of the existing housing development at Caymanas Estates, as well as other private land holdings. The proposed mixed-use core area is surrounded by residential and green space, which provides a buffer from proposed industrial areas. A mixed-use corridor flows through the center of the subject area, connecting the mixed-use core to the industrial areas to the east and beyond to the wharf.

Roads are designed to provide both primary and secondary access to each area within the master plan. Like Concept A, Concept B roadway alignments are conceptual and will require additional topographic analysis in conjunction with future development. In this concept, the proposed sports center is located adjacent to the mixed-use core or village center. The total development capacity for Concept B also far exceeds the 2035 demand-driven projections, as demonstrated in Table II.1-3, and includes similar space for future supply-driven development. Housing and population density, and job capacity are estimated in the same way as for Concept A. Figure II.1-10 presents the Caymanas Estate Concept B by supply-driven development phases, while Figure II.1-11 presents a 3D rendering of this concept plan.

Table II.1-3: Development Capacity (Caymanas Estate - Concept B)

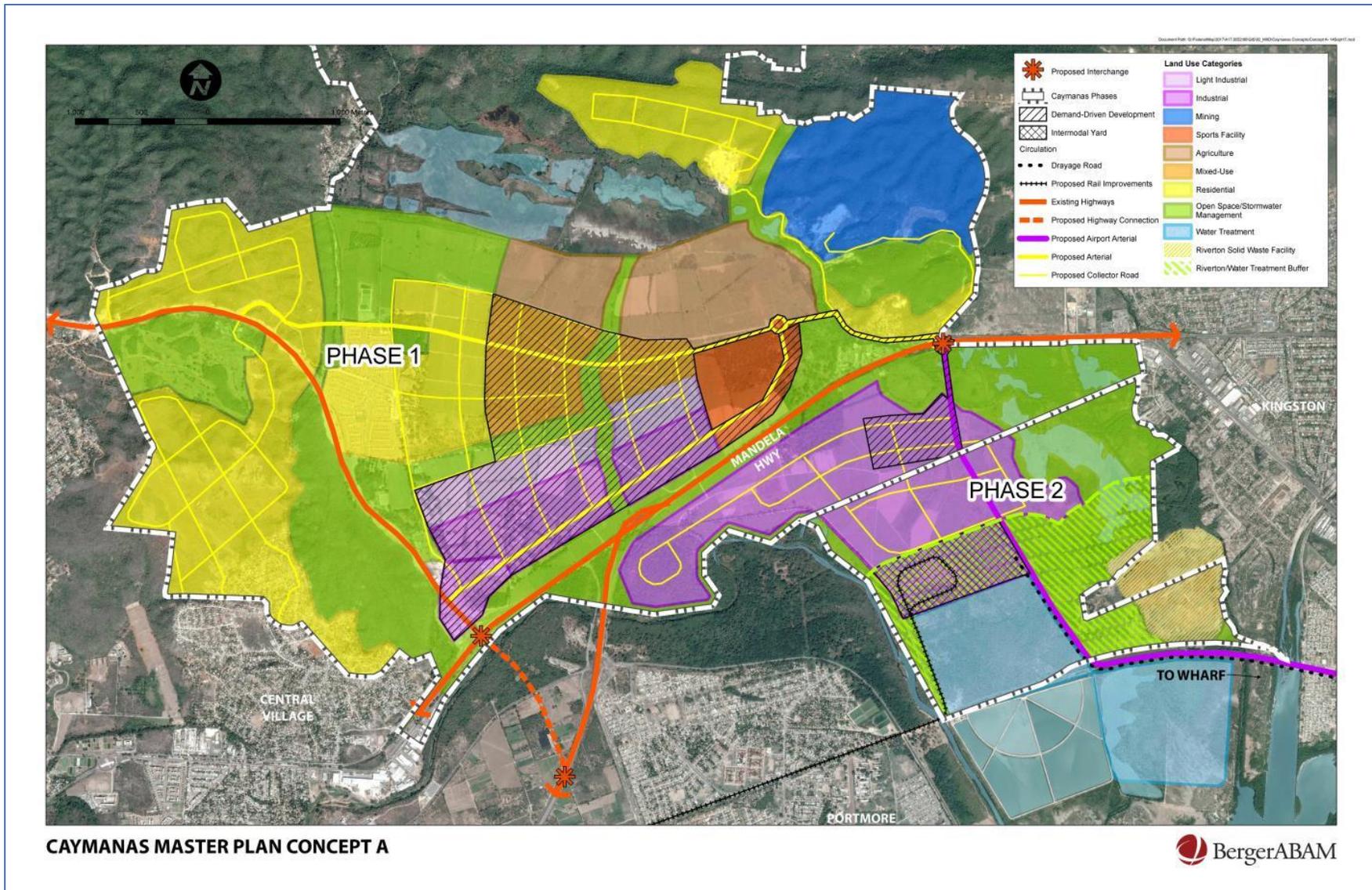
Land Use	Development Capacity (Jobs, Households, Population)
Jobs - Industrial Lands	7,833
Jobs - Light Industrial Lands	2,677
Jobs - Mixed Use Lands	2,377
Total Jobs	12,888
Housing - Residential Lands	8,130
Housing - Mixed Use Lands	2,972
Total Housing	11,102
Total Population	33,306
Population Density	5.6/acre or 14.0/hectare

Figure II.1-8: Caymanas Estate Land Use Plan- Concept B



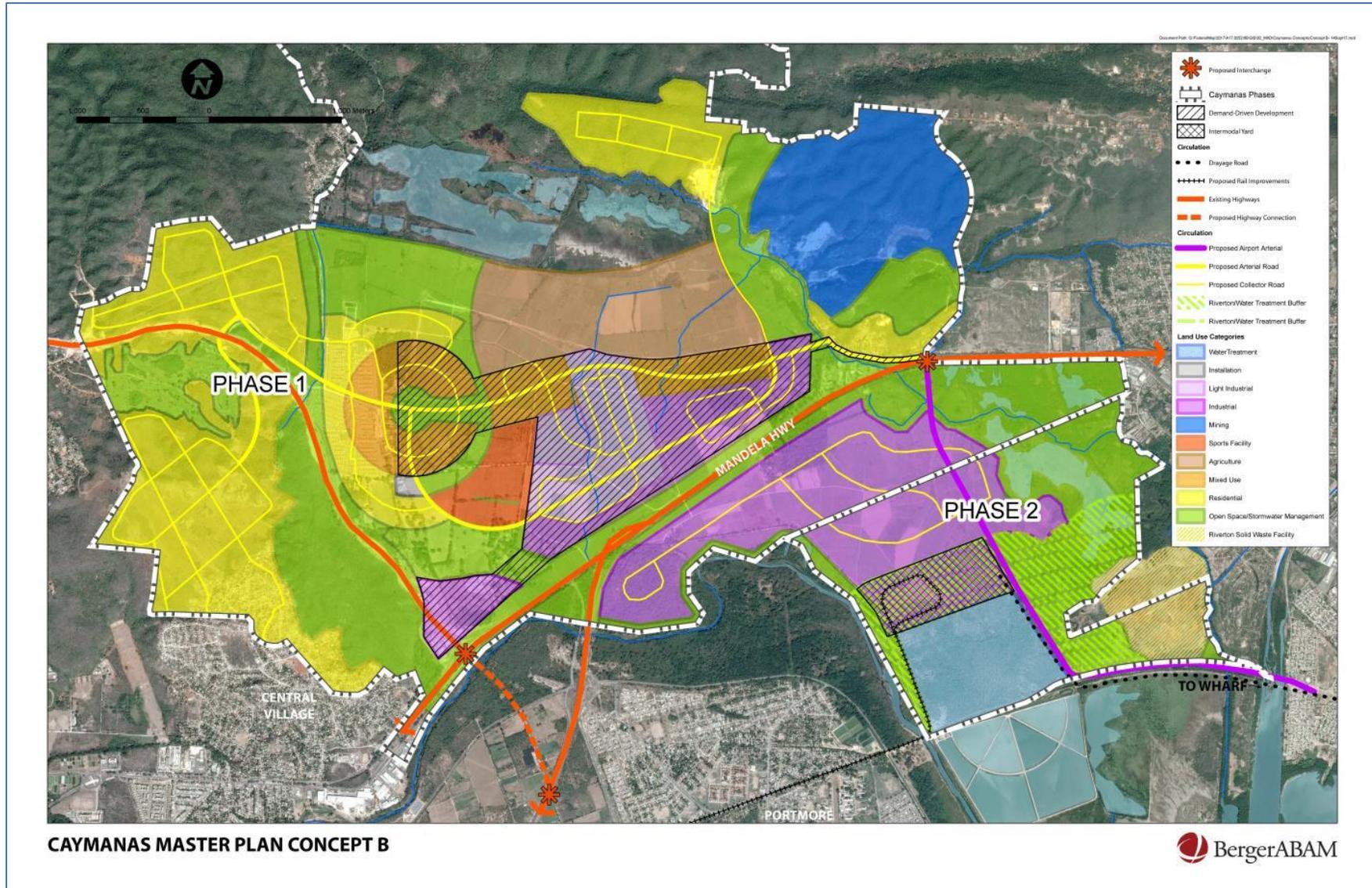
Source: BergerABAM

Figure II.1-9: Phasing Layout: Supply-Driven Development for the CSEZ, Concept A, Supply-Driven Phases 1 & 2



Source: BergerABAM

Figure II.1-10: Phasing Layout: Supply-Driven Development for the CSEZ, Concept B, Supply-Driven Phases 1 & 2



Source: BergerABAM

Figure II.1-11: 3D Rendition of Caymanas Estate Land Use Plan- Concept B



Source: BergerABAM

Vernamfield Airport City

The Vernamfield airport city will be a mixed-use hub featuring a core commercial center (the aerodrome), surrounded by industrial, residential, open space, and agricultural lands. Vernamfield will further leverage Jamaica's strategic access and proximity to global markets by substantially enhancing Jamaica's air connectivity. An "airport city" is a metropolitan area where the economy, urban form, and infrastructure are centered around an airport (or "aerodrome"), wherein the airport and supporting services form the commercial core. The Vernamfield airport city or airport city concept plan represents a strategic new town designed to facilitate the long-term vision of a hub centered on a new economic driver: the proposed Vernamfield aerodrome (Figures II.1-12 and II.1-13). The aerodrome will feature the first runway in Jamaica long enough and wide enough to accommodate the world's largest cargo plane, the Antonov 124. It is envisioned that the Airport City will potentially offer break bulk, manufacturing and logistics facilities as well as business to over 150 countries in Asia, the Americas, Western Europe, and Africa's West Coast.

In order to develop the airport that will form the core of the airport city, the Jamaica Defense Force (JDF) Air Wing will be relocated to Vernamfield from Tinsen Pen, allowing Tinsen Pen to be repurposed for other logistics hub facilities (discussed in further detail below). The following services will be provided at Vernamfield: maintenance repair overhaul (MRO) services, cargo, courier services, general aviation, and a transport training college. Vernamfield is within 10 hours flying time of over 1.6 billion consumers in developed and emerging economies, and will form part of the Global Silk Route, linking it to the Mediterranean, the Red Sea, southeast Asia, and China. The airport will feature modern runways, state-of-the-art cargo facilities, large specialist cargo planes (including the Antonov 124), and a variety of value-added businesses, allowing for rapid business development supporting and benefitting from air cargo operations master planned for a throughput of two million tons per year. In addition to air cargo, the Vernamfield concept plans propose a new southern connection of the railroad adjacent to and west of the new aviation zone, south to the coast, where it would connect to the new Port of Vernamfield. Both concepts provide full connectivity between Vernamfield and Kingston, as part of the Kingston economic corridor, integrating cargo transport by highway, rail and seaport. The Vernamfield concept plans are based on past studies that support relocation of the 4,000-meter runway two kilometers to the west. Additional master planning is required to assess the feasibility of the proposed airport as an air cargo and passenger destination, and further define and refine airport logistics uses adjacent to Vernamfield as specified in the Concept Plans (Figures II.1-12 and II.1-13). Because the combined amount of land available at Caymanas and the Port of Kingston areas exceeds the requirement for demand-driven development outlined in the Part 1 market study, it is anticipated that development of the Vernamfield air cargo terminal and the associated airport city will be largely supply-driven. But given that the process to develop the air cargo terminal would likely take five to 10 years, it is anticipated that the program would have to begin well before the 2035 horizon for demand-driven projections.

Vernamfield Concept Plans

Two land-use concept plans were developed for the Vernamfield airport city, also referred to as Jamaica's third city (supporting Kingston and Spanish Town). These concepts feature the proposed airport, but also respect and incorporate existing communities, such as Gimme-Me-Bit and Gunter's Hill. Additionally, each concept retains open space or low-intensity uses on or near the Alligator Pond Protected Area (to the southwest) and Portland Bight Protected Area (to the southeast), and are designed to retain airport approach zones (including agricultural uses). The Vernamfield concept

plans rely on a future south highway interchange to the northeast at May Pen and include industrial logistics uses to the north, focused on the airport. These uses will include MRO services, logistics such as nearby cold storage for fruit, pharmaceuticals, and other “just in time perishables,” air freight delivery, roll-on roll-off (RoRo) cargo, warehousing and assembly. A series of neighborhoods and commercial village centers or corridors are defined and separated by open space and a storm-water management network, including existing waterways. The protection of natural areas and preservation of the beach for public recreational use and cargo shipments is included in both concepts. Roadway connectivity includes access from the south coast highway at May Pen northwest of Vernamfield. Next, there is a new rail linkage from the mainline that borders the north plan area, southward on the west side of the airport, which connects with the new seaport. There is also potential to provide a new higher speed commuter rail link between Vernamfield and NMIA, but south coast highway and existing rail improvements are the near-term priorities to link Vernamfield east to the CSEZ and Kingston, forming the Kingston economic corridor.

Vernamfield Airport City – Concept 1

Vernamfield Concept Plan 1 (Figure II.1-12) is organized in a grid design around the proposed airport. The airport has a north-south orientation and is bordered by industrial lands to the north and served by new highway and rail connections. The existing (abandoned) runways in the north are utilized to create two main arterial roads surrounded by a vibrant mixed-use corridor providing access from Vernamfield north to the south coast highway. A second abandoned runway, running east-west, will create a mixed-use corridor and arterial road connecting the airport to the north-south mixed-use corridor. The circulation system will provide access to and from both industrial and residential areas, creating a physical separation while providing a financial connection between the two land uses. Collector and local access roads align with the grid pattern, and improve connectivity to areas beyond Vernamfield. A new east-west collector road to the south will provide a connection across Milk River to Manchester Parish and to potential tourism opportunities at the Milk River hot springs. Residential land uses are located to the west and east of the proposed airport, thereby reducing potential for negative noise impacts created by the north-south flight patterns. Public beach access will be provided at four locations dispersed along the coast line, with an open space buffer protecting the coast from residential and agricultural uses. Logistics for port operations are located to the southwest of the airport, and agricultural lands are located directly south of the airport, providing for height and use compliant runway approach zones, and reducing potential for noise impacts from flyovers. Table II.1-4 provides an estimated capacity for jobs, households, and population that could be generated by Concept 1. The estimate of the total number of jobs is based on the same typology concepts as Caymanas, with similar family size and housing density. Figure II.1-14 presents the Vernamfield Airport City Concept 1 by supply-driven development phases, while Figure II.1-16 presents a 3D rendering of this concept plan.

Table II.1-4: Development Capacity (Vernamfield Airport City - Concept 1)

Land Use	Estimated Development Capacity (Jobs, Households, Population)
Jobs – Industrial Lands	23,531
Jobs – Mixed Use Lands	8,182
Total Jobs	31,713
Housing – Residential Lands	29,770
Housing – Mixed Use Lands	10,228
Total Housing	39,998
Total Population	119,993
Population Density	7.7/acre or 18.9/hectare

Vernamfield Airport City – Concept 2

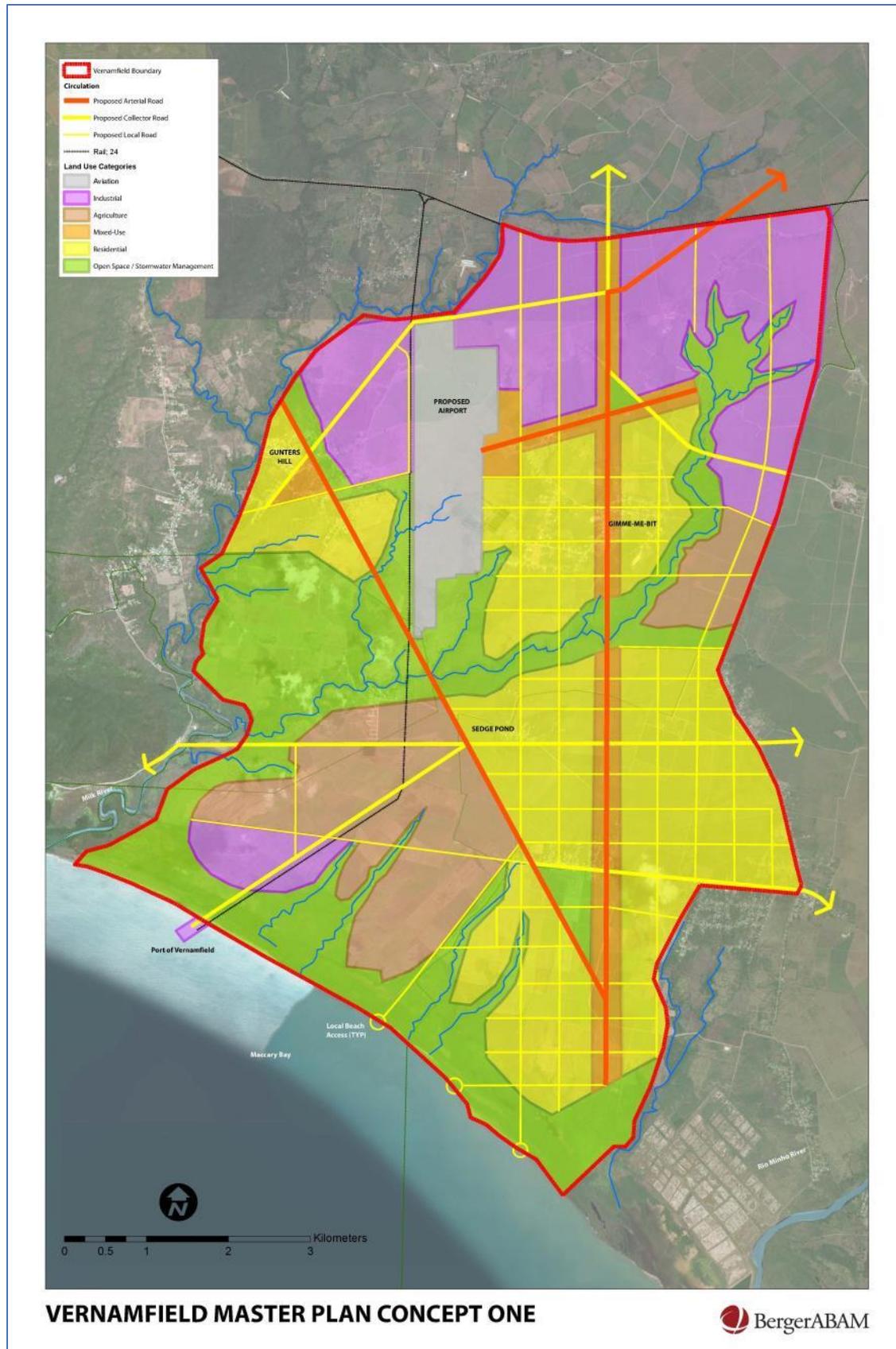
Similar to Concept 1, the proposed airport and logistics facilities are core features of the Concept 2 plan (Figure II.1-13). New highway and rail connections provide access from industrial areas to the airport. Concept 2 is a “village” model that includes mixed-use nodes surrounded by industrial or residential development. Existing neighborhoods, such as Gunter’s Hill and Gimme-me-bit, are incorporated into the mixed-use nodes. A main arterial road runs north-south, connecting major mixed-use hubs and industrial areas to the airport, and an interconnected network of arterial, collector, and local roads provide connectivity to new, smaller-scale hubs spread throughout Vernamfield. Open space and agricultural lands are used to buffer residential areas from industrial uses.

As in Concept 1, the beach remains largely protected for public use, albeit with one commercial access point to the south. Given the access point’s proximity to wetlands and the Portland Bight Protected Area, the access will likely be for modest commercial use, such as a fishing pier, thereby allowing slightly more development at the beach than in Concept 1, but still providing for protection of public access. Table II.1-5 shows the estimated number of jobs, households, and populations projected based on a planning-level land use analysis of Concept 2. Figure II.1-15 presents the Vernamfield Airport City Concept 2 by supply-driven development phases.

Table II.1-5: Development Capacity (Vernamfield Airport City - Concept 2)

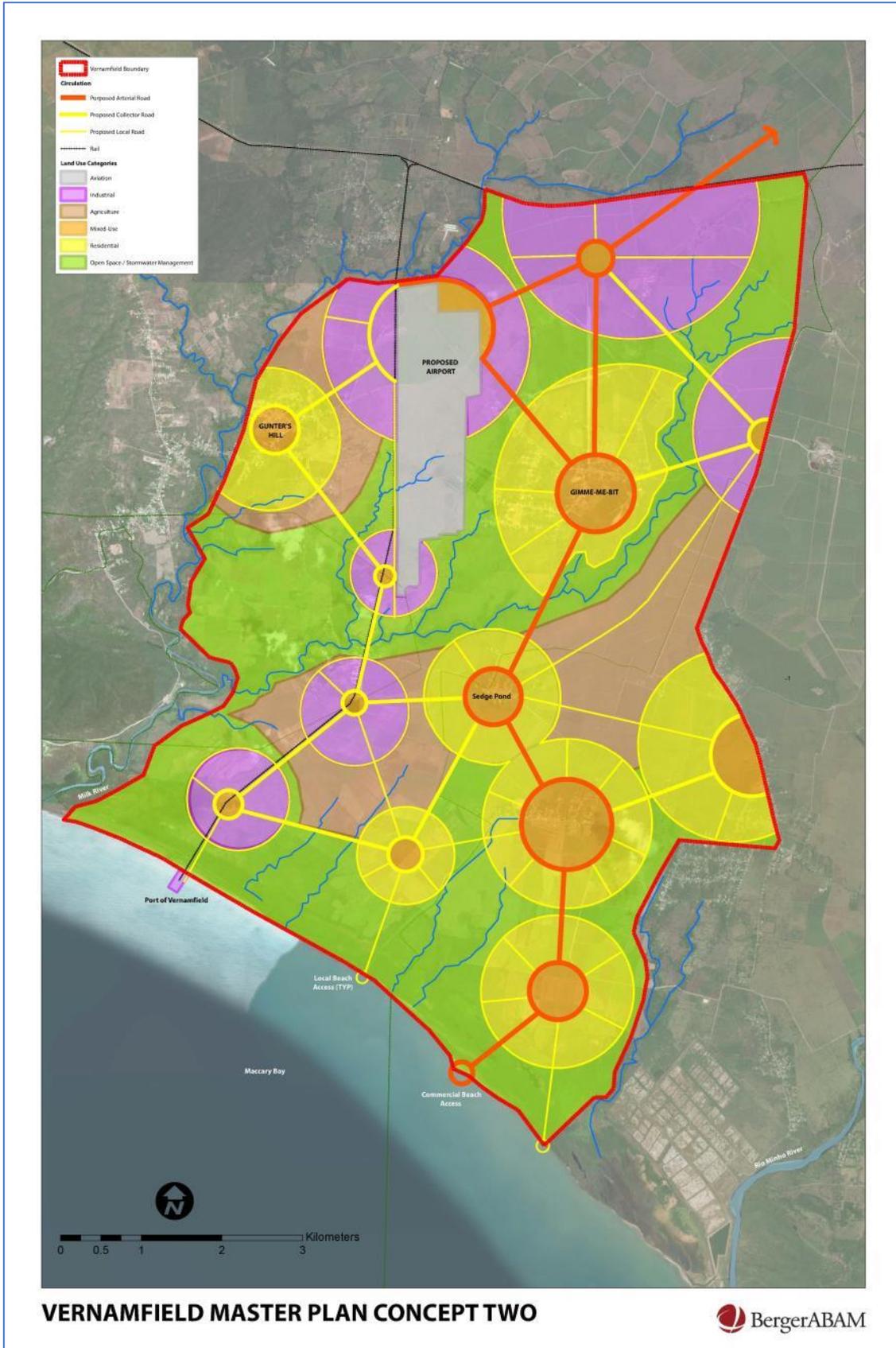
Land Use	Estimated Development Capacity (Jobs, Households, Population)
Jobs – Industrial Lands	20,766
Jobs – Mixed Use Lands	8,051
Total Jobs	28,817
Housing – Residential Lands	26,694
Housing – Mixed Use Lands	10,064
Total Housing	36,758
Total Population	110,275
Population Density	7.0/acre or 17.4/hectare

Figure II.1-12: Vernamfield Airport City – Concept 1



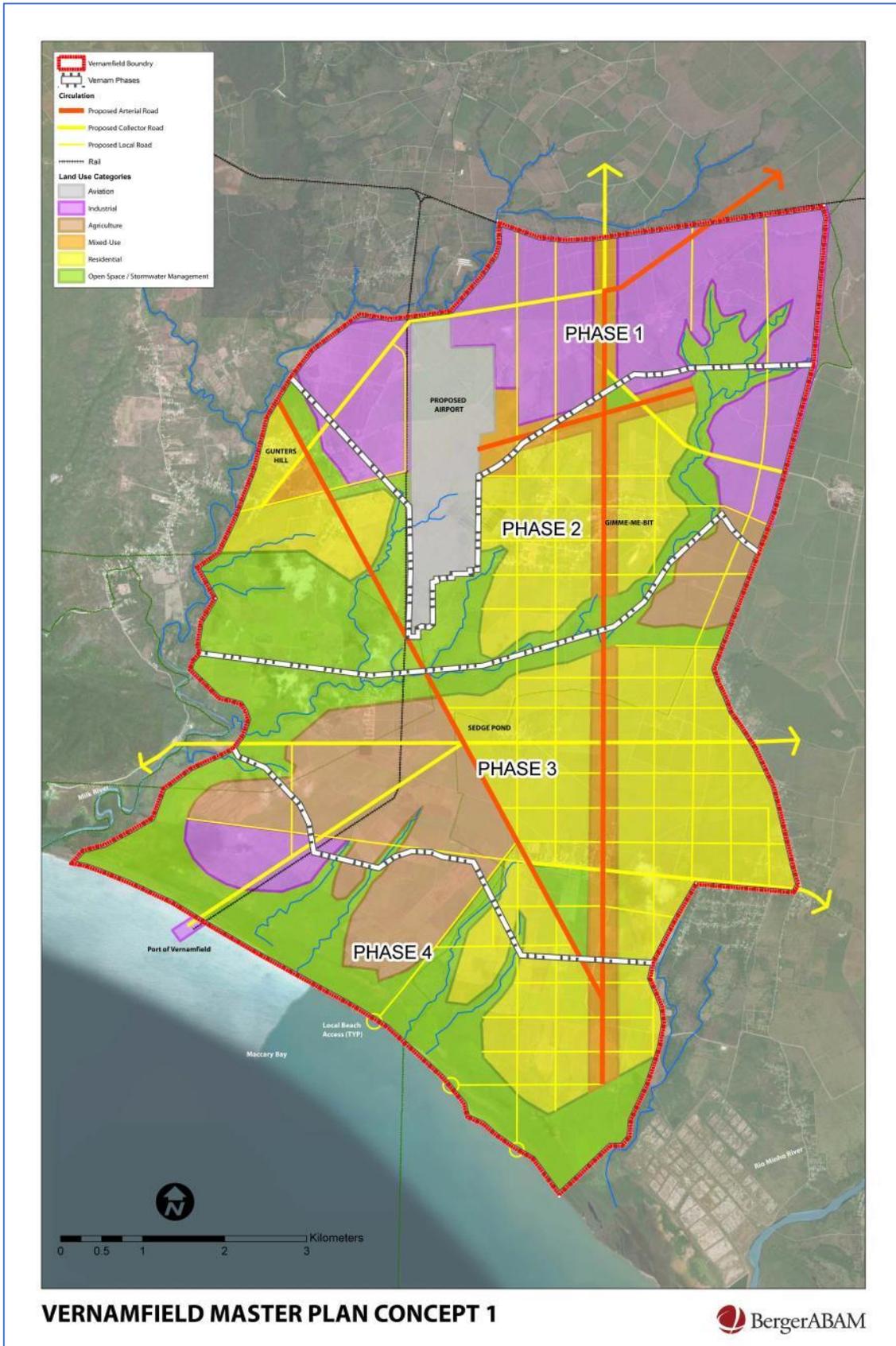
Source: BergerABAM

Figure II.1-13: Vernamfield Airport City – Concept 2



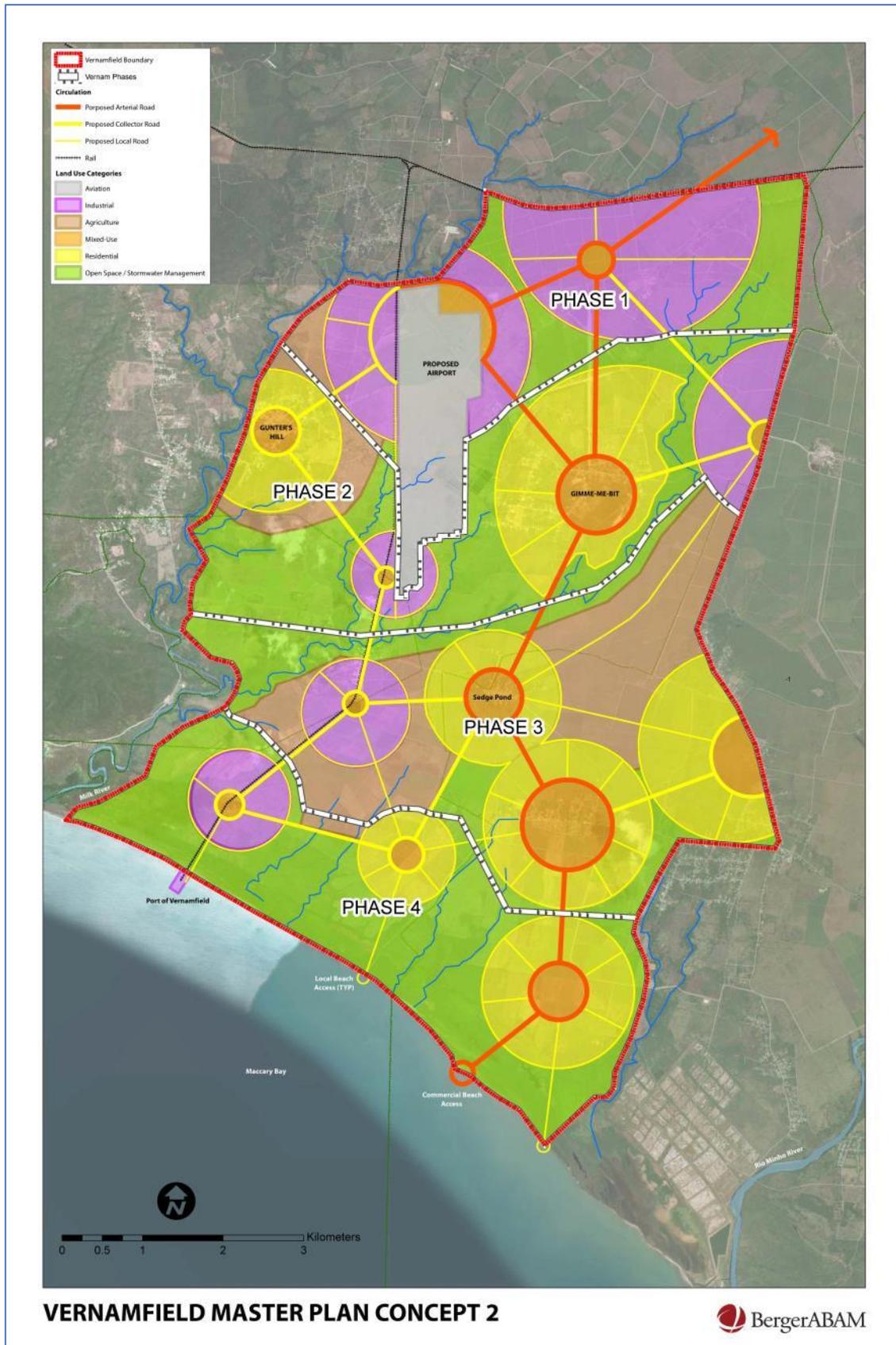
Source: BergerABAM

Figure II.1-14: Phasing Layout: Supply-Driven Development for the Vernamfield Aerotropolis, Concept 1, Phases 1-4.



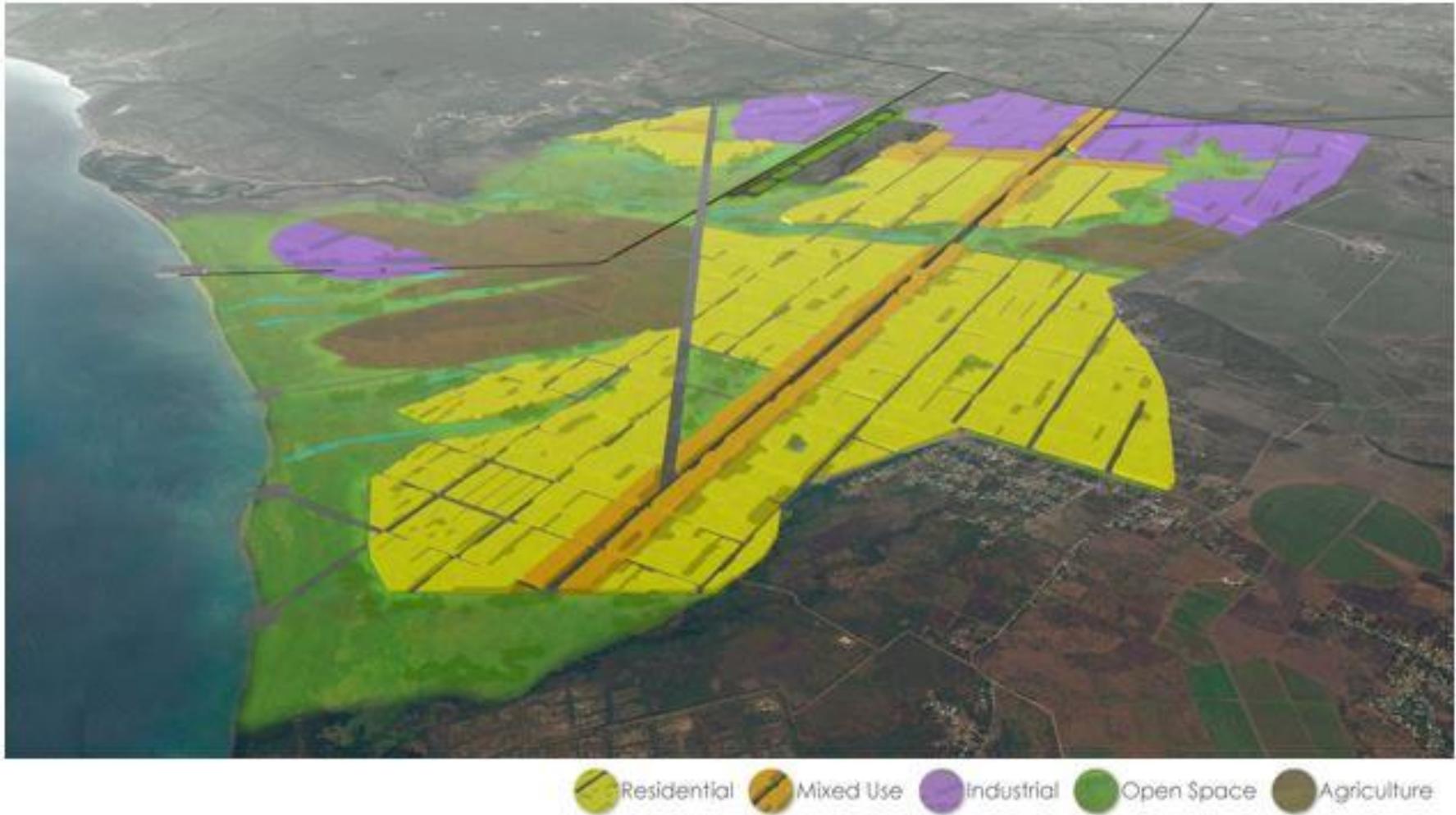
Source: BergerABAM

Figure II.1-15: Phasing Layout: Supply-Driven Development for the Vernamfield Aerotropolis, Concept 2, Phases 1-4.



Source: BergerABAM

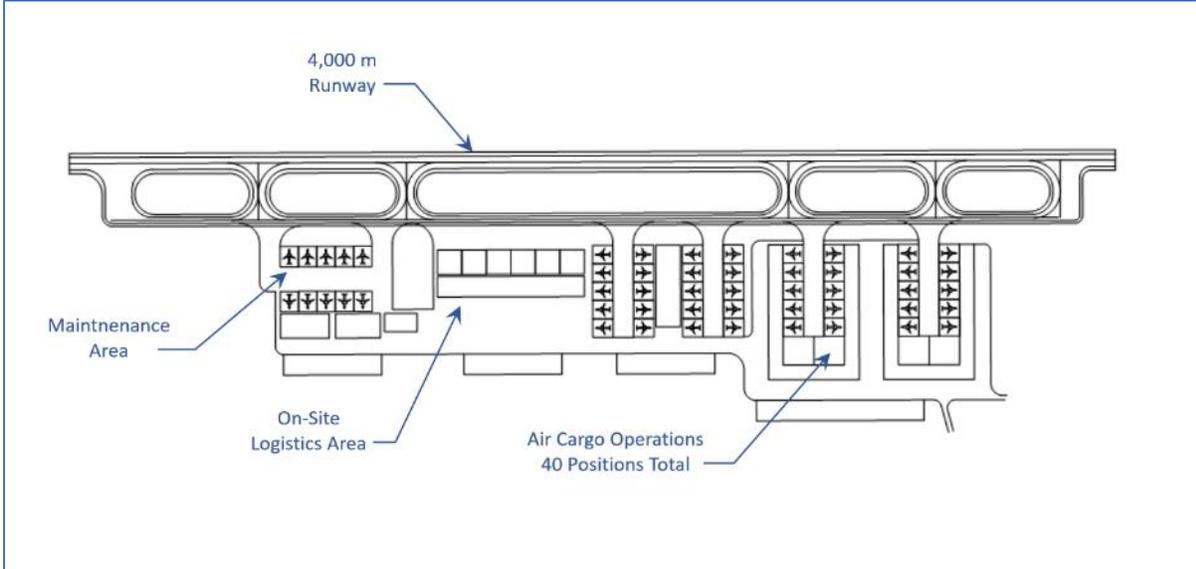
Figure II.1-16: 3D Rendition of Vernamfield Airport City – Concept 1



Source: BergerABAM

The above concepts both assume an air cargo facility of the type shown below in Figure II.1-17. At its full buildout capacity, 40 air cargo handling bays could process 6 flights per day each, for a total of 240 flights per day or a total of approximately 2 million tons per year. In the following chapter, we reference our air cargo demand forecasts prepared in Part I of this project as they relate to demand-based investment requirements for the LHI.

Figure II.1-17: Schematic Arrangement – Vernamfield Air Cargo Facility



Source: BergerABAM

JISCO Jamaica Industrial Park

Jiuquan Iron & Steel Company Ltd (JISCO) recently drafted a master plan for the development of the JISCO Jamaica Industrial Park (JJIP), which will be an Aluminium Cluster involved in downstream aluminium products processing, limestone products, clean energy industries (solar and wind), agro processing, logistics, and other energy intensive heavy industries. The cluster will include manufacturing and processing of local resources (such as bauxite and limestone), wind and solar power generation facilities, an upgraded and expanded Port Kaiser with an LNG terminal, professional services (such as financial services, legal services, training services and consulting services), and commercial and residential zones.

Industrial and logistics land uses will cover close to 200 ha of land, while over 500 ha would be devoted to residential and commercial land uses, housing over 80,000 people. JISCO estimates that in the long term, the project will create approximately 67,000 jobs, and generate over 6 billion USD in revenue and over \$480 million USD in tax revenue. JJIP will be located in St. Elizabeth. The project’s plan is currently undergoing approval by GoJ, and if approved, it would undergo design and procurement stages in 2018, and undergo construction between 2019 and 2035. Since this project’s primary activity will be heavy manufacturing, we did not rate it as a project with “direct impact” to the LHI in Chapter I.3, and therefore was not included in the Gap Analysis and Development Strategy. However, we included this project in the Master Plan because we recognize that it will drive significant further investment into the LHI.

NMIA Expansion

The Airports Authority of Jamaica (AAJ) has developed a master plan for Norman Manley International Airport, incorporating an expanded passenger terminal, new air cargo terminal, logistics facilities, and a 300-meter runway extension. A concept-level layout of the NMIA master plan is shown on Figure II.1-18. Review of the AAJ master plan indicates that as many as four hectares of land area may be devoted to air cargo warehousing. Assuming a relatively low-density operation with average dwell times of three to four days, throughput capacity at the terminal is expected to be in the range of 125,000 tons per year, or an average of 35 ten-ton cargo flights per day. It should be noted that AAJ has identified the need to extend the existing 2,700-meter runway to 3,000 meters, which is consistent with the requirements of long-range aircraft with cargo capacity in the range of 20 tons.

Modern air cargo facilities typically process cargo planes of the type anticipated in one to two hours. In such an operation, each of 13 air cargo bays indicated on Figure II.1-18 could accommodate 6 cycles per day, although utilization of the single runway, labor, and equipment would begin to control the overall throughput. Figure II.1-18 also depicts the proposed NMIA air cargo facility expansion. In the following chapter, we reference our air cargo demand forecasts prepared in Part I of this project as they relate to demand-based investment requirements for the LHI.

Figure II.1-18: Norman Manley International Airport Expansions



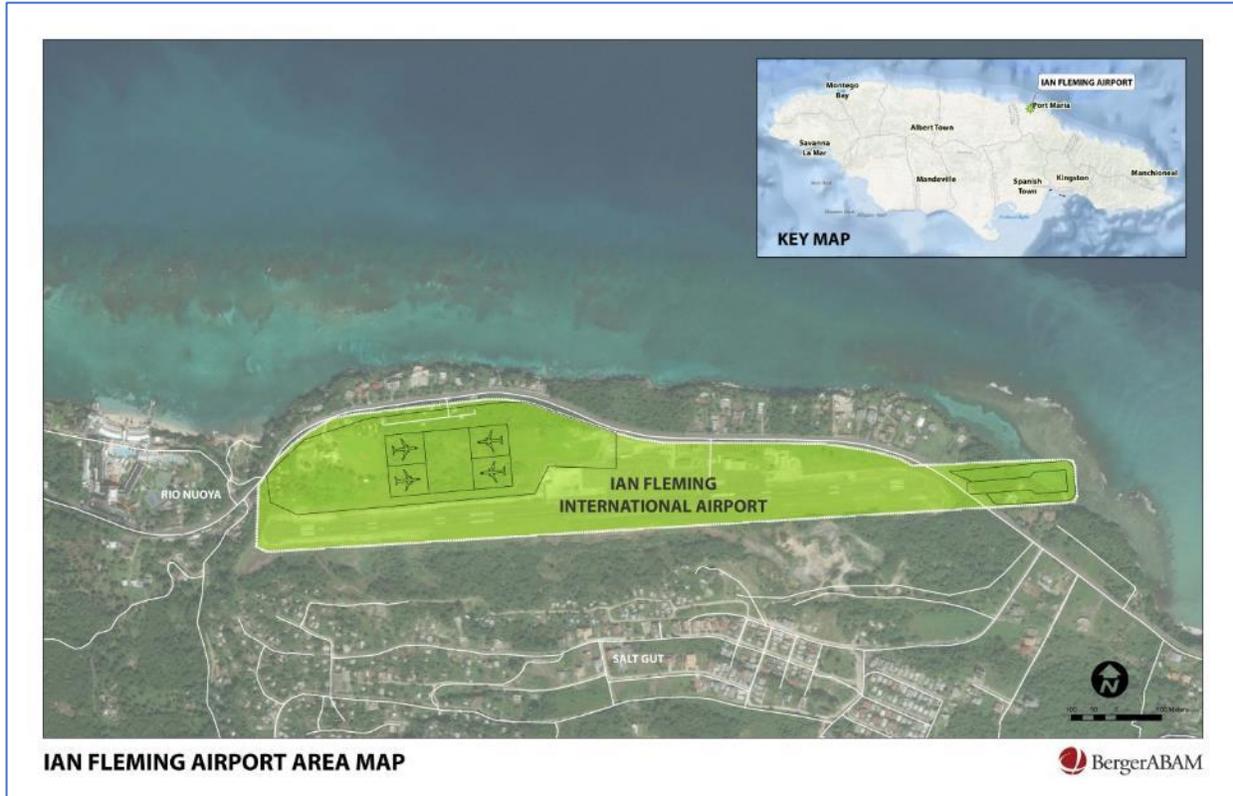
Source: BergerABAM

Ian Fleming International Airport Expansion

AAJ is also evaluating the expansion of Ian Fleming International Airport (IFIA). The AAJ plan includes the extension of the existing 1,400-meter runway to approximately 1,650 meters, and the development of an approximately 5,000 square meter air cargo facility. Discussion with AAJ staff indicates that the runway extension will be designed to allow IFIA to serve larger regional jets, such as Embraer E-190. Jets of this size are commonly used for regional cargo and mail, but with

combined hold capacity in the range of three tons (with a full passenger load), it is not anticipated that air cargo operations at IFIA will be a significant contribution to the LHI in the short or medium term. Planned improvements may boost air cargo capacity at this facility to the range of 30,000 to 50,000 tons per year in the short-to-medium term; however, no long term expansion is planned at this time, and as can be seen in Figure II.1-19, the proximity of the shoreline, highways, and steep terrain will make further expansion of the airfield impractical.

Figure II.1-19: Ian Fleming International Airport Expansions



Source: BergerABAM

Sangster International Airport Expansion

As opposed to Norman Manley and Ian Fleming, the AAJ does not currently have a plan in place for runway expansion at SIA. However, with an existing runway length of 2,700 meters, and the space for relatively economical extension to at least 3,300 meters, there is no reason that air cargo volumes at SIA could not be equal to that of NMIA. Discussions with the current operator at SIA do indicate that there are plans in place to expand air cargo storage capacity at SIA, and in particular cold storage. However, it does not appear that the scale of current plans will have the type of impact that would be significant for the overall LHI program. It is estimated that the proposed increase in cold storage and warehousing facilities would at best double the current air cargo volumes at SIA, from approximately 7,500 tons per year to 15,000 tons per year.

As shown in Figure II.1-20, SIA does have space for development of at least 100,000 square meters of warehousing, which would indicate that at least 125,000 tons per year of air cargo throughput is achievable with a similar operation to that described above for or NMIA.

Figure II.1-20: Sangster International Airport Expansions



Source: BergerABAM

Port of Kingston Improvements

The LHI will take advantage of ongoing developments at the Port of Kingston in three key areas:

- ▶ Channel and Berth Dredging
- ▶ Container Terminal Improvements at KCT and KWL
- ▶ Logistics Facilities Improvements

Dredging is currently being performed in the Port of Kingston entrance channel, inner harbor, and the existing berths at the Kingston Container Terminal (KCT). In addition, Kingston Wharves Limited (KWL) has developed a plan for the deepening of existing berths along the north side of the inner harbor. The design vessel for current and future deepening projects is a Post-Panamax container ship with typical capacity of at least 10,000 TEUs. Although shipping line and service will vary, such a vessel may require 4,000 or more total crane moves (loading and unloading) in a single call.

To keep pace with increasing vessel-size market demand, both KCT and KWL are also undertaking improvements to the existing quays, container storage areas, and container handling equipment. Assuming all planned improvements are implemented, capacity at KCT would be increased to approximately three million TEUs per year. If KWL increases to as much as one million TEUs per year, the approximate total capacity at the Port of Kingston may reach four million TEUs over the next five to 10 years.

**As shown in Figure II.1-6, pipeline projects at the Port of Kingston also include new logistics facilities at Kingston Wharves, the Tinson Pen airfield property, and the existing areas between the Port Kingston causeway and the KCT West Terminal. KWL's work on a 15,000 square meter logistics facility in the upland area of its terminal will help address short-term LHI infrastructure requirements; land available at Tinson Pen and KCT West can provide for at least another 400,000 to 500,000 square meters of warehousing, light manufacturing, and logistics-related development over the combined 75-hectare area, with development schemes similar to those proposed for logistics parks and light industry at Caymanas and Vernamfield, as outlined above. For additional information, please refer to the "Gap Analysis" section of this report.

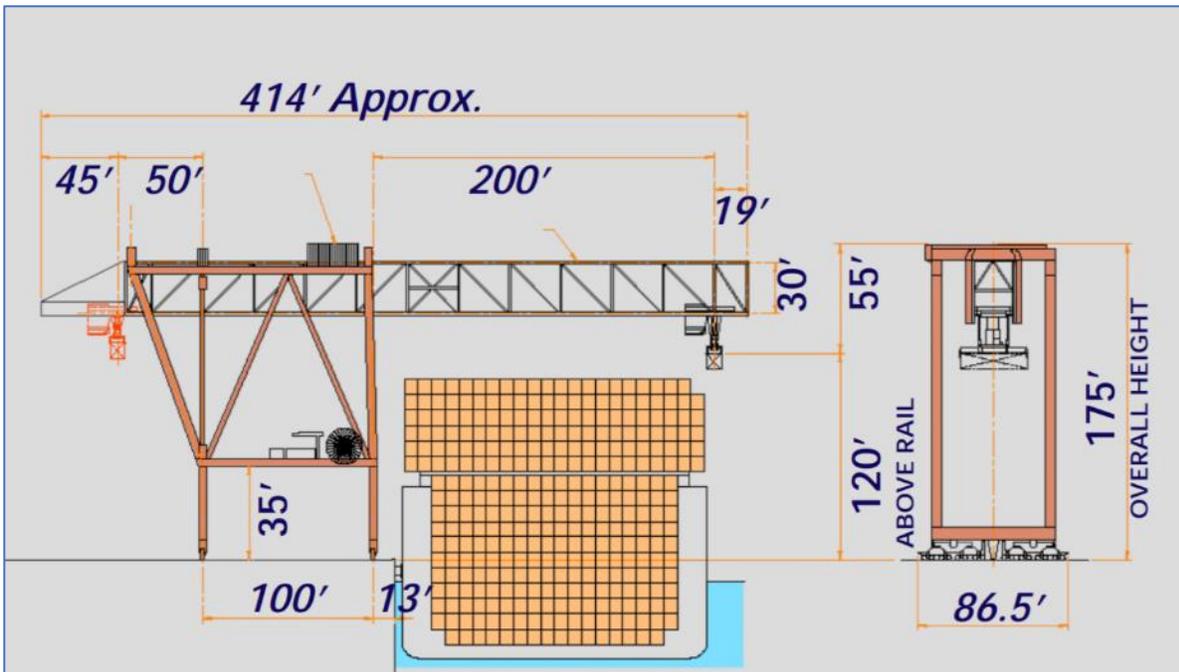
Fort Augusta

The Port Authority of Jamaica (PAJ) anticipates the need to expand beyond the limits of the current Kingston port area in order to keep pace with increasing container volumes, and in particular container transshipment. Accordingly, PAJ's proposed Fort Augusta terminal provides an opportunity to develop container terminal facilities that are less focused on transshipment (as at KCT) and more geared to the specific requirements of domestic traffic (import/export) in Jamaica, including increased cold storage, container freight stations, refrigerated container services, and other logistics-related functions. A proposed layout for the Fort Augusta concept is indicated in Figure II.1-6. For discussion of the capital cost of development and infrastructure requirements, please refer to the "Gap Analysis" section of this report.

Because it lies directly on the flight path of Norman Manley International Airport (NMIA), development of the Fort Augusta container terminal will hinge on coordination with civil aviation criteria for navigable airspace. Specific requirements will be evaluated in later stages of design, but as a point of reference the U.S. Federal Aviation Administration (FAA) requires a clearance slope of 1:100 for a distance of 20,000 feet from the nearest point of the runway.

Because the west end of the NMIA runway is approximately 18,000 feet from the possible future location of container cranes at the Ft. Augusta terminal, the FAA requirement indicates that low profile cranes would likely be required. In such situations, shuttle boom cranes are commonly specified; an example of one possible solution is illustrated in Figure II.1-21.

Figure II.1-21: Post-Panamax Shuttle-Boom Container Crane

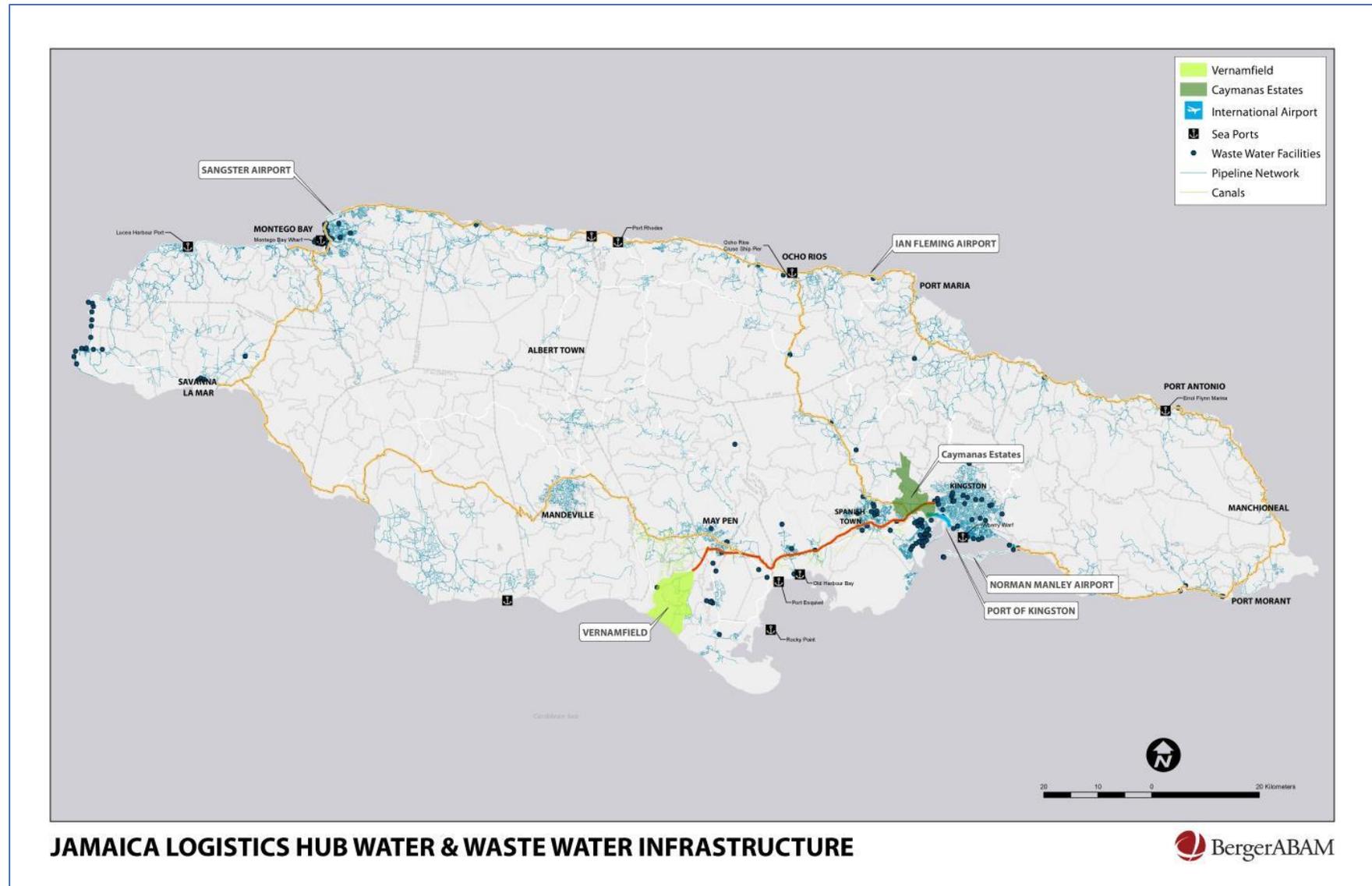


Source: Courtesy Liftech Crane Consultants

Utilities Infrastructure

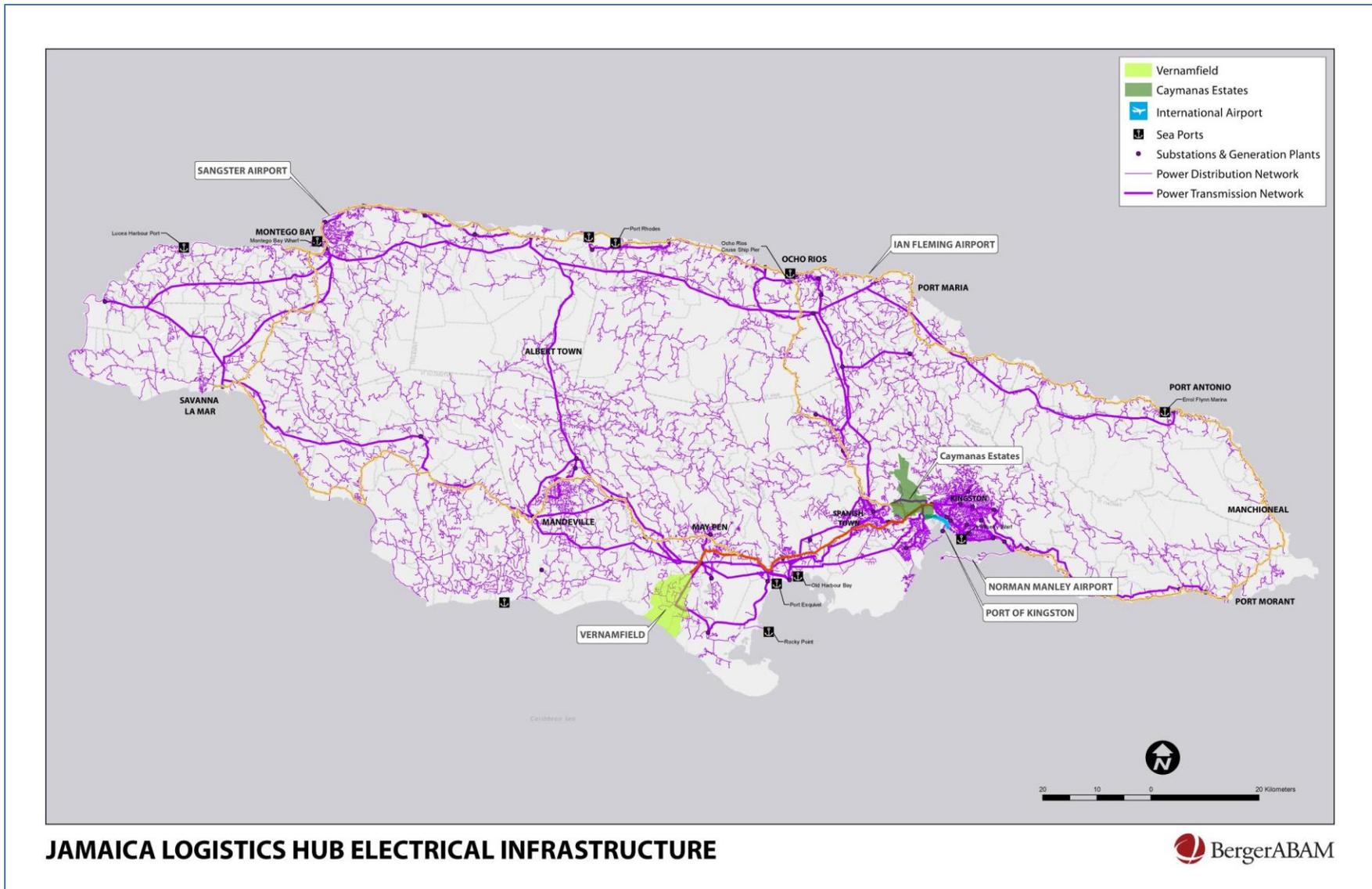
An overview of principal electrical and water/sewer infrastructure is provided in Figures II.1-22 and II.1-33. In general, Jamaica has ample freshwater from both surface sources and aquifers, and benefits from a robust electrical grid with high voltage transmission already in place near the areas of the master plan elements outlined above. Both utilities have multiple capital improvement projects ongoing, and although they are not directly related to the LHI, nor macro-level in their scope, they do highlight the capability of the utilities sector to respond to the demand of the JLHI, particularly because both utilities are currently focused on improved efficiency and loss reduction (as in the National Water Commission - NWC) and in further development of renewable resources (as in the Jamaica Public Service Co. - JPS). That being said, the challenge of the LHI will be the distribution of resources to the actual development sites. As an example, although fresh water is abundant on the island of Jamaica, its exploitation will require development of new wells and/or extension of existing pipelines. And although the existing electrical grid brings 138 kV of transmission close to the Caymanas site, expanded substations will be required to serve new customers. Finally, major developments such as Vernamfield airport city, will require construction of new power plants, wind farms, or solar arrays. For more information, please refer to the “Gap Analysis” section of this report.

Figure II.1-22: LHI Water/Sewer Infrastructure



Source: BergerABAM

Figure II.1-23: LHI Electrical Infrastructure



Source: BergerABAM

Part II.2 Gap Analysis

The Gap Analysis identifies the structural and non-structural needs that have to be addressed to attain the LHI vision. Structural and non-structural gaps are presented in the following categories:

- ▶ Existing Ordinances and Planning Controls
- ▶ Legal, Policy, and Regulatory
- ▶ Maritime Infrastructure
- ▶ Aviation Infrastructure
- ▶ Industrial Infrastructure
- ▶ Utilities Infrastructure
- ▶ Road and Rail Infrastructure
- ▶ Education and Skills Preparation

In the following sections, we address shortcomings relative to each category and provide recommendations for mitigating the gaps. For structural gaps, we identify land requirements and provide order-of-magnitude cost estimates for development in accord with the noted land use master plan. The gap analysis concludes by raising a cautionary flag about externalities that may hamper LHI success.

II.2-1 Existing Ordinances and Planning Controls

In order to identify limitations of the existing ordinances and planning controls that could affect implementation of the LHI, the Nathan team reviewed a number of policies, local and national level plans, planning laws affecting development, and the literature that cite the policies, plans and laws we reviewed. The documents reviewed by the team include:

Policies

- ▶ Land Acquisition Policy Framework

Plans

- ▶ Jamaica Vision 2030: National Development Plan
- ▶ Jamaica Vision 2030: Urban Planning and Regional Development Sector Plan

Laws

- ▶ Town and County Planning Act
- ▶ Kingston and St. Andrew Building Act
- ▶ The Housing Act
- ▶ Land Development and Utilization Act
- ▶ Maritime Areas Act

Articles

- ▶ “The Enforcement of Planning Laws in Jamaica,” Carole Excell, LLb, C.L.E, L.LM. NEPA, 2003

- ▶ “The Marginalization of Physical Planning in Jamaica,” Tanya Bedward, 39th ISoCaRP Congress 2003

This review presents a number of recommendations for changing Jamaica’s development planning framework, which are needed to streamline processes for LHI developments and to further attract foreign investment into new LHI SEZs and elsewhere in Jamaica. While Jamaica’s development planning framework allows for planning at various spatial scales (national, regional, and local) and has a long-term national vision for future development, multiple sources state that coordination of planning processes across different levels of government and agencies is not efficient.¹⁵⁴ Additionally, the development approval process itself can be cumbersome and time consuming.¹⁵⁵

Such weaknesses can be gradually improved through changes in policies and initiatives that render Jamaica more attractive to foreign companies and encourage domestic companies to invest in expansion. To close the existing gaps in Jamaica’s planning development framework, the Nathan team proposes two key interventions: leveraging private contributions for land acquisition and resettlement, and the creation of a one-stop to streamline the development application approval process.

Leverage Private Contributions for Land Acquisition and Resettlement

The land acquisition and resettlement process can lead to negative social, economic, and political consequences. These negative consequences can create local resistance to development and cause significant delays and costs such that development is no longer economically feasible.

Jamaica currently has programs and policies in place that facilitate land acquisition and resettlement procedures. One such example is the Jamaica Social Investment Fund (JSIF). A government-sponsored institution, JSIF was established to manage the financing of small community based development projects aimed at reducing poverty and building social capital.¹⁵⁶ JSIF-funded projects are strengthened by the Land Acquisition and Resettlement Policy Framework, which supplements existing land acquisition and resettlement law through (1) additional compensation measures and (2) arrangements to minimize land acquisition impacts, among other functions.

Some of the gaps in the existing land acquisition law are being filled by the Land Acquisition and Resettlement Policy Framework in the following ways:

- ▶ Proposed projects must include a land acquisition impact assessment, including a census of those affected that incorporates socio-economic data and an inventory of losses (e.g., losses to land and/or home owners that are associated with property acquisition for development purposes).
- ▶ Compensation for lost assets is at replacement costs that use Parish Council standards to value buildings. A valuation based on Parish Council standards includes an amount sufficient to

¹⁵⁴ Bedward, Tanya. “The Marginalization of Physical Planning in Jamaica,” 39th ISoCaRP Congress, 2003.

¹⁵⁵ NEPA. “Jamaica Vision 2030: Urban Planning and Regional Development Sector Plan.” 2009.

¹⁵⁶ JSIF, “Land Acquisition Policy Framework.”(2006). Accessed July 3, 2017, url: <http://documents.worldbank.org/curated/en/963701468263073361/Land-acquisition-and-resettlement-policy-framework>

replace a lost asset and also includes the loss-associated transaction costs. Such standards are in conformance with best practices.

- ▶ The offer of land for land compensation (or land of equal or similar value) where feasible if residential, business, or agricultural land acquisition has resulted in owner displacement.
- ▶ The offer of assistance to tenants/lease holders and squatters to find alternative accommodation (real estate services to assist tenants in finding a new home that will meet their needs and public affordable housing options for squatters).
- ▶ The offer of income restoration assistance if required.¹⁵⁷

JSIF-funded community projects currently include a variety of infrastructure investments beneficial to Jamaican communities that are also relevant to the LHI, including public utility infrastructure, small roads, sidewalks, fencing and wells, and agro-processing facilities, but these infrastructure investments are not aimed towards light manufacturing facilities.

However, JSIF projects, and their enhancements through the Land Acquisition and Resettlement Policy Framework, still play an important role in the success of the LHI. This is because community fund programs like JSIF are seen as beneficial in the eyes of foreign companies, which often consider a country's socioeconomic protections when weighing investment decisions. JSIF-funded projects to revitalize communities surrounding new SEZs also are effective in mitigating potential security issues and help make land available for transport connections essential to the SEZs.

Given the above considerations, the Nathan team recommends the following actions to strengthen the synergies between the JSIF and the LHI:

- ▶ The Government of Jamaica (GoJ) offers additional tax relief to SEZ developers and users for making contributions to JSIF infrastructure projects in their surrounding neighborhoods. An example of such a developer contribution could be compensation to and relocation of displaced families in squatting communities.
- ▶ The GoJ makes community and recreational facilities and residential utility infrastructure inside SEZs eligible for JSIF funding.
- ▶ The GoJ, in agreements with developers and investors, encourages developers and investors to locally source certain requirements, such as employee uniforms and skills training programs.
- ▶ The GoJ, in concert with developers and investors, sponsors promotional campaigns that espouse the benefits related to proposed developments.

Create a National One-Stop Shop to Streamline the Development Application Approval Process

After having implemented a successful and functioning virtual one-stop-shop, the GoJ could further expand its reach by creating a national one-stop shop, which would allow companies in the country to benefit from an improved business enabling environment. The one-stop shop serving SEZ investors centralizes the submission and processing of paperwork that SEZ investors need to complete to expedite and receive approvals, permits, and licenses. Extending the services to entities that want to invest and operate outside the zones could eventually benefit development on a

¹⁵⁷ JSIF, "Land Acquisition Policy Framework."(2006). Accessed July 3, 2017, url: <http://documents.worldbank.org/curated/en/963701468263073361/Land-acquisition-and-resettlement-policy-framework>

national scale. Such a model has proven to be successful in other countries, such as, for example, El Salvador.¹⁵⁸

The all-inclusive national one-stop shop could be housed in the National Environment and Planning Agency (NEPA), which is the agency tasked with the development applications review process, plan preparation and enforcement, and with seeking interagency collaboration in the preparation of national level plans. Such an entity could also be housed in the newly established SEZ Authority. In line with World Bank recommendations, a one-stop shop could be implemented first as a pilot project for SEZ investors before being opened up to companies that want to invest in parts of the country outside the confines of SEZs.¹⁵⁹ This approach could occur over a period of five to ten years. We recommend that under the expanded national one-stop shop model, other exclusive benefits to companies located in SEZs (such as fiscal incentives) under the jurisdiction of the SEZ Authority should still only apply to companies eligible under the SEZ Act. Like in El Salvador, one-stop shop benefits that would apply to all companies could include:¹⁶⁰

- ▶ Company registration;
- ▶ Income Tax ID number;
- ▶ VAT ID number;
- ▶ Initial balance registration
- ▶ Invoices correlative registration
- ▶ Work place registry
- ▶ First-time employer's identification number
- ▶ First time establishment registration

II.2-2 Policy, Legislative, and Regulatory Framework

Special Economic Zones

As stated in Chapter I.5 of Part I, there are three primary objectives that the GoJ can achieve by promoting the right policies, passing key legislation, and establishing an enabling regulatory environment. These primary objectives are:

- ▶ Simplified customs procedures;
- ▶ Streamlined logistics services; and
- ▶ Significant increase in population with higher education.

A key piece of legislation that aims to establish the regulations needed to achieve the above objectives is Jamaica's 2016 Special Economic Zone Act. The Act repealed the Jamaica Export Free

¹⁵⁸ In El Salvador, one-stop investor services are available to all companies, which then benefit from not having to streamlined administrative and regulatory procedures. Free zones are regulated by the Ministry of Commerce. Services include company registration, Income Tax ID number, initial balance registration, work place registry, VAT ID number, invoices correlative registration, first-time employer's identification number, and first time establishment registration, among others.

¹⁵⁹ Erdmann, Andrea. "Caymanas Special Economic Zone: An Initial Assessment of Options for Private and PPP Development in the Context of Jamaica's Global Logistics Hub Initiative and New SEZ Regime," The World Bank Group. June, 2015.

¹⁶⁰ Ibid.

Zones Act of 1982 and established provisions regulating development, regulations, construction, management, and control of SEZs in Jamaica. While some elements of the SEZ Act are in line with international best practices, other elements may leave regulatory gaps.

Based on our experience, the SEZ Act contains elements that are well aligned with international best practices and that can close several existing regulatory gaps that affect LHI success. These include:

- **Establishing a SEZ Authority**

- ▶ A SEZ Authority, an executive agency under the Ministry of Economic Growth and Job Creation and already established in 2016, will be in charge of the administration, supervision, and regulation of all SEZs in Jamaica.
- ▶ The SEZ Authority is governed by a Board of Directors composed of both public and private sector members who are responsible for overseeing the general administration of the Authority.
- ▶ Other responsibilities of the SEZ Authority include supervision of SEZ developers, evaluation and approval of development plans from SEZ developers, entering concession agreements for the lease of SEZ land to developers, and making policy recommendations on regulatory issues affecting SEZs.
- ▶ The SEZ Authority is not directly involved in zone development and operation.
- ▶ SEZ Authority staff cannot have financial interests in SEZ developments.
- ▶ The SEZ Authority Board may bring in outside experts through a Special Purpose Committee to provide advice on the functions of the Board.

- **Developing, Managing, and Operating SEZs**

- ▶ The SEZ Act aims to increase the trend toward private participation in SEZs through PPPs by attracting private investment.
- ▶ The Minister may designate the geographic location of new SEZs based on the recommendation of the SEZ Authority. The SEZ Authority may allow the establishment of a general zone (allowing multiple uses) or a specialized zone (one restricted to specific economic activities).
- ▶ Unless the Minister approves and compliance of certain conditions exists, single-entity zones are not allowed under the SEZ Act.
- ▶ While the developer is tasked with developing basic utilities infrastructure within its land, GoJ entities must assure that utilities infrastructure outside the zone have the capacity to supply the utility needs of the SEZ developers.
- ▶ 50-year leases to developers are authorized with the possibility for re-negotiating new leases upon lease expiration.

- **SEZ Taxes and Incentives**

- ▶ A low and flat corporate income tax of 12% on zone users and developers.
- ▶ Tax deduction incentive for a total of 10% provided for worker training.

- **SEZ Investor Services and Customs Consideration**

- ▶ The SEZ Authority operates a one-stop investor services facility staffed with representatives from various ministries.
- ▶ SEZs are considered outside of the customs territory.

- **SEZ Rules and Regulations**

- ▶ The new SEZ regime allows for a mix of land uses, including residential, commercial, and mixed use zones.
- ▶ The SEZ Authority enforces environmental regulations. The SEZ user is responsible for environmental compliance with SEZ Authority and National Environment and Planning Agency guidelines and rules and must operate in accordance with any applicable law pertaining to the environment.
- ▶ Companies registered under the old Free Zone regime are grandfathered in for five years.
- ▶ Regulations proposed by the SEZ Authority pertain to business registration and licensing and customs.

Despite these features, the Act still leaves some gaps unaddressed. These gaps are outlined below.

- ▶ Registration and licensing application requirements are not explicitly stated in the SEZ Act.
- ▶ There is no reference to business registration fees for users in the SEZ Act; however, we know that the SEZ Authority is specifically authorized establish schedule of fees.
- ▶ The Act does not include tax incentives for contributions to urban renewal, which would be particularly beneficial in existing communities that will become part of an SEZ, such as the ones within the Vernamfield aerotropolis. This is identified here given that the JSIF would exclude SEZ facilities.
- ▶ While the current one-stop investor shop is beneficial to SEZ users, as noted above, a more valuable alternative would be to establish a national one-stop shop that extends services to users (tenants) both within and outside of SEZs. A national one-stop shop could also be a virtual one-stop shop that connects all regulatory authorities through an e-government portal.
- ▶ The SEZ Act does not specify how value added goods departing a SEZ and entering the customs territory will be taxed. Goods for which value was added in a SEZ and which are subsequently sold in the domestic market should be taxed according to the value of the imported inputs and not value of the entire product. The same principle should be applied when value added goods are exported from a SEZ to a CARICOM country. A payment of duties on such goods should be levied on the value of the imported inputs.
- ▶ The SEZ Act does not specify whether or not there will be time limits for the storage of goods, though best practice suggests no time limits should be imposed on the storage of goods.
- ▶ The SEZ Authority should apply for ISO 9001 certification to ensure high-quality administration of benefit to prospective zone developers and users.¹⁶¹
- ▶ The GoJ should ensure that customs officials working in SEZs receive special training so they can be aware of SEZ regulations and how they are interpreted for customs processing.
- ▶ The SEZ Act should allow for de-vanning and re-vanning of cargo inside the SEZs.
- ▶ The same restriction SEZ Authority staff members have on financial interests associated with SEZ developments should be imposed on the SEZ Authority board members.

¹⁶¹ The Philippines Economic Zone Authority, Kenya Export Processing Zone Authority, the Phnom Penh (Cambodia) Special Economic Zone Authority, Special Economic Zone Authority of Duqm Oman), and several local special economic or export processing zone authorities in India and the Philippines are ISO 9001 certified.

With the above in mind, it is important that the GoJ, through the SEZ Authority, initiates policy recommendations that can make SEZs in Jamaica competitive for attracting investments through a commercially aggressive SEZ regime.

Public Private Partnerships

The Jamaican PPP Policy, approved by Cabinet in September 2012, sets out the principles that the GoJ is following to improve infrastructure and the delivery of public services through the involvement of private sector operators and investors.

The involvement of the GoJ in previous PPP projects demonstrates that the country is supportive of PPPs in the provision of transport services and infrastructure, and state disengagement from the operation of the transport infrastructure remains a strategic objective of the Government.

In our opinion, the GoJ has the appropriate institutional structures in place to promote, structure, procure, manage and administer PPP's in the aviation, maritime, rail, road transport sectors as well as the industrial and urban development required in the LHI.

However, a formal PPP Law will give further certainty to international and local investors and operators, financiers and users to participate more actively in the development of the LHI.

Civil Aviation

Jamaica has well-developed civil aviation policy mechanisms and legislation. Jamaica, as a signatory to the Chicago Convention on International Civil Aviation (ICAO), adopts all of ICAO Standards and Recommended Practices (SARPS) regulating civil aviation. Jamaica is also a party to a number of the key international conventions relating to civil aviation as well as several Bilateral Air Services Agreements (ASAs) with other Member States.

The GoJ has promoted a very liberal air space policy and the Jamaica Civil Aviation Authority (JCAA) has been actively pursuing bilateral air service agreements (BASA) with other countries with the goal to expand aviation's impact on the Jamaican economy. Jamaica is currently party to 28 BASAs, and is developing additional agreements with Qatar, India, Sri Lanka, Burkina Faso, Austria, Kenya and Ethiopia.

The JCAA is the technical regulation authority of the aviation industry in Jamaica, having regulatory powers, budget independence, and transparent composition and appointment rules. The JCAA is the regulator responsible for imposing safety standards, ensuring compliance of minimum performance standards and setting maximum airport charges. On the other hand, the Airports Authority of Jamaica (AAJ) is responsible for airports' development and operations directly or through private sector concessionaires.

Jamaica's civil aviation legislative and regulatory framework is modern and developed to ensure legal and regulatory certainty and stability to airlines, investors/operators, financiers, and users, both passenger and air cargo shippers. The roles, rights and responsibilities of the key stakeholders in Jamaican civil aviation are clearly defined in the following acts: the Civil Aviation Act, the Airports (Economic Regulation) Act, and the Airports Authority Act.

In our opinion Jamaica's Civil Aviation Legal and Regulatory Framework has well matured civil aviation policy mechanisms and legislation to support the development of the LHI.

II.2-3 Maritime Infrastructure

Demand-Driven Requirements

The market analysis performed in Part 1 yielded Table II.2-1's forecasts for demand-driven cargo growth, including transshipment. In 2015, Kingston Container Terminal (KCT) had a throughput of approximately 1.6 million TEUs, or nearly 60% of its physical capacity at that time. In the two years since CMA-CGM began operations, volumes have increased fairly steadily at an approximate rate of 10% per year. It is clear that even if volumes do not continue on their current trajectory, it will be essential to complete the improvements currently being undertaken by KCT (and KWL) to meet the additional demand associated with the LHI.

Table II.2-1: Estimated LHI Container Demand (From Part 1, Chapter 2)

TEUS	2016	2017	2018	2019	2020	2021	2030	2035
Transshipment	200,000	400,000	600,000	800,000	1,000,000	1,000,000	1,000,000	1,000,000
SEZ Traffic	558,406	576,120	594,402	613,272	632,748	652,852	982,272	1,013,676
Total	758,406	976,120	1,194,402	1,413,272	1,632,748	1,652,852	1,982,272	2,013,676

As outlined in the land use master plan, improvements proposed for the combined KCT/KWL port complex will increase total capacity to approximately four million TEUs, which would be sufficient to allow for the estimated 600,000 TEUs of annual LHI traffic in year 2021, along with an allowance for growth in other industry sectors. However, if current volumes at the Port of Kingston increase at an average of four percent per year in addition to the volumes predicted for demand-based LHI development, there would not be sufficient capacity for projected LHI volumes by year 2030.

To ensure that sufficient capacity is available for demand-based projections of LHI volumes, it is recommended that current plans for improvement at both KCT and KWL be completed by 2021, and that the proposed Fort Augusta project be undertaken and completed by 2030. Summaries of the scope of work and order-of-magnitude capital cost for KCT, KWL, and Fort Augusta terminals are detailed in Tables II.2-2 and II.2-3.

Table II.2-2: Order-of-Magnitude CAPEX Estimate – KCT/KWL Improvements

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Dredging and Reclamation				
Berth Deepening	m ³	1,800,000	12.00	21,600,000
Advance Maintenance Dredging	m ³	450,000	12.00	5,400,000
Marine Structures				
Apron Structure and Toe Wall	meters	3,600	12,000	43,200,000
Wharf Retrofit and Crane Rail Improvements	m ²	126,000	500	63,000,000
Terminal Development				
Site Preparation & Ground Improvement	Ha	40	800,000	32,000,000
Container Terminal Redevelopment	Ha	80	1,200,000	96,000,000
Major Equipment				
Post-Panamax Container Crane	Each	12	15,000,000	180,000,000
Rubber-Tired Gantry Crane	Each	40	2,000,000	80,000,000
Engineering and Administration			5%	26,060,000
Contingency			30%	164,178,000
TOTAL ORDER-OF-MAGNITUDE CAPITAL COST ESTIMATE - KWL/KCT IMPROVEMENTS				\$ 711,438,000

Supply-Driven Development

As Caymanas and Vernamfield developments are implemented, cluster effects and competition will generate additional growth not accounted for in Part 1's demand-driven projections. It is anticipated that this additional supply-driven demand would materialize prior to the assumed 2035 planning horizon and would necessitate development of new maritime infrastructure beyond the KCT/KWL/Fort Augusta port complex. Two major greenfield port developments are considered to be viable options to address future requirements:

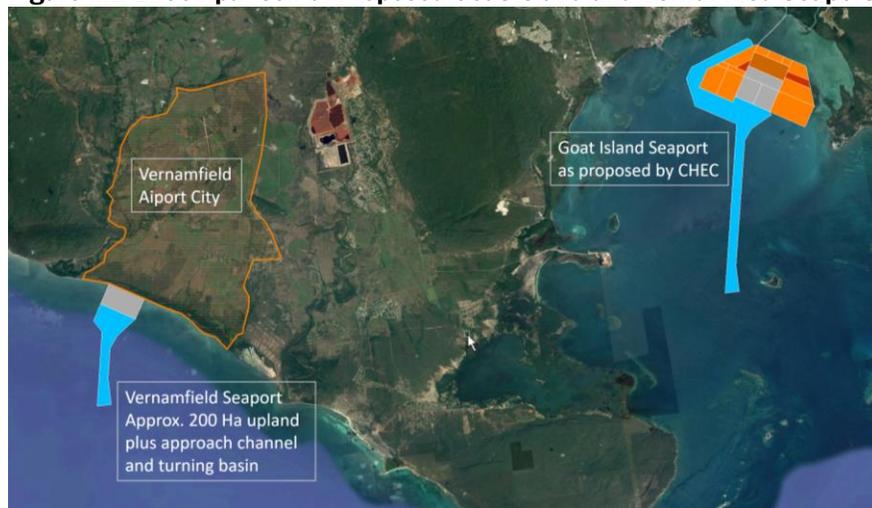
Table II.2-3: Order-of-Magnitude CAPEX Estimate – Fort Augusta Development

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Dredging and Reclamation				
Berth Dredging	m ³	5,000,000	12.00	60,000,000
Advance Maintenance Dredging	m ³	400,000	12.00	4,800,000
Reclamation Fill	m ³	2,000,000	8.00	16,000,000
Marine Structures				
Post-Panamax Container Wharf	m ²	40,000	3,000	120,000,000
Slope Revetments	m	2,000	7,500	15,000,000
Terminal Development				
Site Preparation & Ground Improvement	Ha	60	800,000	48,000,000
Container Terminal Development	Ha	60	2,000,000	120,000,000
Major Equipment				
Post-Panamax Shuttle-Boom Container Crane	Each	12	18,000,000	216,000,000
Rubber-Tired Gantry Crane	Each	40	2,000,000	80,000,000
Engineering and Administration			5%	33,990,000
Contingency			30%	214,137,000
TOTAL ORDER-OF-MAGNITUDE CAPITAL COST ESTIMATE - FT. AUGUSTA CONTAINER TERMINAL				\$ 927,927,000

- ▶ The first is the Goat Island Project, originally proposed by Chinese investors and contractors in 2014. As of today, this is delayed indefinitely due to environmental concerns.
- ▶ The second is the possibility of a new port facility to be developed as part of the Vernamfield complex, with similar capacity to the Goat Island proposal.

Schematic layouts of both options are shown below in Figure II.2-1. For purposes of developing an all-inclusive order-of-magnitude cost estimate for the buildout condition, the costs associated with a project similar to Goat Island, but constructed in the Vernamfield area is included in Table II.2-4. Such a development, conceptually identified as the Vernamfield multi-purpose seaport (Figures II.1-11 and II.1-12 of the land use master plan), may also include liquid bulk and cruise terminals.

Figure II.2-1: Comparison of Proposed Goat Island and Vernamfield Seaports



Source: BergerABAM

Table II.2-4: Order-of-Magnitude CAPEX Estimate – Future Vernamfield Multi-Purpose Seaport

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Dredging and Reclamation				
Rubble-Mound Breakwater	m	3,000	75,000	225,000,000
Berth Dredging	m ³	10,000,000	12.00	120,000,000
Advance Maintenance Dredging	m ³	400,000	12.00	4,800,000
Reclamation Fill	m ³	2,000,000	8.00	16,000,000
Marine Structures				
Post-Panamax Container Wharf	m ²	25,000	2,500	62,500,000
Slope Revetments	m	800	7,500	6,000,000
Liquid Bulk Berth, Complete	Each	2	15,000,000	30,000,000
Cruise Berth, Complete	Each	1	20,000,000	20,000,000
Terminal Development				
Site Preparation & Ground Improvement	Ha	60	800,000	48,000,000
Container Terminal Development	Ha	40	2,000,000	80,000,000
Liquid Bulk Tank Farm	Ha	20	1,500,000	30,000,000
Cruise Terminal	Each	1	5,000,000	5,000,000
Major Equipment				
Post-Panamax Container Crane	Each	8	15,000,000	120,000,000
Rubber-Tired Gantry Crane	Each	30	2,000,000	60,000,000
Engineering and Administration			5%	41,365,000
Contingency			30%	260,599,500
TOTAL ORDER-OF-MAGNITUDE CAPITAL COST ESTIMATE - VERNAMFIELD MULTI-PURPOSE SEAPORT				\$ 1,129,264,500

II.2-4 Aviation Infrastructure

Demand-Based Analysis

The Part 1 market analysis concluded that opportunities to exploit Jamaica’s air connectivity exist and that the LHI plan should take advantage of synergies between air, marine, and SEZ freight. Such conclusion was supported by an air cargo demand forecast in Jamaica that was conducted as part of Chapter I.2 of the Part 1 market analysis (page I.2-74 of Part I). The forecast concludes that under the right customs and SEZ regulations, if strategic projects and actions recommended as part of the LHI are realized, and if the Vernamfield Air Cargo terminal begins its international operations in 2030, 30 percent of projected air cargo from Latin America and Europe operated at Miami International Airport could be diverted by 2036. While we estimate that the construction of the Vernamfield air cargo terminal would begin by 2025, AAJ stated that it plans to begin using the Vernamfield runway for small-scale local operations as early as 2018. Accordingly air cargo is projected to grow from 16,588 tons in 2016 to approximately 97,902 tons in 2021, 445,579 tons in 2035, and 570,654 in 2040.

Table II.2-5: Air Cargo Demand Forecast for Jamaican Airports (Conducted in Part I)

Airport	2016	2017	2018	2019	2020	2021	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
NMIA Organic	10,588	13,500	13,689	13,881	14,075	14,272	15,030	15,240	15,454	15,670	15,890	16,112	16,338	16,566	16,798	17,033	17,272
NMIA JLHI Cluster			48,493	66,795	69,005	71,291	65,000	58,500	52,000	45,500	39,000	32,500	26,000	19,500	13,000	6,500	0
Total NMIA	10,588	13,500	62,182	80,676	83,080	85,563	80,030	73,740	67,454	61,170	54,890	48,612	42,338	36,066	29,798	23,533	17,272
SIA Organic	6,000	7,000	10,000	12,000	12,168	12,338	12,994	13,176	13,360	13,547	13,737	13,929	14,124	14,322	14,522	14,726	14,932
V. Field Cluster (Landing and Departing)*							41,210	48,917	56,624	64,330	72,037	79,743	86,867	94,574	101,697	109,404	116,528
V. Field Transshipment							26,373	54,329	111,919	172,914	237,469	303,295	374,873	386,119	397,702	409,634	421,923
Total V. Field							67,584	103,246	168,542	237,244	309,506	383,038	461,740	480,693	499,400	519,037	538,450
Total Air Cargo (tons)	16,588	20,500	72,182	92,676	95,248	97,902	160,608	190,162	249,356	311,961	378,132	445,579	518,201	531,081	543,720	557,296	570,654

* This cargo segment counts for landing-import and departing-export

Source: Nathan Associates. NMIA cargo air projections, SIA interviews.

After discussing plans for civil aviation expansion with the AAJ, it was concluded that the improvements AAJ has planned are well aligned with the LHI vision and may be considered essential by potential developers in key sectors such as agriculture, biomedical, and logistics. Some improvements planned by the AAJ, such as, for example, the Ian Fleming International Airport (IFIA) runway extension, may not necessarily advance the mission of the LHI, but others go further toward advancing the LHI initiative, like the proposed Sangster air cargo facilities. To address demand-based gaps in Jamaica’s aviation infrastructure capacity, the following projects are recommended, with order-of-magnitude capital cost estimates for these projects included in Tables II.2-6 and II.2-7:

- ▶ NMIA Runway Extension and NMIA air cargo and logistics facilities
- ▶ SIA air cargo and logistics facilities

Table II.2-6: Order-of-Magnitude CAPEX Estimate – NMIA Runway Extension and Air Cargo Facilities

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Dredging and Reclamation				
Rubble-Mound Containment Dike	m	1,200	15,000	18,000,000
Reclamation Fill	m ³	1,200,000	12.00	14,400,000
Terminal Development				
Site Preparation & Ground Improvement	Ha	30	600,000	18,000,000
Arifield Terminal Development	Ha	20	2,500,000	50,000,000
Logistics Area Development	Ha	10	1,000,000	10,000,000
Buildings				
Air Cargo Facilities	m ²	60,000	600	36,000,000
Other Logistics Facilities	m ²	40,000	600	24,000,000
Engineering and Administration			5%	8,520,000
Contingency			30%	53,676,000
TOTAL ORDER-OF -MAGNITUDE CAPITAL COST ESTIMATE - NMIA RUNWAY EXTENSION & AIR CARGO				\$ 232,596,000

Table II.2-7: Order-of-Magnitude CAPEX Estimate – SIA Air Cargo and Logistics Facilities

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Terminal Development				
Site Preparation & Ground Improvement	Ha	30	600,000	18,000,000
Arifield Terminal Development	Ha	20	2,000,000	40,000,000
Logistics Area Development	Ha	10	1,000,000	10,000,000
Buildings				
Air Cargo Facilities	m ²	60,000	600	36,000,000
Other Logistics Facilities	m ²	40,000	600	24,000,000
Engineering and Administration			5%	6,400,000
Contingency			30%	40,320,000
TOTAL ORDER-OF -MAGNITUDE CAPITAL COST ESTIMATE - SANGSTER AIR CARGO FACILITIES				\$ 174,720,000

Supply-driven Development

In the long term, as the LHI advances to become a full international air cargo hub, the gap in aviation infrastructure will be such that continued improvement of NMIA and SIA will not address demand. By that time, the development of the Vernamfield airport city should have been completed, along with improved infrastructure connections to Kingston, the Caymanas SEZ, and Montego Bay.

A concept-level layout for a dedicated air cargo facility with a capacity of two million tons per year at Vernamfield is indicated in Figures II.1-11 and II.1-12 of the land use master plan. Along with the Vernamfield seaport described above, the air cargo terminal will be a key component of the LHI and

will be the central hub of the “airport city” development. Associated industrial development and transportation infrastructure are outlined in other sections of this report. An order-of-magnitude capital cost is tabulated in Table II.2-8.

Table II.2-8: Order-of-Magnitude CAPEX Estimate – Vernamfield Air Cargo Facility

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Terminal Development				
Site Preparation & Ground Improvement	Ha	300	400,000	120,000,000
Airfield Terminal Development	Ha	150	2,500,000	375,000,000
Logistics Area Development	Ha	150	1,000,000	150,000,000
Buildings				
Air Cargo Facilities	m ²	300,000	600	180,000,000
Other Logistics Facilities	m ²	200,000	600	120,000,000
Engineering and Administration			5%	47,250,000
Contingency			30%	297,675,000
TOTAL ORDER-OF -MAGNITUDE CAPITAL COST ESTIMATE - VERNAMFIELD AIR CARGO FACILITY				\$ 1,289,925,000

II.2-5 Industrial Infrastructure

Demand-Based Analysis

Analysis of the industrial infrastructure required for LHI development is included in the Part 1. For purposes of outlining required infrastructure at this early stage of planning, two general types of industrial development are considered: light manufacturing and warehousing/logistics. These require fundamentally different types of construction. Additionally, due to the importance of this cluster in the LHI vision, a specific subset of light manufacturing in the biomedical sector is considered. Table II.2-9 summarizes our Part 1 analysis. Not including residential and commercial development, the estimated total space requirement for demand-driven development by 2035 is approximately 200 hectares of building footprint. Note the ranges indicated in Table II.2-9 are based on a base and high scenario of TEU projections and other development scenarios described in Chapter I.6 of Part I.

Table II.2-9: Demand-driven Requirements in Hectares for Industry Clusters (from Part 1)

Development Type	By 2021 (ha)	By 2030 (ha)	By 2035 (ha)
Light manufacturing	40.5 - 62.93	47.25 - 76.43	50.4 - 82.73
Biomedical	4.5 - 7.07	5.25 - 8.57	5.6 - 9.27
Warehousing	45 - 70.7	52.7 - 95.7	56.2 - 102.7
Residential	20-Dec	14.3 - 24	15.3 - 26
Commercial (office space and Institutional)	28 - 40	32.7 - 48	34.7 - 52
Total ha of new development	130 - 200.7	152.2 - 252.7	162.2 - 272.7

Preliminary master planning for KCT and KWL-area improvements (see the land use master plan chapter) indicates that there is space for approximately 50 hectares of development at the Port of Kingston, including the proposed KWL logistics developments. Because of the attractiveness of the location (e.g., lower cost of development; proximity to marine infrastructure), it is assumed that these areas would be developed first. The remaining 150 hectares would be developed at the Caymanas Special Economic Zone (CSEZ) once transportation and utilities infrastructure are in place (we assumed that such municipal infrastructure would be developed as part of the Port of Kingston area buildout).

Industrial development in the Port of Kingston and CSEZ areas will be promoted by the Port of Kingston and/or municipal development authorities working under the guidance of the LHI. Site preparation, public utility works, and transportation connections will be provided by the municipalities. Individual facilities will be developed under a public-private initiative. An approximate breakdown of the public/private costs of development for the demand-based forecast (to year 2035) at the Port of Kingston and in the first phases of development at CSEZ is provided in Table II.2-10.

Table II.2-10: Order-of-Magnitude CAPEX Estimate – Demand-Based Industrial Development

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Public Infrastructure				
Site Preparation	Ha	180	50,000	9,000,000
Transportation Arterials	Ha	10	2,000,000	20,000,000
Public Works Infrastructure	Ha	200	200,000	40,000,000
Private Development				
Light Industrial	m ²	400,000	800	320,000,000
Biomedical	m ²	100,000	1,200	120,000,000
Warehousing / Logistics	m ²	500,000	600	300,000,000
Engineering and Administration			5%	40,450,000
Contingency			30%	254,835,000
ORDER-OF -MAGNITUDE CAPITAL COST ESTIMATE - DEMAND-BASED INDUSTRIAL DEVELOPMENT				\$ 1,104,285,000

Supply-driven Development

As noted above, supply-driven cluster effects and industry competition will create the needed additional infrastructure. In fact, logistics-related facilities that were not captured by the Part 1 demand forecasts are already being developed in Jamaica, many of which are planned for the Port of Kingston and Caymanas areas.

Factoring the addition of supply-driven development in the demand for industrial space means that expansion of the CSEZ and the development of the Vernamfield airport city would be required before demand-driven volumes reach their peak in 2035. The ratio of supply- to demand-driven development space is not well defined, but for purposes of analyzing infrastructure gaps and developing an order-of magnitude estimate, it is assumed that full buildout of the land use master plans for CSEZ and Vernamfield Airport City will occur.

Areas available for light industrial development will exceed 3,000 hectares and will be supported by future air cargo and marine terminals, commercial and residential development, and road/rail infrastructure. Based on Table II.2-11’s estimates, the required total investment (public and private) is approximately \$5 million USD per hectare (in 2017 dollars), for a total of \$21 billion for over 3,500 total hectares of development.

Table II.2-11: Order-of-Magnitude CAPEX Estimate – LHI Buildout of Industrial Development

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Public Infrastructure				
Site Preparation	Ha	2,600	600,000	1,560,000,000
Transportation Arterials	Ha	100	2,000,000	200,000,000
Public Works Infrastructure	Ha	3,000	1,000,000	3,000,000,000
Private Development				
Light Industrial	m ²	7,500,000	800	6,000,000,000
Warehousing / Logistics	m ²	7,500,000	600	4,500,000,000
Engineering and Administration			5%	763,000,000
Contingency			30%	4,806,900,000
TOTAL ORDER-OF-MAGNITUDE CAPITAL COST ESTIMATE - LHI BUILDOUT OF LIGHT INDUSTRY & LOGISTICS				\$20,829,900,000

II.2-6 Utility Infrastructure

As indicated in the land use master plan, major utility infrastructure development or expansion is not currently being planned by the National Water Commission (NWC) or the Jamaica (JPS). Because sufficient space for required LHI industrial development will be available in the Port of Kingston and Caymanas areas, such development or expansion would not be required.

Future development of an airport city at Vernamfield would require development of a new power plant and exploitation of new water sources. The KCT and KWL areas are already connected to existing grids, and Caymanas requires relatively basic expansion of the existing utilities to prepare areas for future development.

Our discussion with the NWC indicated that the anticipated development of the Caymanas SEZ will create enough demand for one to two new municipal wells, each with capacity in the range of 4,000 to 5,000 gpm, or an approximate total of 10 million gallons per day. Correlating this level of consumption with the planned development area outlined above yields roughly 400 gallons per person per day, for approximately 35,000 individuals for both residential and light industrial use. However, this allowance is more than double the typical usage in major North American cities and could be reduced as site development engineering gets underway.

NWC has also noted that the existing water treatment plant at Soapberry would require expansion and that plans had already been in place to do so. Such expansion would go a long way to meet CSEZ demand. However, should industrial developments with more wastewater-intensive requirements be proposed, new tertiary treatment plants at specific point sources can be included in the design requirements. The order-of-magnitude cost estimates for required CSEZ utility improvements include allowances for such additional treatment capacity.

Lastly, a short extension of the 169 kV transmission line to the CSEZ and a new primary substation will be required. Details of high- and medium-voltage distribution will be developed during later phases of design. At this time it is assumed that a central substation would step voltage down to 13.8 kV for distribution throughout the CSEZ. Order-of-magnitude estimates for required utility infrastructure are included in Table II.2-12.

Table II.2-12: Order-of-Magnitude CAPEX Estimate – Demand-Based Utility Development

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Water Supply and Distribution				
5,000 gpm well and pump stations	Each	2	1,500,000	3,000,000
Distribution mains	kilometers	20	750,000	15,000,000
Wastewater Treatment				
Soapberry Plant Expansion (allowance)	Ha	25	150,000	3,750,000
Point Source package plants (allowance)	Each	10	250,000	2,500,000
Electrical Distribution				
169 kV Transmission Main	kilometers	5	1,500,000	7,500,000
Primary Substations	MVA	200	15,000	3,000,000
Engineering and Administration			5%	1,737,500
Contingency			30%	10,946,250
ORDER-OF -MAGNITUDE CAPITAL COST ESTIMATE - DEMAND-BASED INDUSTRIAL DEVELOPMENT				\$ 47,433,750

In telecommunications, Jamaica has a unique opportunity, because overall there is a high capacity for access to international bandwidth. For example, as shown in Figure II.2-2, Jamaica has five fiber optic submarine cable landing stations and terrestrial fiber throughout the country, showing a high amount of internet connectivity. Nonetheless, Jamaica has relatively low subscribership and ranks below almost all of its peers when measuring bandwidth per internet user, which can serve as a proxy for access quality due to insufficient or poor ICT infrastructure within the country.

With further industrial development, Jamaica could potentially utilize all available international capacity, and with increased demand from industrial clients, the private sector has more incentive to develop and improve the country’s broadband infrastructure. The location of cable landing stations near industrial areas such as Kingston, Harbour View, and Bull Bay are ideal access points for the private sector to develop local broadband expansions.

Figure II.2-2: Jamaica Terrestrial Fiber Transmissions Map



Source: Nathan Associates Inc. using information from Telegeography Submarine Cable Map 2016 and International Telecommunications Union Interactive Terrestrial Fiber Transmissions Map, May 2017.

Jamaica’s terrestrial infrastructure is also expansive as Digicel and CWC/LIME/FLOW both have networks in the areas slated for development, such as Caymanas, Vernamfield, airports, and container terminals in the Kingston area. For this reason, very little action is suggested to the Planning Institute of Jamaica (PIOJ).

The GoJ should ensure that there is a continued competitive environment that allows potential industrial logistics hub customers to have high quality coverage at an affordable price from private sector providers. Overall, the telecommunications infrastructure is in place, but the commercial aspects could be facilitated as the LHI develops.

Additionally, the GoJ’s Island-wide Broadband Network (currently under development) should enhance ICT literacy in the general population, which will add to the skills of potential LHI workforce. Nathan recommends continued broadband connectivity to educational institutions, 209 of which are currently covered under this program.¹⁶²

Future LHI Buildout of Utility Infrastructure

The buildout of the Caymanas and Vernamfield developments will require additional water supply and distribution infrastructure, wastewater treatment facilities, and power generation and distribution. The extent of utility infrastructure will depend on the type of usage ultimately proposed for the planned development areas. The following breakdown extends what is depicted in Table II.2-13 over the full buildout of the master plan.

Table II.2-13: Order-of-Magnitude CAPEX Estimate – Utility Infrastructure at Buildout

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Water Supply and Distribution				
5,000 gpm well and pump stations	Each	6	1,500,000	9,000,000
Distribution mains	kilometers	40	750,000	30,000,000
Wastewater Treatment				
Vernamfield Plant	Ha	50	150,000	7,500,000
Point Source package plants (allowance)	Each	20	250,000	5,000,000
Electrical Distribution				
Gas turbine power generation	MW	300	800,000	240,000,000
169 kV Transmission Main	kilometers	30	1,500,000	45,000,000
Primary Substations	MVA	500	15,000	7,500,000
Engineering and Administration			5%	17,200,000
Contingency			30%	108,360,000
ORDER-OF -MAGNITUDE CAPITAL COST ESTIMATE - UTILITY INFRASTRUCTURE AT BUILDOUT				\$ 469,560,000

II.2-7 Road and Rail Infrastructure

Demand-Based Analysis

Most cargo (air and maritime) volumes associated with demand-based analysis will be handled in industrial developments at the Port of Kingston and CSEZ. Accordingly, road and rail improvements through 2035 must be focused on the proposed transportation corridor connecting the two key

¹⁶² Robinson, Julian. Presentation given April 13, 2016. “Youth Empowerment through Technology.”

areas. As outlined in the land use master plan, the proposed transportation corridor will include the following.

- ▶ Improvements to existing rail, including intermodal yard at CSEZ
- ▶ 2-lane bonded drayage road
- ▶ 4-lane public express highway and interchanges
- ▶ Arterial connections to logistics areas and improvement to key arterials

Table II.2-14 presents order-of-magnitude cost estimates for demand-based road and rail infrastructure.

Table II.2-14: Order-of-Magnitude CAPEX Estimate – Demand-Based Road and Rail Infrastructure

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Railroad Improvements				
Rehabilitate existing rail line to Vernamfield	km	40	750,000	30,000,000
New marshalling/Intermodal yards at Vernamfield	km	3	1,500,000	4,500,000
Roadways				
4-lane expressway - Vernamfield Connector	km	12	4,000,000	48,000,000
Allowance for Vernamfield Interchanges	Each	2	30,000,000	60,000,000
Improved 2-lane arterial - May Pen to Montego Bay	km	150	1,500,000	225,000,000
Improved 2-lane arterial - Ocho Rios to Montego Bay	km	65	1,500,000	97,500,000
4-lane expressway - Harbour View to Port Antonio	km	110	4,000,000	440,000,000
Engineering and Administration			5%	18,375,000
Contingency			30%	277,012,500
TOTAL ORDER-OF -MAGNITUDE CAPITAL COST ESTIMATE - ROAD AND RAIL AT BUILDOUT				\$ 1,200,387,500

Future LHI Road and Rail Infrastructure Buildout

The future buildout at Caymanas and Vernamfield will require improvements and/or extension of the existing road and rail corridor between Kingston and May Pen. The highway connection will be via the existing Highway 2000 facility, with new interchanges directly north of Vernamfield. Existing rail alignment will be redeveloped to allow for both passenger and cargo traffic, as proposed by the Jamaica Railway Corporation (JRC).

As air cargo volumes increase, the importance of maintenance on the existing roadway between the north-south highway to Ocho Rios and Montego Bay will also increase. Detailed assessment of the existing north coast highway will be done in future stages of design, but based on visual inspection an allowance has been included for limited reconstruction and expansion in key areas.

Table II.2-15 presents order-of-magnitude cost estimates for road and rail infrastructure for the buildout.

Table II.2-15: Order-of-Magnitude CAPEX Estimate – Road and Rail Infrastructure at Buildout

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Railroad Improvements				
Rehabilitate existing rail line	km	40	750,000	30,000,000
New marshalling/Intermodal yards	km	3	1,500,000	4,500,000
Roadways				
4-lane expressway	km	12	4,000,000	48,000,000
Allowance for Interchanges	Each	2	30,000,000	60,000,000
2-lane arterials	km	60	3,000,000	180,000,000
Allowance for Improvements to existing highways	km	25	1,000,000	25,000,000
Engineering and Administration			5%	16,125,000
Contingency			30%	109,087,500
TOTAL ORDER-OF -MAGNITUDE CAPITAL COST ESTIMATE - ROAD AND RAIL AT BUILDOUT				\$ 472,712,500

II.2-8 Summary of Required Development for all Infrastructure Types

Table II.2-16 summarizes investment (in US million) and space (in ha) requirements for maritime, aviation, industrial, utilities, and road and rail development.

Table II.2-16: Summary of Required LHI Development Costs for-all Infrastructure Types

Item	Area (in Ha) / Cost (in US Million)								
	Demand-Driven Development				Supply-Driven Development				
	2021	2030	2035	Total	2026	2036	2041	2046	Total
Maritime Infrastructure	80/\$711	60/\$851		140/\$1,562	80/\$711	60/\$887	30/\$565	30/\$565	200/\$2,728
Aviation Infrastructure	60/\$408			60/\$408	60/\$408	150/\$645	150/\$645		360/\$1,698
Industrial Infrastructure	100/\$552	100/\$552		200/\$1,104	100/\$552	1,650/\$7,495	1,550/\$6,943	/\$6,943	3,300/\$21,933
Utilities Infrastructure	25/\$47			25/\$47	25/\$165	/\$118	/\$118	/\$118	25/\$519
Road and Rail Infrastructure	/\$105	/\$105	/\$105	\$315	/\$405	/\$405	/\$405	/\$300	/\$1,515
Total Ha/Cost	265/\$2,137	160/\$1,508	/\$103	425/\$3,436	265/\$2,241	1,860/\$7,860	1,730/\$8,389	30/\$7,926	3,885/\$28,393

II.2-9 Education and Skills Preparation

As Jamaica’s economy shifts towards new industries attracted by LHI-induced opportunities, potential LHI workers need help matching skills to existing jobs and accessing targeted training and certifications for new jobs. Jamaica’s educational providers need better information about likely emerging jobs and their skill requirements, and current and future employers need a better system for finding, evaluating, and arranging job-specific training for prospective employees. To meet the government’s economic goals and realize LHI’s promise, there needs to be a supply of talent that matches the demand for the coming diverse industrial base, and workers and firms must be matched efficiently. The ultimate goal is to enable the workforce system and labor markets to more efficiently and effectively meet the needs of employers in the coming years.

Likely workforce demand will be predominated by logistics-oriented jobs. Preparing workers through certificate programs, degrees, remedial courses, and skills-based short-term programs should focus on the requirements for the careers identified in Table II.2-17. Figure II.2-3 identifies the minimal skill sets required for various positions in the logistics industry. Additional skill sets for entry-level positions may include “hard skill” sets, such as basic math (addition, subtraction, multiplication, and division using whole numbers, common fractions, and decimals and the ability to interpret bar

charts), driving and equipment operation, minor mechanical repair, and “soft skill” sets such as discipline, dependability, initiative, problem solving, oral communications, motivation, accuracy and thoroughness, adaptability, and physical capacity (lifting strength, grasping with both hands, etc.).¹⁶³ Obviously, more advanced positions will also be required immediately upon operational start-up of assets and services, which are also reflected in Figure II.2-3. Post-operational startup hires for more advanced positions in future years also imply the need for more advanced training in computer and computer systems use, sales, marketing, and personnel supervision, among others.

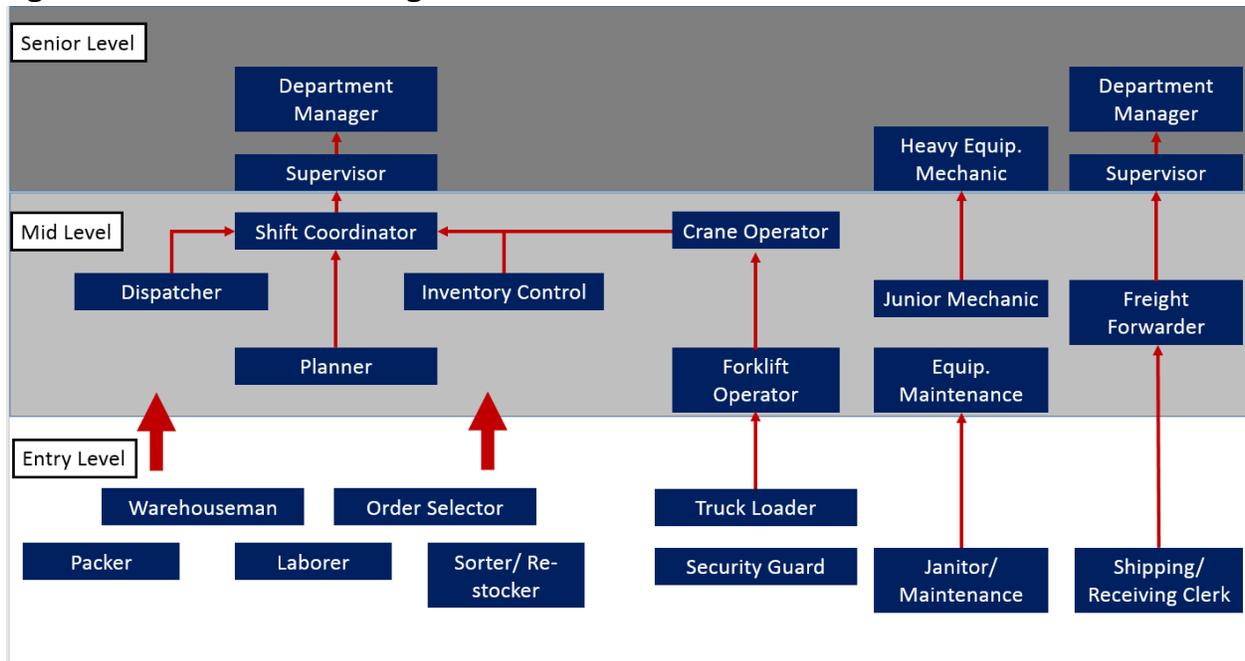
Table II.2-17: Recommended Training Programs for a New LHI Higher Education Campus

Career	Entry-Level Occupations for those with: <ul style="list-style-type: none"> No background of theft or crime Literacy skills Possible need for customer service skills 	Advanced Occupations for those with: <ul style="list-style-type: none"> Literacy, math skills Customer service skills Completed on-the-job training/ years of experience Possible need for computer/IT skills
Warehouse Operations	Laborer, Packer, Picker, Sorter, Truck Loader, Security Guard, Janitor, Shipping and Receiving Clerk, Warehouseman	Planners, Dispatchers, Inventory Control, Freight Forwarder, Forklift Operator, Crane Operator, Maintenance Technician, Equipment Mechanic, Supervisor
Truck and Bus Drivers	Taxi Driver, Delivery Driver, Waste Material Collector, Light Truck Driver, Bus Driver, Transit Driver, Heavy Tractor Truck Driver	Driver Supervisor, Experienced Driver
Diesel Mechanics	Tire Technician, Customer Service Technician, Diesel Mechanic Trainee	Engine Technician, Maintenance Supervisor or Manager
Mariner	Ordinary Seaman, Cook, Steward	Engineer, Officer, Cook, Steward
Logistics	Administrative Assistant, Data Entry Agent	Freight Forwarder, Customs/Import Specialist/Officer, Export Specialist, Customs Broker, IT Manager

Source: Nathan Associates Inc. using information from RDA Global Inc. *Career Pathways in the Baltimore Region: Transportation and Logistics*. Opportunity Collaborative.

¹⁶³ These skillsets are corroborated by the American Association of Colleges and Universities, where a survey indicated 75% of business leaders emphasize abilities in five key areas regardless of an employee’s degree or level of education: critical thinking, complex problem solving, written communication skills, oral communication skills, and applied knowledge in real-world settings. See “It Takes More than a Major: Employer Priorities for College Learning and Student Success”, Association of American Colleges and Universities, Hart Research Associates, April 10, 2013. Available at https://www.aacu.org/sites/default/files/files/LEAP/2013_EmployerSurvey.pdf.

Figure II.2-3: Levels of Common Logistics Career Positions



Source: Nathan Associates Inc. using information from RDA Global Inc. *Career Pathways in the Baltimore Region: Transportation and Logistics*. Opportunity Collaborative.

Table II.2-18 details some of the basic requirements for various positions in the logistics industry. This provides some guidance on the development of vocational level training programs designed to address LHI-related worker requirements.

Jamaica can improve its prospects for industrial growth and investment by raising its secondary school participation rates. It had only an 82% secondary school enrollment rate in 2015.¹⁶⁴ As the Tables above indicate, higher levels of education are not necessarily needed for every job that could be offered by LHI initiatives. However, as was previously suggested, literacy, basic math, and computer skills, among others, are critically important. Further, the Jamaican Foundation for Lifelong Learning (JFLI) reports adult literacy at 87%, among the lowest of neighboring countries (Table II.2-19). Said another way, 9 of 13 neighboring countries rank higher in literacy rates than Jamaica. Certainly, Jamaica is aware of the situation, with JFLI operating 28 adult education centers, which are complemented with 50 volunteer centers throughout the island.

¹⁶⁴ The World Bank. "World Development Indicators: Jamaica." (2015).

Table II.2-18: Requirements/Barriers to Logistics Careers

	Requires basic math skills	Requires basic reading skills	Requires a driver's license	Requires prior work experience	Requires technology/computer skills	Requires customer service skills	Requires certification/training prior to work
Laborer							
Security Guard							
Janitor/Maintenance							
Packer		√					
Picker/Sorter		√					
Order Selector	√	√					
Warehouseman				√			
Truck Loader		√					
Truck Driver			√				√
Dispatcher	√	√		√			
Inventory Control	√	√		√	√		
Shift Coordinator	√	√		√	√	√	
Forklift Operator			√	√			√
Crane Operator			√	√			√
Equipment Maintenance Tech	√	√	√		√	√	
Junior Equipment Mechanic	√	√	√		√	√	
Senior Heavy Equipment Mechanic	√	√	√	√	√	√	
Shipping and Receiving Clerk	√	√			√		
Freight Forwarder	√	√		√	√	√	
Warehouse Supervisor	√	√		√	√	√	
Data Entry Agent	√	√			√		
Admin Assistant	√	√			√	√	
Cargo and Freight Agent	√	√	√		√		
Customs/Import-Export Specialist	√	√		√	√	√	√
Customs Broker	√	√		√	√	√	√

Source: Nathan Associates Inc. using information from RDA Global Inc. *Career Pathways in the Baltimore Region: Transportation and Logistics*. Opportunity Collaborative.

The majority of new and existing businesses in Jamaica will have an increasing dependence on IT technologies and solutions to remain competitive and reduce operational costs. Jamaica's high capacity access to international bandwidth offers a unique capability that would otherwise be a concern to investors. Accordingly, potential investors will need access to a workforce that is well equipped to support technology-related jobs, or have the capability to acquire related skill sets. Yet current conditions indicate that Jamaica's workforce preparation may be weak; Table II.2-20 and II. 2-21 show that only 35% of the population is currently using a computer, compared to economies like Panama with 46% and Colombia with 53%, while even fewer individuals have specific computer use

Table II.2-19: Adult Literacy Rates in the Caribbean

Country	Adult Literacy Rate
Cuba	99.8%
Barbados	99.7%
Trinidad and Tobago	98.6%
St. Kitts and Nevis	97.8%
Grenada	96%
St. Vincent and the Grenadines	96%
The Bahamas	95.6%
Dominica	94%
Saint Lucia	90.1%
Jamaica	87.9%
Dominican Republic	87%
Antigua and Barbuda	85.8%
Haiti	52.9%

Source: Aneki Rankings and Records.

Table II.2-20: Percentages of Individuals Using a Computer in Jamaica (2015)

All Individuals	Gender		Urban			Rural		
	Male	Female	Total	Male	Female	Total	Male	Female
35.3	33.9	36.6	36.5	34.8	38.2	30.8	30.7	30.9

Source: International Telecommunications Union. 2015 World Telecommunication Indicators.

Table II.2-21: Percentages of Individuals in Jamaica with Specific Computer Skills (2015)

Copying, Pasting, Moving Folders	Sending E-mails with attached files	Using basic arithmetic formula in spreadsheet	Connecting and installing new devices	Downloading and installing software	Creating presentations with software	Transferring files between devices	Writing a computer program using specialized language
17	17.6	3.9	6.4	7.8	3.8	9.4	1

Source: International Telecommunications Union. 2015 World Telecommunication Indicators.

skillsets of use to employers.¹⁶⁵ The master plan includes further recommendations on telecommunications accessibility. Jamaica’s strategy for workforce preparation in view of coming demands should incorporate certain components; these include:

1. Enable current and prospective employers to articulate needs through simple entry points into a workforce system designed to match workers with ongoing and future positions;
2. Guide providers and educators to create demand-driven curricula, programming, and counseling that clearly leads workers to sustainable careers;
3. Incorporate revisions in specific courses or curriculums in secondary, vocational, and higher educational institutions that are responsive to trends in employer-identified needs;
4. Provide demand-driven information and data in an easily digestible and usable format to guide educational and career decisions of institutions and workers;
5. Produce and retain more graduates in engineering and technical fields by increasing the quantity and quality of applied science institutions, building interest in the fields, and providing connections to jobs and entrepreneurial activity;
6. Consider creating financial incentives for university students to stay in Jamaica upon their graduations, in Jamaica or overseas institutions; these may include income tax holidays, housing incentives, or private sector employment contract guarantees offered while still students;
7. Establish cooperative MOUs between individual companies and the government to establish training programs that meet the preparedness workforce requirements of the individual companies.

The former Caribbean Maritime Institute, recently elevated to university status as the Caribbean Maritime University, is one institution in Jamaica that closely monitors job growth trends and revises its curriculums accordingly. Already planning to develop a campus in the CSEZ, the Maritime University is well positioned to serve industry worker demand associated with the LHI.

¹⁶⁵ International Telecommunications Union. “2015 World Telecommunication Indicators.” 2015.

Institutional Infrastructure Requirements

In line with the above findings and recommendations, the below table shows the Order of Magnitude CAPEX estimates for a Maritime University campus that could be developed within the proposed mixed use areas of the Caymanas SEZ as outlined in the Land Use Master Plan Concepts. Such campus would provide capacity and housing for 5,000 students, as well as mixed use, commercial, and recreational areas that would also serve the population living and working in the Caymanas SEZ.

Table II.2-22: Order of Magnitude CAPEX Estimates for a Maritime University Campus

Item	Unit	Quantity	Unit Cost, USD	Total, USD (2017)
Public Infrastructure				
Site Preparation	Ha	8	50,000	400,000
Internal Roadways	Ha	0.50	2,000,000	1,000,000
Public Works Infrastructure	Ha	8	200,000	1,600,000
Campus Developments				
Classrooms / Training Facilities	m ²	30,000	4,000	120,000,000
Shops / Vocational Technology	m ³	30,000	4,500	135,000,000
Residential - 5,000 Students	m ²	60,000	2,500	150,000,000
Recreation / Commercial / Mixed Use	m ²	20,000	2,000	40,000,000
Engineering and Administration			5%	22,400,000
Contingency			30%	141,120,000
ORDER-OF -MAGNITUDE CAPITAL COST ESTIMATE - DEMAND-BASED INDUSTRIAL DEVELOPMENT				\$ 611,520,000

II.2-10 Conclusions

Addressing the identified gaps offers transformative potential not only for the LHI, but for the Jamaican economy as well. At full buildout, the LHI will comprise just over 3,600 hectares of development, with a total order-of-magnitude cost of nearly \$21 billion. The potential for LHI development is undeniable, but several risks that may impair the LHI potential that go beyond the gaps addressed above must be accounted for by the GoJ. These include:

Jamaica's Fiscal Situation. Jamaica's current debt is about 122 percent of its GDP. Percentage debt is used by investors to measure a country's ability to make future debt payments, thus affecting a country's borrowing costs. Jamaica has undertaken pension reform, raising the retirement age and requiring all public sector employees to make pension contributions. Additionally, Jamaica has instituted a policy to generate an annual surplus equivalent to seven percent of GDP and recently received an IMF Stand-by Arrangement to support reform efforts and mitigate unforeseen economic shocks. If Jamaica does not successfully address fiscal improvements, critical funding for the transformative investments described in the gap analysis will be lost, and an associated and paralyzing uncertainty for businesses would drastically limit the potential impact on growth.

Lagging public education. Jamaica's public education performance, as determined by school enrollment and literacy rates, lags what is needed to ensure workforce preparedness for the opportunities that lie ahead. An adequately educated workforce and an effective pipeline to provide it are vital to LHI success.

Perception of a tax environment that may impede investment decisions. Given the fiscal situation, domestic and foreign businesses are likely to be concerned that fiscal conditions will lead to future tax increases, suggesting that corporate taxes could become disincentives to move to or grow in Jamaica.

Potentially significant fragmentation for decision-making. The types and locations of LHI-related development imply involvement of a myriad of national and local government agencies for project implementation. Prudent, but expeditious approvals of program and project plans may be a challenge given the many entities involved.

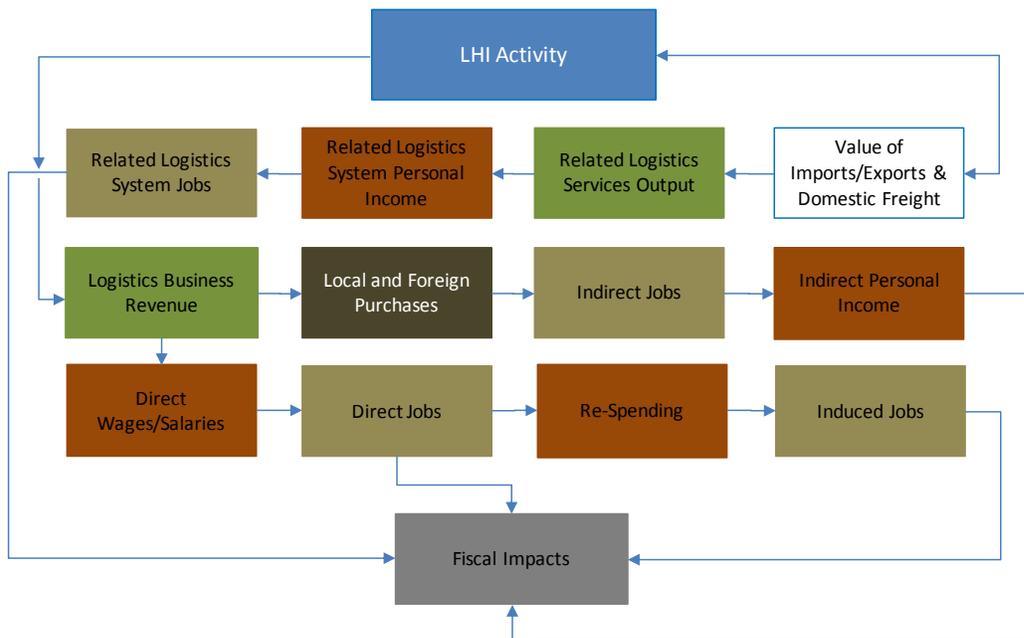
For Jamaica to recognize its full potential, the above risks will need to be taken into account and ideally reduced. There are additional preconditions for success, which are not necessarily addressed in the gap analysis that influence location and investment decisions; overall quality of life, public safety, and access to adequate healthcare are all critical core enablers for basic economic growth. This does not mean that execution of the master plan is predicated on all risks listed above being addressed in advance; however, it is important to acknowledge these risks to ensure that the plan's full potential for impact can be realized.

Part II.3 Development Strategy

II.3-1 A Seven-Part Growth Strategy

Jamaica's LHI is intended to expand economic growth by creating jobs and contributing to fiscal growth. An initiative of this scale, if properly executed, has a substantial impact on direct and indirect job growth and can aid fiscal solvency – that is, Jamaica's ability to meet its short-term and long-term obligations without incurring excessive debt (Figure 1).

Figure II.3-1: Economic Effects of the LHI



Job Creation
Direct Jobs: jobs that would not exist if logistics activity ceased
Induced Jobs: jobs created due to purchasing of goods and services by logistics sector workers
Indirect Jobs: generated as the result of local purchasing by firms directly dependent on logistics activity
Related User Jobs: jobs held primarily with production and distribution firms using Jamaica's logistics system
Local Purchasing
Local Purchases: goods and services purchased by firms dependent on Jamaica's logistics system; these purchases create indirect economic impacts
Fiscal Impacts
Taxes, Tariffs, and Fees: Paid by logistics system-dependent individuals, firms, and users to government

Employment Income
Personal Income: consists of salaries and wages of those directly employed by logistics activity and includes impact of re-spending measuring personal consumption activity
Indirect Personal Income: includes the salaries and wages received by those employed by firms indirectly engaged in logistics activity
Value of Economic Activity
Logistics Business Revenues: includes total business receipts by firms providing services in support of logistics services activity
Related User Output: represents revenue generated by shippers and other parties using logistics system assets as well as the value of output to Jamaica that is created due to freight moving through the country's logistics system

Source: Nathan Associates Inc.

Part I of this report identified the strengths, weaknesses, opportunities, and threats that Jamaica must confront or capitalize upon to realize its LHI vision. Part II, constituting the master plan and gap analysis, set forth the path for Jamaica to establish itself as a global logistics hub. As Part II suggests, Jamaica will need to take action on several fronts simultaneously, pursuing a seven-part strategy consisting of those critical elements, referred to as strategic enablers, that significantly affect Jamaica's ability to achieve the LHI vision and fulfill the country's role in growing its economy and contributing to fiscal stability. The strategic enablers include:

1. Improving Institutional Effectiveness
2. Ensuring Supportive Policies and Legislative and Regulatory Frameworks
3. Enhancing Workforce Capacity
4. Developing Efficient and Productive Infrastructure
5. Providing Efficient Transport Logistics System
6. Facilitating Sustainable Financing
7. Promoting the LHI

These enablers, their goals, and associated strategies allow Jamaica to navigate the course of challenges and opportunities to achieve its vision. We set forth below the rationale for each enabler, each enabler's goal, and the strategies to be executed. These are followed by a plan that identifies the myriad of actions to be undertaken for successful strategy execution.

Because a well-charted and successful journey requires the right craft and crew, the strategy calls for adjustments to the institutional arrangements intended to provide a coordinated and collaborative development strategy. Whatever the ultimate institutional arrangement is, a teamwork philosophy will need to be instilled while granting upper-tiered executives sufficient autonomy to engage in pursuits and respond to shifts in market trends. Enabler 1 is thus the most critical enabler, as it addresses the changes required to provide the appropriate institutional framework for LHI development and implementation. Just as Jamaica is a country of champions, the country will need another institutional "champion" to ensure successful strategy implementation.

As Jamaica improves its logistics facilities and services, a time can be envisioned when more meaningful competition in the region will emerge, placing pressure on the champion entity to ensure stakeholders that the transport logistics services are provided at the lowest possible cost and highest efficiency to service providers, enterprises, tenants, and their customers. The strategy calls for on-going logistics system performance analysis to ensure that logistics system users have access to a competitive logistics system. In so doing, the champion agency can determine whether course corrections should be made, and identify emerging challenges and opportunities while staying focused on long-term strategic goals.

1. Improve Institutional Effectiveness

There are numerous strategies and actions that will need to be carried out simultaneously by a variety of parties. While global best practice illustrates a variety of institutional options for establishing the logistics industry, success in creating a hub seems to be tied to designating a champion entity that will be responsible for ensuring effective coordination and collaboration. Such an entity needs to lead, coordinate, and support initiatives and projects related to planning, promoting, implementing, assessing, and reporting in support of the LHI vision and facilitating its achievement.

Jamaica should thus establish an independent authority or assign the LHI development and implementation portfolio to an existing government agency, such as the Special Economic Zone (SEZ) Authority, and accordingly broaden its mandate. While the details of such a structure should be ironed out in the course of an institutional assessment, the authority should have broad decision making power on matters of strategy, management, budgeting, operations, investment, personnel, pricing, marketing and promotion, guided by policy set forth by a board, likely structured with both public and private sector members that are free from conflicts of interest and restricted from activity that may create them. The entity should hold the mandate to lead the charge in LHI development and manage the collaborative process needed to realize successful development. The independent authority in turn will need to prepare internal regulatory procedures and operating protocols regarding staffing, personnel merit systems, accounting, and finance and other internal operating procedures.

Goal

Create and manage an effective institutional arrangement that fosters catalytic and dynamic public-private development of the LHI.

Development Strategies

1. Establish an LHI institutional and organizational framework for administration and execution of the LHI vision.
2. Implement development and oversight of the LHI.
3. Establish the regulatory framework governing LHI development.

2. Ensure Supportive Policies and Legislative and Regulatory Frameworks

In order to develop a global logistics hub, Jamaica will need to establish policy and regulatory conditions that generate trade and improve conditions in which freight is processed or moved. This means expanding Jamaica's portfolio of trade agreements and adhering to best practice standards reflected in its WTO obligations. Jamaica's free trade agreements are generally tied to the Caribbean community, a limited number of Latin American countries, and indirectly through the European Union, but no direct trade arrangements have been made with Asia (or ASEAN countries), the mid-East, and Africa.¹⁶⁶ Additionally, Jamaica must ensure its standards do not exceed its WTO obligations and importantly must ensure that its obligations under a number of treaties (e.g. WCO Kyoto Protocol, Rotterdam Rules, WIPO Madrid Protocol, Cape Town Convention on International Interest in Mobile Equipment) are suitably reflected in domestic legislation. While being a signatory to some treaties means the standards and obligations supersede domestic law and regulations, the lack of these being reflected in domestic law creates confusion in treatment and enforcement. Otherwise, these reflect technical barriers to trade that discourage trade (and business) growth.

While ensuring conformance with obligations and standards contributes to trade facilitation, success on that front cannot be realized without effective policies on other fronts. Having a PPP law in place sends a message to the global investment community that Jamaica is open for business. An

¹⁶⁶The ACP/EU Cotonou Partnership Agreement provides benefit from non-reciprocal preferential access to the European markets for product-specific protocols for bananas, rum, sugar and rice.

effective PPP law can induce investment, assuming demand conditions warrant it, in aviation, port, airport, logistics, surface transport sectors, and urban/community development sectors. And the ease of developing these sectors can be facilitated through an expedited permit process and a tax and tariff regime intended to mitigate perceived investment risk and enhance cost competitiveness.

Goal

Conform with international standards for trade, special economic zones, civil aviation, land transport and logistics, and public-private partnerships through effective policymaking and continuous enhancements of Jamaica's business enabling environment.

Development Strategies

Trade and Customs

1. Improve Customs efficiency and SEZ and border clearance practices.
2. Become a signatory to, and expand the portfolio of, multilateral, bilateral, investment, and tax treaties.
3. Ensure Jamaica adopts and/or adheres to its WTO obligations relative to sanitary/phyto-sanitary standards (animal health, plants, and food) and industrial standards.
4. Ensure Jamaican domestic law and regulations reflect obligations under international treaties.

Private Sector Investment

5. Formalize the national PPP framework to further encourage private sector participation in infrastructure development and long-term operations and maintenance.
6. Promote private sector participation in the revitalization of communities to be located inside SEZs and encourage developer support for workforce capacity improvements.

Utility Services

7. Develop agreements between the SEZs and utilities that encourage expansion of existing utility infrastructure at LHI facilities with negotiated rate structures, and ensure design and construction of new utilities infrastructure is in accordance with ESIA and industry BMPs.
8. Assure efficient cost competitive delivery of utility services to SEZ users.

SEZ Regulatory Framework

9. Modernize and enhance the efficiency of SEZs through an increasingly effective SEZA.

Aviation

10. Further promote air transport liberalization and competition, new ASA, new routes, increased services, and air connectivity.
11. Private operators in coordination with the Jamaican government effectively promote and improve quality standards at NMIA, SIA, Vernamfield, and Ian Fleming airports.
12. Promote the efficient and effective functioning of government authorities operating within airports to increase the ease of doing business at NMIA, SIA, Vernamfield, and Ian Fleming airports.

Trucking

13. Effectively promote competition amongst freight transport operators.

3. Enhancing Workforce Capacity

The LHI's ability to attract investment in new industries or expansions of existing ones importantly relies on Jamaica's ability to provide a suitably prepared workforce and ensure workforce availability in the long term. This means incorporating STEM and critical thinking skills at the earliest schooling ages, understanding prevailing and expected skill demands, ensuring that schools and vocational training systems have the capacity to develop expected skill requirements, and retaining Jamaican talent and creating incentives for Jamaican university graduates to return to Jamaica. Countries must closely monitor shifts in employment demands to ensure that the workforce is prepared to assume new or changing jobs; but educational and training institutions must be sufficiently agile to adjust academic and vocational training curriculums to meet demand shifts. Basically, supply and demand must be in sync, but to do so requires a focus on reducing lag time. Incorporating STEM and critical thinking skills at early ages means that job candidates in later years will be more agile and adept in learning and applying new skills. It appears that Jamaica has a sufficient range of institutions that can meet workforce demands. But meeting the more granular needs of particular companies requires collaboration between educational institutions and companies, a collaboration that suggests a shared-cost approach. This is especially well suited given that companies with unique granular requirements have a high degree of certainty in workforce availability.

Goal

Ensure the long-term readiness and short-term preparedness of Jamaica's workforce system and labor markets to efficiently and effectively meet the growing demands of LHI-related employers.

Development Strategies

1. Improve technical and vocational training capabilities.
2. Ensure Jamaica's training and re-training institutions build skills that are compatible with and relevant to LHI industries and logistics.
3. Increase secondary school participation rates.
4. Improve computer literacy.
5. Prevent the brain-drain effects in Jamaica.
6. Leverage private sector contributions to training programs.

4. Develop Efficient and Productive Infrastructure

Part 1 of this report underscores Jamaica's connectivity advantage. Connectivity, where importers and exporters have a range of options for receiving and shipping freight, is the hallmark for establishing global logistics hubs, as the cases in Panama, Singapore, Dubai, and South Korea demonstrate. However, the infrastructure associated with producing, moving, and processing this freight, and the underlying backbone services to support it, is a necessary prerequisite for achieving the LHI vision. Transport systems are enablers of trade, while tenants in industrial sites are freight generators. Road and rail systems allow LHI's economic benefits to be distributed to other parts of the island outside of the Kingston area while also creating additional options for investors and industries provided they also have access to freight logistics services and facilities.

Accordingly, the development strategy addresses requirements for transportation systems (maritime, aviation, road, and rail), industrial facilities that generate or process freight movements, and the underlying utility services requirements. Additionally, the development strategy recognizes the environmental and social ramifications that often accompany large-scale development programs.

Goal

Create an internationally competitive environment to connect businesses to world markets through the development of enabling transportation and logistics infrastructure and underlying services that supports the LHI's value proposition.

Development Strategies

Maritime

1. Provide improved maritime infrastructure at KCT and other maritime infrastructure.
2. Develop new maritime infrastructure in the medium term at Fort Augusta.
3. Develop new maritime infrastructure in the long term at Vernamfield.
4. Improve maritime infrastructure of small private ports.

Civil Aviation

5. Develop and monitor master plans for all aviation facilities in collaboration with private operators.
6. Develop aviation facilities to support expanded air cargo and passenger services at Norman Manley International Airport.
7. Develop improved air cargo and passenger service capacity through facility improvements at Sangster International Airport.
8. Develop Vernamfield with adequate facilities to support air cargo, industrial development, and passenger services as the economic driver for aerotropolis development.
9. Develop aviation facilities to support passenger and air cargo growth at Ian Fleming International Airport.
10. Develop maintenance and repair operations facilities at new long-term master planned areas.

Industrial

11. Private operators at KCT to develop additional logistics and industrial infrastructure on the port's hinterland to support LHI industries.
12. Expand logistics infrastructure on port-adjacent land available at KCT to support LHI industries.
13. Provide industrial infrastructure development to support the most critical LHI master planned developments in the short term.

Utility Services

14. Provide improved utility capacity for KCT operators.
15. Provide improved utility capacity to support new logistics infrastructure in KCT.
16. Provide additional utility capacity to support Caymanas SEZ.

17. Provide new utilities and capacity, including wind and solar sources, to support development of Vernamfield Aerotropolis.

Road and Rail

18. Provide enhanced capacity and connectivity between major airport nodes and key LHI facilities.
19. Provide enhanced connectivity between KCT and Caymanas Estate to reduce transport costs and minimize customs procedures.
20. Provide North Coast Highway Improvements to enhance capacity and connectivity between, to, and across the north coast.
21. Enhance land transport connectivity of key LHI greenfield industrial and airport developments.
22. Improve land connectivity between the KCT and key LHI greenfield industrial and airport developments.
23. Provide South Coast Highway Improvements west to Savanna La Mar to support logistics hub growth on the west side of the island.

Environmental and Social

24. Ensure environmental and social sustainability of projects.

5. Provide an Efficient Transport Logistics System

As Jamaica promotes its development as a global logistics hub, logistics systems sufficient to meet the needs of prospective tenants and industries must be in place. It is not just a question of infrastructure assets, but also of processes. While the World Bank's Logistics Performance Index identifies weaknesses in Jamaica's logistics system, the analysis does not provide sufficient guidance to mitigate performance constraints. Jamaica must thus identify impediments to logistics efficiency, continuously monitor performance, and provide the systems and technologies that enable shippers to know the real time status of freight processing, movement, and location. This is necessary because logistics decisions are based on availability and timely receipt of logistics transaction information. Having access to, and communicating through a system between relevant parties assists in facilitating planning and reliability of logistics chains. It is no surprise, therefore, that global logistics hubs, which aim to facilitate seamless freight flows, are among the highest ranked globally in terms of logistics performance.

Goal

Ensure the availability of and access to a competitive and efficient transport logistics system.

Development Strategies

1. Determine bottlenecks and other constraints to transport logistics efficiency.
2. Monitor logistics system performance.
3. Develop and implement logistics technology information and communications system.

6. Facilitate Sustainable Financing

The development of a PPP law as part of Enabler 2 will mitigate uncertainty in the markets about Jamaica's intent to engage private-sector investment and sticking to government commitments post-transaction. The PPP law and the LHI promotion strategy (Enabler 7) are likely to highlight opportunities and induce private sector interest in LHI assets and services. Assuming that suitable conditions addressed by the prior enablers are in place, light industry location and expansion decisions are likely to emerge. The underlying infrastructure assets, however, are needed to encourage and support industrial development, and some of these are well suited for private investment or PPP arrangements. To the extent that private-sector investment can be leveraged for the LHI development also means that more public funding can be reserved for infrastructure whose financial returns may not justify private-sector investment, but whose economic and social benefits justify public investment. Jamaica can pursue public funding via multilateral financial institutions.

Goal

By leveraging a combination of PPP transactions and multilateral institution financing, the government of Jamaica facilitates significant private-sector financing for LHI-related infrastructure development and develops long-term operating and maintenance agreements with private investors and operators to ensure sustainability and efficiency of LHI infrastructure assets.

Development Strategies

1. Continue the P3 transaction effort at Norman Manley and pursue transactions at Ian Fleming and Vernamfield, and amend cabinet decision No. 06/17 to specify in NMIA's concession agreement that passenger service at Vernamfield should not be restricted.
2. Promote engagement of international finance institutions to provide loans at competitive rates for long-term project financing.
3. Promote private sector investment and concession (PPP) at Port Augusta Container Terminal.
4. Promote private sector participation from existing investors in Jamaica to facilitate the development of LHI manufacturing at the Caymanas SEZ.
5. Leverage private sector contributions for land acquisition and resettlement affected by SEZs.
6. Leverage private sector financing in the development of LHI.
7. Promote private sector participation in the installation of utility infrastructure.
8. Promote private sector participation for cargo transfer services between KCT and Caymanas Estate.

7. Promote LHI

A successful global promotion strategy for a logistics hub relies on a collaboration of industry and logistics partners. Jamaica's government agencies cannot alone bear the entire brunt for promoting the country's advantages as incumbent industry players will benefit from the improved services, expanded industrial activity, and the associated assets developed to serve them. Incumbent players have much to gain from the emergence of a global logistics hub and hence should have a role in the promotion effort; in fact, experience shows they would be willing partners in promotional campaigns. Public-private collaboration can be effective in promoting investment opportunities as the private sector can bear witness to the

plans, business environment, the fitness of the transport and logistics system, workforce quality, and other conditions favorable to location in Jamaica. Jamaica should thus devise a promotion strategy designed to target the market segments identified in Part I of this report and other segments that may emerge during the course of LHI development.

Goal

Strategically position Jamaica as the logistics hub of the Americas through effective LHI promotion efforts.

Development Strategies

1. Create a marketing and promotion strategy for the LHI to market Jamaica as the gateway interconnecting the Americas to global markets.
2. Prepare and promote LHI marketing materials specific to the ports sector to aim at attracting new shipping lines.
3. Market new routes in the air transport sector and conduct related business development.
4. Promote Caymanas SEZs as a "ready for business" green development with backbone infrastructure.
5. Promote best practices in land and aviation transport sectors through recognition awards.

II.3-2 The Call for Action

Jamaica's LHI development strategy is effectively a navigational chart to guide it towards the noted strategic goals. The strategy's perspective is forward-looking and its destination is a responsive and sustainable logistics system focused on customer, business, and optimal performance. Because the strategy is forward-looking, it is subject to circumstances unforeseeable at the time of inception. Thus, the strategy must be adaptable to future conditions without losing site of the ultimate destination accounted for in its goals.

The charts that follow present the seven enablers, 62 strategies, and requisite implementing actions required for LHI success. A 20-year planning horizon is provided for each of the seven enablers, with focused attention on the first five years and several strategies extending well beyond the initial five years. Where only one year for implementation is indicated, strategies are to commence and be completed in one year. While most actions are executed during the first five years, there are several that occur on a recurring basis and hence are also indicated for years 6-20.

A development strategy normally reflects a strong focus on the first five years of implementation given the uncertainty of longer periods. Hence, though a 20-year planning horizon is addressed, uncertainty compels the champion agency to monitor strategic trends and development success, and to adjust the strategy accordingly. Strategies in the charts are color-coded to reflect their degree of priority, with red being the mission critical top priority, green indicating mission critical high priority, and gray indicating mission critical lower priority.

The development strategy is put into effect through the implementing actions. Some action responsibilities are assigned to a variety of stakeholders, reflecting the collaboration needed for

strategy achievement. A set of metrics designed primarily to ensure strategies are achieved are also included for each enabler, which also provides the basis for evaluating course-correction, as needed.

The development strategy charts are followed by Gantt charts that illustrate strategy relationships and sequencing for each enabler. These are intended to be used as a tool to facilitate effective coordination and implementation. A composite chart, too large to present in hardcopy, is separately submitted as part of this report as a Microsoft Project File, along with separate Gantt charts for each enabler.

The promise of this development strategy is that it focuses on providing logistics services and assets while aligning and strengthening finances, people, systems, policies, processes and administration. Strategy success also relies on an organizational culture committed to collaboration and innovation in all its activities. Through commitment to the development strategy, Jamaica will realize its highest potential as a global logistics hub for Jamaica and beyond.

As Jamaica's future is shaped by ongoing events and emerging trends, expeditious acceptance and implementation of the strategy is paramount to the ability to adequately respond to these coming events and trends. Jamaica should immediately appoint a core team and support staff, or an organization, to devote the needed time to managing the strategy's implementation, monitoring its progress, and executing actions in the strategy until a permanent LHI champion entity is in place.

Enabler 1. Improving Institutional Effectiveness

Goal: Create and manage an effective institutional arrangement that fosters catalytic and dynamic public-private development of the LHI.

Strategy Category	Strategy Rationale	Actions	Implementation Responsibility	Begin and Complete (years)							Performance Measure	
				In Progress	1	2	3	4	5	6-15		16-20
Establish an institutional and organizational framework for LHI administration and execution for achievement of vision.	In accordance with global best practice, Jamaica should establish an independent authority or assign the portfolio to an existing government agency and broadening its mandate, such as Special Economic Zone Authority (SEZA). The authority should have broad decision making power on matters of strategy, management, budgeting, operations, investment, personnel, pricing, marketing and promotion, and establishing a one-stop permitting shop to facilitate business establishment and industrial/commercial development inside and outside designated special economic zones.	Conduct assessment of options for LHI institutional arrangements and preparation of organizational, staffing, and startup plans, to include estimated capital and operating budget for LHI authority.	Prime Minister's Office		●							1. Preferred institutional option selected and decrees, laws, and legislative amendments prepared, issued, and approved, as appropriate within the first year. 2. LHI Authority established and board members and staffing appointed in accord with startup operational plan. 3. First SEZ permit application processed and issued through the new Virtual One-Stop-Shop within one year.
		Prepare and issue decrees, legislation, and legislative amendments, as appropriate, for establishing LHI Authority.	Prime Minister's Office		●							
		Approve legislation or legislative amendments as appropriate.	Parliament		●							
		Incorporate LHI Authority operating and capital budget in accord with the startup plan in the appropriations bill	Ministry of Finance		●							
		Appoint Board	Appointing authority			●						
Implement development and oversight of LHI.		Establish management team.	Independent Authority/CEO			●						
Establish regulatory framework governing LHI development.	To support the institutional and organizational framework required for the LHI, the Government of Jamaica will require a clear, practical, and effective regulatory framework to govern successful implementation of the initiative.	Prepare internal regulatory procedures and operating protocol regarding staffing, personnel merit systems, accounting, and finance and other internal operating procedures.	Authority Board and staff			●	●					
		Assist with the implementation of relevant aspects of the Trade Facilitation Agreement.				●	●					
		Establish a "Virtual One-Stop Shop" to connect all regulatory authorities through an e-government portal accessible to businesses.				●	●					
		Prepare and issue regulations and procedures for a one-stop shop and extend the one-stop shop concept nationwide.				●	●					
		Identify any administrative/operational gaps requiring decrees, regulations, or legislation as appropriate.				●	●					

= vision critical top
 = vision critical high priority
 = vision critical lower priority

Enabler 2. Ensuring Supportive Policies and Legislative and Regulatory Framework

Goal: Conform with international standards for trade, special economic zones, civil aviation, land transport and logistics, and public-private partnerships through effective policymaking and continuous enhancements of Jamaica's business enabling environment.

Strategy Category	Strategy Rationale	Actions	Implementation Responsibility	Begin and Complete (years)							Performance Measure	
				In Progress	1	2	3	4	5	6-15		16-20
Trade and Customs												
Improve Customs efficiency and SEZ and border clearance practices.	Ensuring Customs efficiency and engagement in free trade agreements and adherence to best practice standards encourage trade and ensure an attractive environment to conduct trade-related and logistics business. Jamaica's free trade agreements are generally tied to the Caribbean community, some Latin American countries, North America (Canada and the US) and the EU. The current portfolio shows no direct arrangements with Asian (or ASEAN), mid-East, and African countries, though the ACP/EU Cotonou Partnership Agreement provides benefit from non-reciprocal preferential access to the European markets for product-specific protocols for bananas, rum, sugar and rice.	Enact new Customs Act in conformance with LHI vision and objectives while reflecting international best practice standards	Prime Minister, Parliament	●	●							Customs Act passed.
Become signatory to, and expand portfolio of, multilateral, bilateral, investment, and tax treaties.		Engage in greater number of free trade agreements, bilateral investment treaties, open skies agreements, and reciprocal tax agreements. (Note: Some agreements, such as the ACP/EU Cotonou Partnership Agreement, require a review process every five years. The review process for the ACP/EU CPA has already begun and is expected to be completed by the end of 2018).	Ministry of Foreign Affairs and Foreign Trade	●	●	●	●	●	●	●	●	Signatory to treaties and international agreements.
Ensure Jamaica adopts and/or adheres to its WTO obligations relative to sanitary/phytosanitary standards (animal health, plants, and food) and industrial standards.	Imposing standards that exceed the requirements of WTO obligations form technical barriers to trade. Jamaica should continuously monitor its application of international standards and protocols to ensure trade and industrial location competitiveness.	Monitor continuously the effectiveness and compatibility of Jamaican standards relative to international obligations regarding food (Codex Alimentarius), animal health (OIE), plants (IPPC), and industrial (TBT) standards.	Ministry of Agriculture, Ministry of Foreign Affairs and Foreign Trade	●	●	●	●	●	●	●	●	Implementation and application of continuous review process of standards and technical regulations.
Ensure Jamaican domestic law and regulations reflect obligations under international treaties.	Jamaica has obligations under a number of treaties (e.g. WCO Kyoto Protocol, Rotterdam Rules, WIPO Madrid Protocol, Cape Town Convention on International Interest in Mobile Equipment) that are not necessarily reflected in domestic legislation. While being a signatory to some treaties means the standards and obligations supersede domestic law and regulations, the lack of these being reflected in domestic law creates confusion in treatment and enforcement.	Review international treaty/protocol commitments relative to domestic laws and revise domestic law accordingly.	Ministry of Foreign Affairs and Foreign Trade; Parliament		●	●	●	●	●	●	●	Implementation and application of continuous review process of domestic legislation for prevailing and future obligations; submission of amendments to domestic legislation.
Private Sector Investment												
Formalize national PPP framework to further encourage private sector participation in infrastructure development and long-term operations and maintenance.	Private investment facilitated through PPPs in the aviation, maritime, rail, road transport sectors as well as in industrial and urban development are requisites for the long-term viability of the LHI.	Develop a formal PPP Law to provide certainty to international and local investors and operators, financiers and users to participate more actively in the development of the LHI.	GOJ, MOF, PIMSEC, DBJ		●							PPP Law enacted.
Promote private sector participation in the revitalization of communities to be located inside SEZs and encourage developer support for workforce capacity improvements.	Community revitalization is often the outcome of economic development. Jamaica should ensure that local communities benefit from development in proximity to these communities. Global experience suggests the private sector desires to have a substantive positive impact in the communities where they are located.	Ensure that community and recreational facilities and residential utility infrastructure inside SEZs become eligible for JSIF funding.	SEZA, MEGJC, JSIF		●	●						At least one community/recreational/residential facility in all SEZs receives JSIF funding.
		Offer additional tax relief to SEZ developers and users for making contributions to JSIF infrastructure projects in their surrounding neighborhoods.	SEZA, MEGJC		●							Five JSIF infrastructure projects adjacent to SEZs receive financial contributions from developers.
		Sponsor promotional campaigns that espouse the benefits related to JSIF-funded development projects.	SEZA, MEGJC, JSIF		●	●	●	●	●			Three Jamaica-based enterprises receive contracts from SEZ developers to fulfill input requirements.
		Develop agreements with developers and investors to locally source certain requirements, such as employee uniforms and skills training programs.	SEZA, MEGJC, JSIF		●	●	●	●	●			Two national promotional campaigns implemented.
Utility Services												
Develop agreements between the SEZs and utilities that encourage expansion of existing utility infrastructure at LHI facilities with negotiated rate structures, and ensure design and construction of new utilities infrastructure is in accordance with ESIA and industry BMPs.	Reliable and competitively priced utility services are an important prerequisite for attracting private sector investment in SEZ-related activities.	Specific technical requirements incorporated in all planning, design, and procurement documents in accordance with energy conservation and efficiency standards, and provide tax incentives or credits for implementation of alternative energy plants.	PIOJ, Local Government, Estate Developer, NWC, JPS, Users		●	●	●	●	●			At least two new renewable energy plant operating within an SEZ by 2022.
Assure efficient cost competitive delivery of utility services to SEZ users.		Promote energy conservation and efficiency and encourage the development of alternative energy sources to supply new LHI facilities.	SEZA, MEGJC		●							1. SEZA applies for ISO 9001 certification 2. ISO 9001 certification attained

● = vision critical top priority

■ = vision critical high priority

■ = vision critical lower priority

Enabler 2. Ensuring Supportive Policies and Legislative and Regulatory Framework (Continued)

Goal: Conform with international standards for trade, special economic zones, civil aviation, land transport and logistics, and public-private partnerships through effective policymaking and continuous enhancements of Jamaica's business enabling environment.

Strategy Category	Strategy Rationale	Actions	Implementation Responsibility	Begin and Complete (years)							Performance Measure	
				In Progress	1	2	3	4	5	6-15		16-20
SEZ Regulatory Framework												
Modernize and enhance the efficiency of SEZs through an increasingly effective SEZA.	Streamlined SEZ services, a modern regulatory framework, and improved ease of doing business are critical elements in attracting investment to Jamaica's SEZs. The GoH, through the SEZ Authority, must initiate policy recommendations that can enable SEZs in Jamaica to be competitive for attracting investments through a commercially viable and aggressive SEZ regime with high standards for quality assurance. An effective policy, legal, and regulatory for the SEZs will also ensure more rapid development of backbone infrastructure required to accelerate future supply driven development.	Increase effectiveness of SEZA in encouraging initial investment in SEZs.	SEZA, MEGJC		●	●	●	●	●			1. Two favorable publications on SEZA's positive performance from an international private source. 2. One lease signed by SEZ developer with a major international brand.
		Transform the SEZA's existing one-stop-shop for investor services into a national virtual one-stop shop that connects all regulatory authorities through an e-government portal.	SEZA, MEGJC			●						1. National one-stop shop implemented as a pilot project for SEZ investors. 2. National one-stop shop expanded to companies that seek to invest in Jamaica outside of the SEZs.
		Facilitate the ease of doing business in SEZs through reforms to the tax scheme and SEZ regulations.	SEZA, MEGJC	●	●							1. Tax scheme revised to tax imported inputs to goods, not final value of the entire product. 2. Time limits for storage of goods in SEZs removed. 3. SEZ Act revised to allow for de-vanning and re-vanning of cargo inside SEZs. 4. No SEZ Authority Board Members from the public sector to have a financial interest in SEZ development.
		Assure prospective SEZ users' ability to deliver high quality services and customer satisfaction.	PIOJ, Local Government, Estate Developer, NWC, JPS, Users		●							New regulation enacted that provides fiscal incentives for developers to use existing infrastructure or build alternative energy plants in SEZs.
Aviation												
Further promote air transport liberalization and competition, new ASA, new routes, increased services, and air connectivity.	Air connectivity is a crucial enabler of global trade and an essential mode of transport for industries such as perishables, pharmaceuticals, electronic devices, retail and automotive; those industries which are targeted by the JLHI. Further, Jamaica's industrial development requires efficient, reliable and cost competitive air connectivity that leverages the country's strategic and competitive location to conduct international commerce.	Establish competitive tariffs across aviation services (aircraft landing, parking, use of terminal, fuel services, air traffic control) to be equal or less than than competing airports in the region, specifically: Miami, Panama, Cancun, Puerto Rico. Each major airport to provide 2-3 alternatives for ramp and ground handling services for passenger and cargo flights.	JCAA, Private Sector Operators		●	●	●	●			Attract at least two new major airlines to a major Jamaican airport by 2021.	
Private operators in coordination with the GoJ effectively promote and improve quality standards at NMIA, SIA, Vernamfield, and Ian Fleming airports.		AAJ to require airport operators to fully comply with ICAO and FAA safety and security regulatory requirements and guidelines and with all JCAA safety and security regulatory requirements and guidelines.	Private Sector Operators, AAJ, JCAA		●	●	●				1. Achieve full Compliance with ICAO and FAA safety and security regulatory requirements and guidelines at all Jamaican commercial airports. 2. Achieve comply with all JCAA safety and security regulatory requirements and guidelines at all Jamaican commercial airports.	
Promote the efficient and effective functioning of government authorities operating within airports to increase the ease of doing business at NMIA, SIA, Vernamfield, and Ian Fleming airports.		AAJ to establish minimum processing times for passenger and cargo arriving and departing.	GoJ, AAJ, JCAA		●	●	●				Achieve highest level of service according to ICAO standards.	
Trucking												
Effectively promote competition amongst freight transport operators.	Promoting competition and interagency collaboration through enhanced policies, laws and regulations is critical to improved land transport infrastructure and lower land transport costs between key transport nodes and hinterland LHI facilities.	Review the current licensing process and policies to ensure that freight transport regulation competition is promoted.	MTM, Users, Trucking Association		●	●	●	●	●		Cost of freight transport (USD/ton-km) is reduced by 30 percent.	
		Promote the consolidation of trucking operators in order to create larger, professionally run operators to improve freight operations and reliability.	PIOJ, Local Government, Estate Developer, MTM, Users		●	●	●	●	●		Time to complete shipments is reduced by 20 percent.	
		Evaluate options for use of railway ROW for KCT - Caymanas Estate freight interchange (sale, lease or transfer of ownership).	JRC, PIOJ, Local Government, Estate Developer, MTW, Users		●						Regulation enacted to allow for ROW acquisition and development of new land transport infrastructure connecting key LHI nodes.	

= vision critical top priority
 = vision critical high priority
 = vision critical lower priority

Enabler 3. Enhancing Workforce Capacity

Goal: Ensure the long-term readiness and short-term preparedness of Jamaica's workforce system and labor markets to efficiently and effectively meet the growing demands of LHI-related employers.

Strategy Category	Strategy Rationale	Actions	Implementation Responsibility	Begin and Complete (years)							Performance Measure	
				In Progress	1	2	3	4	5	6-15		16-20
Improve technical and vocational training capabilities.	LHI will have a range of skill set requirements, but training and educational institutions also need appropriate capabilities to meet training needs at acceptable standards.	Conduct employment/worker demand study and identify skill set requirements for projected employment requirements.	Ministry of Labor and Social Security; SEZA		●							Assessment completed in Year 1.
		Conduct top-to-bottom assessment of institutional capacity to meet anticipated training requirements and define strategies for institutional preparation.			●						Assessment completed in Year 1.	
		Implement strategies for expanding or revising institutional capacity to meet projected requirements.					●	●	●	●		Strategy is executed over a 4-year period with annual reporting on progress.
Ensure that Jamaica's training and re-training institutions build skills that are compatible with LHI industries.	As Jamaica's economy shifts towards new industries attracted by LHI-induced opportunities, potential LHI workers will need help matching skills to existing jobs and accessing targeted training and certifications for new jobs.	Produce and retain more graduates in engineering and technical fields by increasing the quantity and quality of applied science institutions.	GoJ, MOE, SEZA, Maritime University		●	●	●	●				1. Construction of LHI training campus in CSEZ with capacity for 5,000 students covering an area of approximately eight hectares by 2021. 2. Achieve graduation rates of at least 85 percent from the new LHI CSEZ campus and the Maritime University by 2021.
		Construct JLHI higher education campus and implement training for potential customs and industrial workforce.			●	●	●	●				
Develop workforce capacity in aircraft maintenance and repair, pilots, and government authority officers .	Improving workforce capacity of aviation sector operators will lead to higher quality of service delivery of all LHI players	Initiate technical school for aircraft maintenance and repair, pilots, and airport government authority training.	Private Sector Operator, JCAA, GoJ			●	●					Aviation Institute should be fully operative by 2020.
Increase secondary school participation rates.	Match population potential with required skillset for jobs in new industries attracted by the LHI, specifically basic reading, math, and computer literacy.	Increase spending in secondary education.	GoJ, MOE			●	●	●				1. Secondary School enrollment to 95 percent by 2021. 2. Adult literacy rates to 95 percent by 2021.
Improve computer literacy.		Increase government spending into elementary and secondary education to make computer science a mandatory part of the curriculum.	GoJ, MOE		●	●	●	●				The percentage of individuals using a computer increases to 60 percent by 2021.
Prevent the brain-drain effect in Jamaica.	Potential LHI workers with secondary and tertiary education will need help matching skills to existing jobs, with a focus on preventing the brain-drain in the STEM fields.	Define financial incentives for university students to stay in Jamaica upon receiving university degree.	GoJ, MOE		●	●	●	●				Place 90 percent of graduates in STEM and LHI-related fields from national institutions in jobs in Jamaica.
Leverage private sector contributions for training programs .	The private sector has a critical role to play in education and training related to logistics-oriented jobs and the industrial sector, and can be a catalytic force in job training for the LHI.	Establish cooperative MOUs between individual companies and the government to establish training programs that meet workforce requirements.	GoJ, SEZA			●	●	●				Five cooperative MOUs are established by 2021.
Develop workforce capacity in utility and alternative energy source installation.	Improving workforce capacity of utility and alternative energy source infrastructure technicians will enable LHI developments to rapidly respond to utility infrastructure demand growth.	Maritime University provides workforce training in alternative energy source installation.	Maritime University			●	●					At least 500 new certified technicians graduate from the first cohort through the new Maritime University Program.
Develop workforce capacity for commercial trucking operations.	Improving the workforce capacity of the land transport sector operators will lead to higher quality of service delivery of all LHI-related industries.	Develop and deliver training on management, financing, fleet maintenance and scheduling.	Maritime University			●	●					At least 500 new certified technicians graduate from the first cohort through the new Maritime University Program.

■ = vision critical top priority ■ = vision critical high priority ■ = vision critical lower priority

Enabler 4. Developing Efficient and Productive Infrastructure

Goal: Create an internationally competitive environment to connect businesses to world markets through development of enabling transportation and logistics infrastructure and underlying services that supports the LHI's value proposition.

Strategy Category	Strategy Rationale	Actions	Implementation Responsibility	Begin and Complete (years)								Performance Measure	
				In Progress	1	2	3	4	5	6-15	16-20		
Maritime													
Provide improved maritime infrastructure at KCT and other maritime infrastructure.	The improvement of existing maritime infrastructure and development of new maritime infrastructure is an essential strategy for supporting growth of LHI industries, and for attracting new shipping lines and additional transshipment and cargo traffic to Jamaica.	Private operator to update master plan and review KCT maritime infrastructure needs at 5-year increments throughout concession period. PAJ shall monitor the master plan in accordance with concession agreement.	PAJ, Private Sector Operator		●	●	●	●	●	●	●	1. Full compliance with MARPOL, PIANC, and other industry standard and FAA regulatory requirements and guidelines. 2. Full compliance with levels of service required by master plan and concession agreements.	
Develop new maritime infrastructure in the medium term (Fort Augusta).		PAJ develops and implements master plan and ESIA for greenfield port development at Fort Augusta; updates master plan at 5-year increments in conjunction with private operator.	PAJ						●	●	●	1. PAJ acquires property 2. PAJ selects private sector operator for Fort Augusta 3. PAJ monitors port construction 2. Full compliance with levels of service required by master plan and concession agreements.	
Develop new maritime infrastructure in the long term (Vernamfield).		PAJ develops and implements master plan and ESIA for greenfield port development at Vernamfield multi-purpose seaport; updates master plan in 5-year increments in conjunction with private operator.	PAJ								●	1. PAJ acquires property at Vernamfield multi-purpose seaport. 2. PAJ selects private sector operator for Vernamfield. 3. PAJ monitors port development and operation. 4. Full compliance with levels of service required by master plan and concession agreements.	
Improve maritime infrastructure of small private seaports.		Private operators update master plans and review maritime infrastructure needs at Port Esquivel and other small private seaports at 5-year increments over a 20-year planning horizon to coordinate with JHL.	Private Sector Operators, PAJ							●	●	●	1. Full compliance with MARPOL, PIANC, and other industry standard and FAA regulatory requirements and guidelines. 2. Full compliance with levels of service required by master plan and concession agreements.
Civil Aviation													
Develop and monitor master plans for all aviation facilities in collaboration with private sector operators.	Air connectivity is a crucial enabler of global trade and an essential mode of transport for industries such as perishables, pharmaceuticals, electronic devices, retail and automotive; those industries which are targeted by the JLI. Further, Jamaica's industrial development requires efficient, reliable and cost competitive air connectivity that leverages the country's strategic and competitive location to conduct international commerce.	Private operators update aviation facility master plans at 5-year increments for a 20-year planning horizon. Master plans should include all air cargo logistics components and should be reviewed/ revised periodically.	Private Sector Operators, AAJ	●	●	●	●	●	●	●	●	Master plans completed for all aviation facilities on recommended 5-year increments.	
Develop aviation facilities to support expanded air cargo and passenger service at Norman Manley International Airport.		Land at NMIA is reserved for further expansion of air cargo activities.	AAJ	●	●	●	●	●	●				Necessary agreements in place and acquisition completed.
Develop improved air cargo and passenger service capacity through facilities improvements at Sangster International Airport.		Land at SIA is reserved for further expansion of air cargo activities.	MBJ Airports Limited, AAJ	●	●	●	●	●	●				Necessary agreements in place and acquisition completed.
Develop an aerropolis at Vernamfield with adequate facilities to support air cargo, industrial, and passenger services as the economic driver of this new airport city.		Prepare a feasibility study and master plan for the Vernamfield Aerropolis and its air cargo facility and update it at 5-year increments over a 30-year planning horizon to include all air cargo logistics components.	AAJ		●	●	●	●	●	●	●		1. Feasibility study completed. 2. Master plan completed.
Develop aviation facilities to support growth in passenger and air cargo at the Ian Fleming International Airport.		Monitor expansion and modernization of IFIA in accordance with master plan recommendations.	AAJ									●	Passenger traffic at IFIA increases by 300,000 passengers by 2035.
Develop aircraft maintenance and repair (MRO) facilities at new long-term greenfield master planned areas.		MRO facilities are fundamental to ensure that civil aviation hubs are competitive.	Prepare a feasibility study for MRO in the Vernamfield Aerropolis and its air cargo facility.	AAJ-MT						●			Feasibility study completed.
		Construct MRO in the Vernamfield Aerropolis and its air cargo facility.	AAJ-MT								●	Construction completed.	
Industrial													
Private operators at KCT to develop additional logistics and industrial infrastructure on the port's hinterland to support LHI industries	The development of industrial facilities in support of logistics initiatives will attract anchor industries and foreign investment in the LHI, leading to greater economic growth and thus better position Jamaica in the global market.	Develop and implement a master plan and ESIA for industrial development at the KWL/Tinson Pen logistics area; update master plan at 5-year increments in conjunction with the developer.	PIOJ, Local Government, JSEZA, Developers, Users		●	●	●	●	●	●	●	1. Master plan for KWL completed. 2. Property for industrial facilities at KWL/Tinson acquired. 3. Development of industrial facilities at KWL/Tinson completed. 4. Full compliance with industry standard codes and planning guidelines and best practices.	
Expand logistics infrastructure on port-adjacent land available at KCT to support LHI industries.		Develop and implement a master plan and ESIA for industrial development at the KCT West logistics area; update master plan in 5-year increments in conjunction with the developer.			●	●	●	●	●	●	●	●	1. Master plan for land adjacent to KCT (West Logistics Area) developed. 2. Property for industrial facilities at KCT West Logistics Area acquired. 3. Site preparation completed and backbone infrastructure constructed. 4. Development of industrial facilities in KCT West Logistics Area completed. 5. Full compliance with industry standard codes and planning guidelines and best practices.
Provide industrial infrastructure development to support the most critical LHI master planned developments in the short term.		Develop and implement a master plan and ESIA for industrial development at the Caymanas Special Economic Zone; update master plan in 5-year increments in conjunction with the developer.			●	●	●	●	●	●	●	●	1. Master plan for industrial development in Caymanas SEZ completed. 2. Industrial development feasibility study for Caymanas SEZ completed. 3. Property for industrial facilities at Caymanas SEZ acquired. 4. Site preparation completed and backbone infrastructure constructed. 4. Development of industrial facilities completed. 5. Full compliance with industry standard codes and planning guidelines and best practices

● = vision critical top priority ● = vision critical high priority ● = vision critical lower priority

Enabler 4. Developing Efficient and Productive Infrastructure (Continued)

Goal: Create an internationally competitive environment to connect businesses to world markets through development of enabling transportation and logistics infrastructure and underlying services that supports the LHI's value proposition.

Strategy Category	Strategy Rationale	Actions	Implementation Responsibility	Begin and Complete (years)								Performance Measure
				In Progress	1	2	3	4	5	6-15	16-20	
<i>Utility Services</i>												
Provide improved utility capacity for KCT operators.	The expansion of existing utilities and creation of new utility networks is required to allow Jamaica to increase tenant capacity in new and expanded LHI facilities, and subsequently to attract and support economic growth, and be better positioned to compete in the global market. Utility infrastructure will include the use of traditional and alternative energy sources.	Develop and update utilities in KWL / Tinson Pen Logistics area in accordance with final master plan and estimated user requirements.	PIOJ, Local Government, Estate Developer, NWC, JPS, Users	●	●	●	●	●	●			1. Demand analyses for utilities in KWL/Tinson Pen completed. 2. Feasibility study completed. 3. Right of way acquired. 4. New primary utilities networks and/or expand existing facilities constructed.
Provide improved utility capacity to support new logistics infrastructure in KCT.		Develop/update utilities in KCT West logistics areas in accordance with final master plan and estimated user requirements.		●	●	●	●	●	●			1. Demand analyses for utilities in KCT West logistics area completed. 2. Feasibility study completed. 3. Right of way acquired. 4. New primary utilities networks and/or expand existing facilities constructed.
Provide additional utility capacity to support Caymanas SEZ.		Develop/update utilities in the Caymanas Special Economic Zone in accordance with final master plan and estimated user requirements.		●	●	●	●	●	●			1. Demand analyses for utilities in the Caymanas SEZ area completed. 2. Feasibility study completed. 3. Right of way acquired. 4. New primary utilities networks and/or expand existing facilities constructed.
Provide new utilities and capacity, including wind and solar sources, to support development of Vernamfield Aerotropolis.		Develop utilities in the Vernamfield Aerotropolis, air cargo facility, and multi-purpose seaport in accordance with final master plan and estimated user requirements.								●		1. Demand analyses for utilities in the Vernamfield Aerotropolis area completed. 2. Feasibility study completed. 3. Right of way acquired. 4. New primary utilities networks and/or expand existing facilities constructed.
<i>Road and Rail</i>												
Provide enhanced capacity and connectivity between major airport nodes and key LHI facilities.	Improving the existing roadway and railway corridors in Jamaica will increase connectivity and the capacity to facilitate the movement of goods and people within the LHI, thereby enhancing economic opportunity across Jamaica.	Enhancement of the NMIA Access Road and South Coast Highway in accordance with final master plan and estimated user requirements.	PIOJ, Local Government, Estate Developer, MTW, Users		●	●	●	●	●			1. Demand analysis for NMIA Access Road and South Coast Highway conducted. 2. Feasibility study completed. 3. Right of way acquired. 4. Existing roads including channelization and traffic control expanded and improved. 5. Full compliance with AASHTO, MUTCD, APWA, and other international standards for highway, bridge and signalization design.
Provide enhanced connectivity between KCT and Caymanas Estate to reduce transport costs and minimize customs procedures.		Enhancement of KCT-Caymanas Estate transportation corridor in accordance with final master plan and estimated user requirements.			●	●	●	●	●			1. Demand analysis for KCT- Caymanas Estate Transportation Corridor conducted. 2. Feasibility study completed. 3. Right of way acquired. 4. Existing roads including channelization and traffic control expanded and improved. 5. Full compliance with AASHTO, MUTCD, APWA, and other international standards for highway, bridge and signalization design. 6. Full compliance with AREMA and AASHTO requirements for railway design and highway, rail interface.
Provide North Coast Highway Improvements to enhance capacity and connectivity between, to, and across the north coast.		Enhancement of the North Coast Highway in accordance with final master plan and estimated user requirements.		●	●	●	●	●	●	●		1. Demand analysis for North Coast Highway conducted. 2. Feasibility study completed. 3. Right of way acquired. 4. Existing roads including channelization and traffic control expanded and improved. 5. Full compliance with AASHTO, MUTCD, APWA, and other international standards for highway, bridge and signalization design. 6. Full compliance with AREMA and AASHTO requirements for railway design and highway, rail interface.
Enhance land transport connectivity of key LHI greenfield industrial and airport developments.		Enhancement of the Vernamfield access corridor and interchanges in accordance with final master plan and estimated user requirements.			●	●	●	●	●			1. Demand analysis for Vernamfield Access Corridor and Interchanges conducted. 2. Feasibility study completed. 3. Right of way acquired. 4. Existing roads including channelization and traffic control expanded and improved. 5. Full compliance with AASHTO, MUTCD, APWA, and other international standards for highway, bridge and signalization design. 6. Full compliance with AREMA and AASHTO requirements for railway design and highway, rail interface.
Improve land connectivity between the KCT and key LHI greenfield industrial and airport developments.		Enhancement of KCT-Vernamfield railroad improvements in accordance with final master plan and estimated user requirements.								●		1. Demand analysis for VKCT-Vernamfield railroad improvements conducted. 2. Feasibility study completed. 3. Right of way acquired. 4. Improve or expand existing rail infrastructure 5. Full compliance with AREMA and AASHTO requirements for railway design and highway, rail interface.
Provide South Coast Highway Improvements west to Savanna La Mar to support logistics hub growth on the west side of the island.		Enhancement of Savanna La Mar Highway Improvements in accordance with final master plan and estimated user requirements.								●		1. Demand analysis for North Coast Highway conducted. 2. Feasibility study completed. 3. Right of way acquired. 4. Existing roads including channelization and traffic control expanded and improved. 5. Full compliance with AASHTO, MUTCD, APWA, and other international standards for highway, bridge and signalization design.
<i>Environmental and Social</i>												
Ensure environmental and social sustainability of projects.	Environmental and social sustainability is required to obtain stakeholder and public support, and to prevent the depletion of environmental resources critical to development in Jamaica.	Complete environmental assessments or environmental impact statements for infrastructure projects in accordance with NEPA and international standards.	Private Sector Operators, PAJ, AAJ, MTW, GoJ	●	●	●	●	●	●	●	●	Environmental standards recommended by the World Bank implemented.

■ = vision critical top priority

■ = vision critical high priority

■ = vision critical lower priority

Enabler 5. Providing Efficient Transport Logistics System

Goal: Ensure the availability of and access to a competitive and efficient transport logistics system.

Strategy Category	Strategy Rationale	Actions	Implementation Responsibility	Begin and Complete (years)							Performance Measure		
				In Progress	1	2	3	4	5	6-15		16-20	
Determine bottlenecks and other constraints to transport logistics efficiency.	While Jamaica promotes the development of its LHI, prospective tenants/industries require that logistics systems sufficient to meet their needs are in place. The World Bank's Logistics Performance Index identifies weaknesses in Jamaica's logistics system, but the analysis does not provide sufficient guidance to mitigate performance constraints. Jamaica must thus identify impediments to logistics efficiency and provide the systems/technologies that enable shippers to know the real time status of freight processing, movement, and location.	1. Conduct diagnostics of transport logistics performance.	SEZA, MEGJC		●								Diagnostics completed in Year 1.
		2. Identify structural and non-structural interventions for improving logistics performance.			●								Interventions identified in Year 1.
		3. Establish priorities for logistics performance improvements.			●								Improvement priorities identified in Year 1.
		4. Develop phased development and financing strategy for making improvements.			●								Strategy developed in Year 1.
Monitor Logistics System Performance	Logistics decisions are based on availability and timely receipt of logistics transaction information. Having access to, and communicating through a system between relevant parties assist in facilitating planning and reliability of logistics chains.	Develop Transport Logistics Performance Monitoring System	SEZA			●							Monitoring system established in Year 2.
		Monitor performance on a regular and continuous basis.	SEZA				●	●	●	●	●		Monitoring conducted continuously and quarterly performance report issued.
Develop and implement logistics technology information and communications system.	Logistics decisions are based on availability and timely receipt of logistics transaction information. Having access to, and communicating through a system between relevant parties assist in facilitating planning and reliability of logistics chains.	Assess needs and prepare design for a logistics community system that enables logistics planning, track and trace capability, and information sharing among relevant parties; determine framework for funding and implementation.	SEZA			●	●						Detailed design, implementation, and funding strategy prepared by end of Year 3.
		Implement and operate logistics community system.	SEZA					●	●	●	●		Logistics system community system operational in Year 4.

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Enabler 6. Facilitating Sustainable Financing

Goal: By leveraging a combination of PPP transactions and multilateral institution financing, the government of Jamaica facilitates significant private sector financing for LHI-related infrastructure development and develops long-term operating and maintenance agreements with private investors and operators to ensure sustainability and efficiency of LHI infrastructure assets.

Strategy Category	Strategy Rationale	Actions	Implementation Responsibility	Begin and Complete (years)								Performance Measure
				In Progress	1	2	3	4	5	6-15	16-20	
Continue the P3 transaction effort at Norman Manley and pursue transactions at Ian Fleming and Vernomfield.	Increased private sector participation will substantially increase quality and efficiency of the aviation sector.	Finalize Concession (PPP) of NMIA.	AAJ, Private Operator		●	●						All primary air transport sector infrastructure areoperated by private concessionaires by 2022.
		Analyze feasibility of PPP concession of Ian Fleming.	AAJ		●							
		Design, structure, and implement private sector participation at Vernamfield.	AAJ, Private Operator		●	●	●	●				
Promote engagement of international finance institutions to provide loans at competitive rates for long-term project financing.	The master plan indicates the need for financing of projects that are not necessarily suitable for private sector financing but critical for developing the LHI. Jamaica will have to resort to non-private sector funding strategies to fund projects that are justifiable on economic grounds.	Meet with prospective financing institutions and identify projects that merit funding.	SEZA	●	●	●	●	●	●	●	●	Projects identified each year and proposed through appropriate multilateral institutions; annual report prepared each year identifying projects and status towards funding.
Promote private sector investment and concession (PPP) at Port Augusta Container Terminal.	As the LHI is developed and takes shape, further development of Jamiaca's port sector, such as the Port Augusta Container Terminal, may be required to ensure the long-term vision of the LHI.	Analyze the feasibility of a PPP concession for Port Augusta.	PAJ							●		PPP tender initiated for Port Augusta.
Promote private sector participation from existing investors in Jamaica to facilitate the development of LHI manufacturing at the CSEZ.	Increased private sector participation in managing and operating LHI facilities will substantially increase quality and efficiency of existing and new infrastructure.	Encourage LHI related mix and industrial use development to new CSEZ developers, such as CHEC.	GoJ, PIOJ, SEZA		●	●	●	●				Concession agreement signed with five CSEZ developers by 2021.
Leverage private sector contributions for land acquisition and resettlement affected by SEZs.		Promote fiscal incentives that contribute to resettlement programs urban renewal and of existing communities within future SEZs.	GoJ, MEGJC		●	●	●	●				Concession agreement signed with at least three CSEZ developers by 2021 that make urban renewal contributions within communities encompassed by new SEZs.
Leverage private sector financing in the development of LHI.		Promote fiscal incentives for private participation in the development of SEZs and JLHI.	GoJ, MEGJC, IFC		●	●	●	●				Concession agreements signed with five CSEZ developers by 2021.
Promote private sector participation in the installation of utility infrastructure.	Competitive private sector participation incentives for developing utility infrastructure will enable the LHI to provide growing utility needs for manufacturing industries in accordance with the supply-driven development scenario outlined in the LHI Land Use Master Plan.	Promote fiscal incentives that encourage private sector participation in energy, water, sewerage, and broadband infrastructure installation.	NWC, JPS, SEZA		●	●	●	●	●			Agreements reached with at least two anchor industries to develop backbone utility infrastructure at and SEZ by 2022.
Promote private sector participation for cargo transfer services between KCT and Caymanas Estate.	Private sector participation is the key element for financing, operating and maintaining high quality highway and railroad infrastructure.	Design, structure and implement a PPP concession for cargo transfer services.	PIOJ, KCT, Customs, Local Government, Estate Developer, MTW, Users		●	●						Concession agreement signed with operator of the newly constructed transport link.

= vision critical top priority
 = vision critical high priority
 = vision critical lower priority

Enabler 7. Promoting the LHI

Goal: Strategically position Jamaica as the logistics hub of the Americas through effective LHI promotion efforts.

Strategy Category	Strategy Rationale	Actions	Implementation Responsibility	Begin and Complete (years)								Performance Measure	
				In Progress	1	2	3	4	5	6-15	16-20		
Create a marketing and promotion strategy for the LHI to market Jamaica as the gateway interconnecting the Americas to global markets.	<p>Establishing Jamaica as a logistics hub for the Americas requires targeted sensitization and promotion of the various enablers such as physical and virtual capabilities; promoting the "logistics" in the LHI as not only a one-sector initiative, but as a holistic initiative that aim to create an economically diverse and influential special economic zone regime, and transport and logistics services with access to highly skilled and experienced workforce.</p> <p>The strategy must be geared towards attracting investors in existing and emerging industries as well as international organisations to: establish Jamaica as their regional headquarters; attract international finance and insurance companies so that Jamaica is perceived as a regional center of excellence for transport and logistics finance and insurance; promote and attract transport and logistics companies to create the environment that enables Jamaica to attract Fortune 500 companies; and to achieve recognition as a regional center of excellence for SEZs, transport, logistics, supply chain management and research and development.</p>	Identify and promote key business environments and foreign direct investor determinants that will enable Jamaica to achieve its vision.	GoJ Prime Minister's Office, MEGJC, SEZA, JAMPRO		●								<ol style="list-style-type: none"> 1. Attract five new "anchor investors" into LHI SEZs by 2021. 2. Achieve mention of LHI progress in at least three major international magazines/publications per year. 3. JAMPRO to present LHI marketing materials in at least two world conferences per year. 4. Secure the rights to host a globally recognized logistics and infrastructure conference in Jamaica to showcase the LHI's assets and the opportunity it provides to potential investors. 5. Annual developers' conference conducted with report on contacts and follow-up plans. 6. Annual road shows conducted with report on contacts and follow-up plans.
		Initiate a marketing campaign to identify target anchor companies that offer global/regional supply chain management, transport and logistics, and integrated multimodal IT platform.			●								
		Seek out major transport and logistics conference event management companies that will partner with the LHI Authority and other local sponsors to organise a Global or Regional Transport and Logistics Conference. Attract leading 3PL companies, manufacturing and other logistics value added services companies to participate in the conference in Jamaica and tour various LHI locations across the island.			●	●	●	●	●				
		Partner with educational and research institutions in Jamaica to identify industry, sector and sub-sector players to better understand the economic impact of targeted promotion strategies for successful logistics hub developments.			●	●	●	●	●				
		Utilize Jamaica's Foreign Service Offices (FSO) to target and engage potential investors overseas.			●	●	●	●	●				
		Target five "anchor investors" with the ability to bring high level visibility to Jamaica should or more decide to establish operations in the hub.			●	●	●	●					
		Work to increase investment from those multinational corporations which are already operating in Jamaica.			●	●	●	●	●				
		Conduct annual LHI Developers Conference targeting global developers, investors, and financial institutions.			●	●	●	●	●	●	●		
		Conduct annual road show to promote investment/development opportunities.				●	●	●	●	●			

= vision critical top
 = vision critical high priority
 = vision critical lower priority

Enabler 7. Promoting the LHI (Continued)

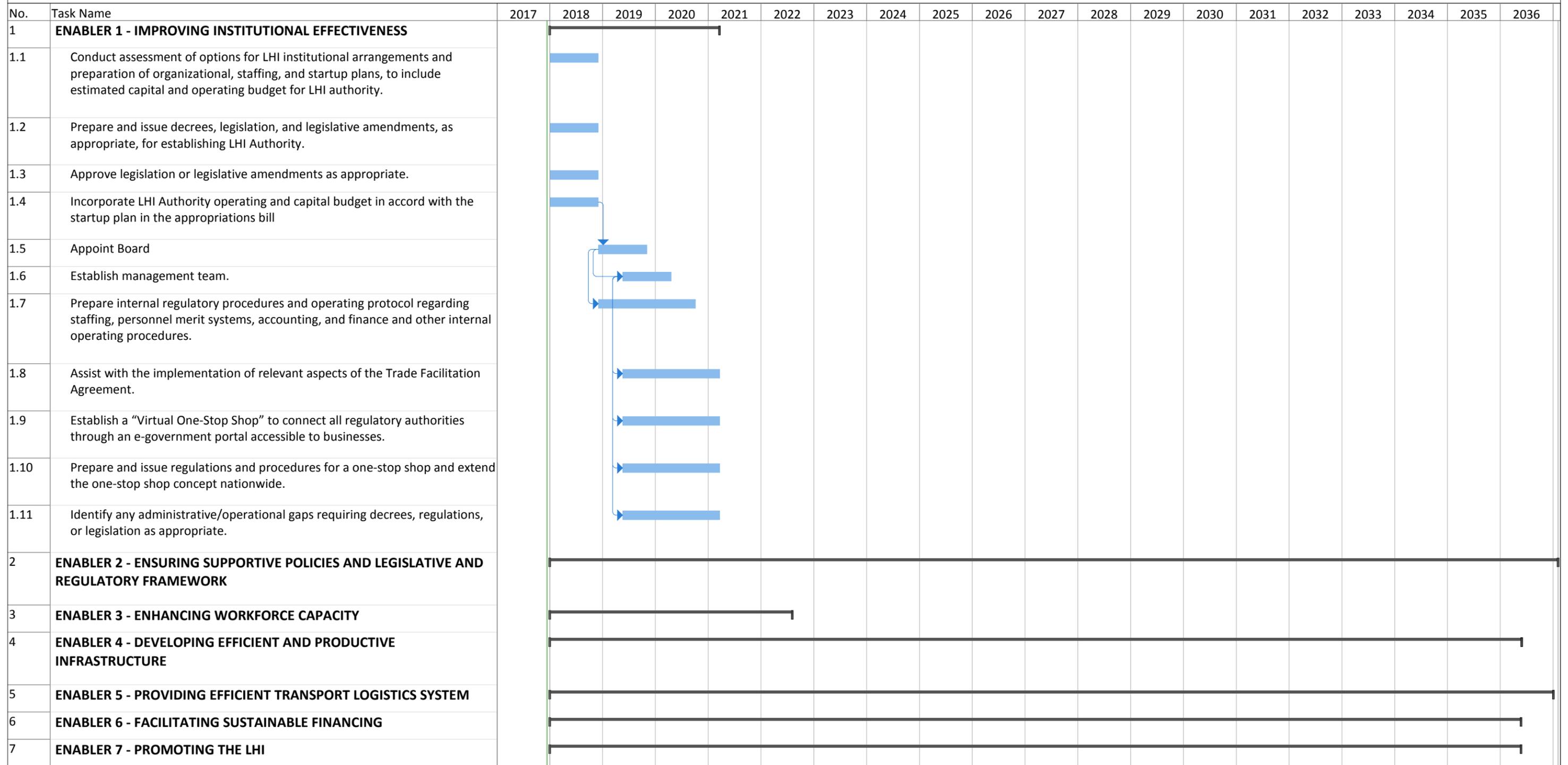
Goal: Strategically position Jamaica as the logistics hub of the Americas through effective LHI promotion efforts.

Strategy Category	Strategy Rationale	Actions	Implementation Responsibility	Begin and Complete (years)							Performance Measure		
				In Progress	1	2	3	4	5	6-15		16-20	
Create a marketing and promotion strategy for the LHI to market Jamaica as the gateway interconnecting the Americas to global markets.	Establishing Jamaica as a logistics hub for the Americas requires targeted sensitization and promotion of the various enablers such as physical and virtual capabilities; promoting the "logistics" in the LHI as not only a one-sector initiative, but as a holistic initiative that aim to create an economically diverse and influential special economic zone regime, and transport and logistics services with access to highly skilled and experienced workforce. The strategy must be geared towards attracting investors in existing and emerging industries as well as international organisations to: establish Jamaica as their regional headquarters; attract international finance and insurance companies so that Jamaica is perceived as a regional center of excellence for transport and logistics finance and insurance; promote and attract transport and logistics companies to create the environment that enables Jamaica to attract Fortune 500 companies; and to achieve recognition as a regional center of excellence for SEZs, transport, logistics, supply chain management and research and development.	Conduct annual road show to promote investment/development opportunities.	GoJ Prime Minister's Office, MEGIC, SEZA, JAMPRO			●	●	●	●	●			1. Attract five new "anchor investors" into LHI SEZs by 2021. 2. Achieve mention of LHI progress in at least three major international magazines/publications per year. 3. JAMPRO to present LHI marketing materials in at least two world conferences per year. 4. Secure the rights to host a globally recognized logistics and infrastructure conference in Jamaica to showcase the LHI's assets and the opportunity it provides to potential investors. 5. Annual developers' conference conducted with report on contacts and follow-up plans. 6. Annual road shows conducted with report on contacts and follow-up plans.
Prepare and promote LHI marketing materials specific to the ports sector to aim at attracting new shipping lines.	The efficient functioning of Jamaica's ports are a critical factor for the success of the LHI. To serve as the fourth node of the logistics hub, maritime connectivity and efficiency is of the utmost importance. Jamaica's port industry provides opportunities for large scale value-added activities. Along with modern and efficient logistics and customs, the ports of Kingston are the first node for Jamaica's supply chain as an international hub. This can be effectively marketed on behalf of the LHI.	Promote and incentivize publication of articles written by opinion leaders in the ports industry and published in magazines, journals and electronic media that highlight the value of the LHI.	GoJ, JAMPRO, PAJ		●	●	●	●	●			Achieve mention of LHI progress in at least 3 major international magazines/publications per year.	
		Develop joint-marketing materials and a public relations campaign to promote the LHI globally.	GoJ, JAMPRO, PAJ, KWL, Private Entities		●	●						Global marketing and PR campaign implemented via major port publications, websites, journals, and conferences.	
		Target and attract a globally recognized bunker company that will meet/exceed the needs of shipping lines (quality & quantity supplies) as part of the LHI marketing and promotion strategy.	GoJ, JAMPRO, PAJ		●	●						Contract executed with a globally recognized bunker company.	
		Target and attract a reputable Dry Dock Company as part of the LHI marketing and promotion strategy.	GoJ, JAMPRO, PAJ		●	●						Contract executed with a reputable dry dock company.	
		Target and attract international ship chandlery service as part of the LHI marketing and promotion strategy.	GoJ, JAMPRO, PAJ		●	●						Contract executed with a ship chandlery service.	
Market new routes in the air transport sector and conduct related business development.	Air connectivity is a crucial enabler of global trade and air cargo is an essential mode of transport for industries such as perishables, pharmaceuticals, electronic devices, retail and automotive. Jamaica's industrial development strategy requires efficient, reliable and cost competitive air connectivity that leverages Jamaica's strategic location to conduct international business.	Promote new routes and increased services and air connectivity through participation in air and air cargo shows and conventions organized by IATA, ICAO, AirCargoWorld, among others.	GoJ, JCAA, SEZA, Private Operator		●	●	●	●	●			Participate in at least three air cargo shows and conventions per year.	
		Promote cargo/cold storage facilities on airport sites, specifically at SIA.	Private Sector Operator, AAJ		●	●	●	●				Air cargo throughput increases by over 60 percent by 2021.	
Promote CSEZs as a "ready for business" green development with backbone infrastructure.	Availability of public utilities that can support new large scale industrial development, or the existence of fiscal incentives and PPPs to develop them, are key competitive traits of the LHI that need to be marketed to potential investors	Implement a targeted publicity campaign in international markets through social media.	JAMPRO, SEZA		●							Set of LHI marketing materials showcasing expanding utilities capacity at LHI facilities and plans to reduce rates published.	
Promote best practices in land and aviation transport sectors through awards.	Effective promotion that highlights LHI's plans to develop a world class land transport system will be a key element for attracting foreign investors	Promote annual awards ceremonies.	JAMPRO, Chamber of Commerce, trucking and aviation associations		●	●	●	●	●			Host annual awards ceremonies in land and aviation sectors.	

■ = vision critical top ■ = vision critical high priority ■ = vision critical lower priority

Jamaica Logistics Hub Initiative (JLHI) - Action Plan for Implementation of Development Strategy

Enabler 1 - Improving Institutional Effectiveness

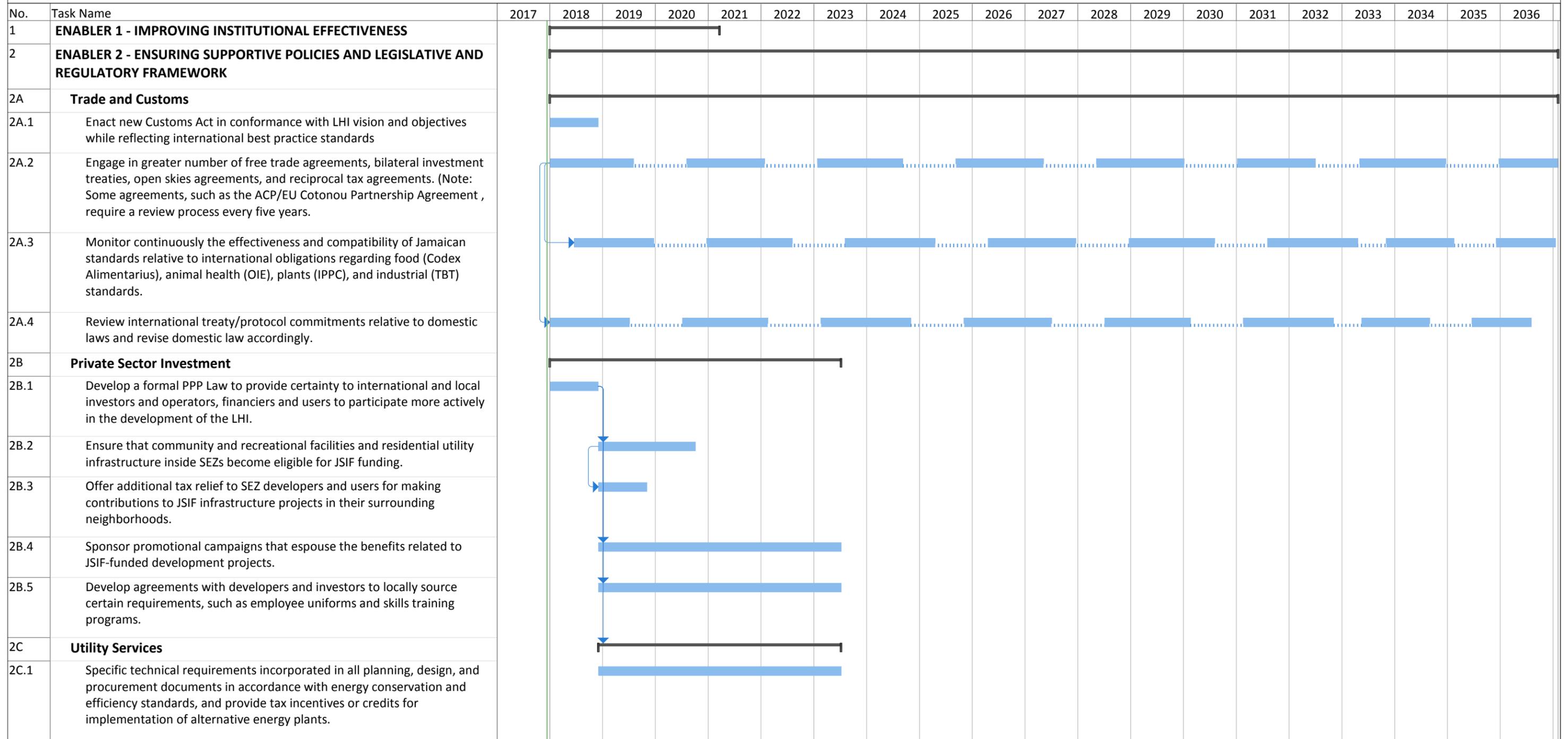


JLHI Development Strategy.mpp
Date: Wed 12/13/17

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
Split		External Tasks		Inactive Summary		Manual Summary		Progress	
Milestone		External Milestone		Manual Task		Start-only		Manual Progress	
Summary		Inactive Task		Duration-only		Finish-only			

Jamaica Logistics Hub Initiative (JLHI) - Action Plan for Implementation of Development Strategy

Enabler 2 - Ensuring Supportive Policies and Legislative And Regulatory Framework



JLHI Development Strategy.mpp Date: Wed 12/13/17	Task	[Blue Bar]	Project Summary	[Grey Bar]	Inactive Milestone	[Teal Bar]	Manual Summary Rollup	[Teal Bar]	Deadline	[Down Arrow]
	Split	[Dotted Line]	External Tasks	[Grey Bar]	Inactive Summary	[Teal Bar]	Manual Summary	[Teal Bar]	Progress	[Blue Bar]
	Milestone	[Diamond]	External Milestone	[Diamond]	Manual Task	[Teal Bar]	Start-only	[Teal Bar]	Manual Progress	[Blue Bar]
	Summary	[Black Bar]	Inactive Task	[White Bar]	Duration-only	[Teal Bar]	Finish-only	[Teal Bar]	[Blue Bar]	[Blue Bar]

Jamaica Logistics Hub Initiative (JLHI) - Action Plan for Implementation of Development Strategy

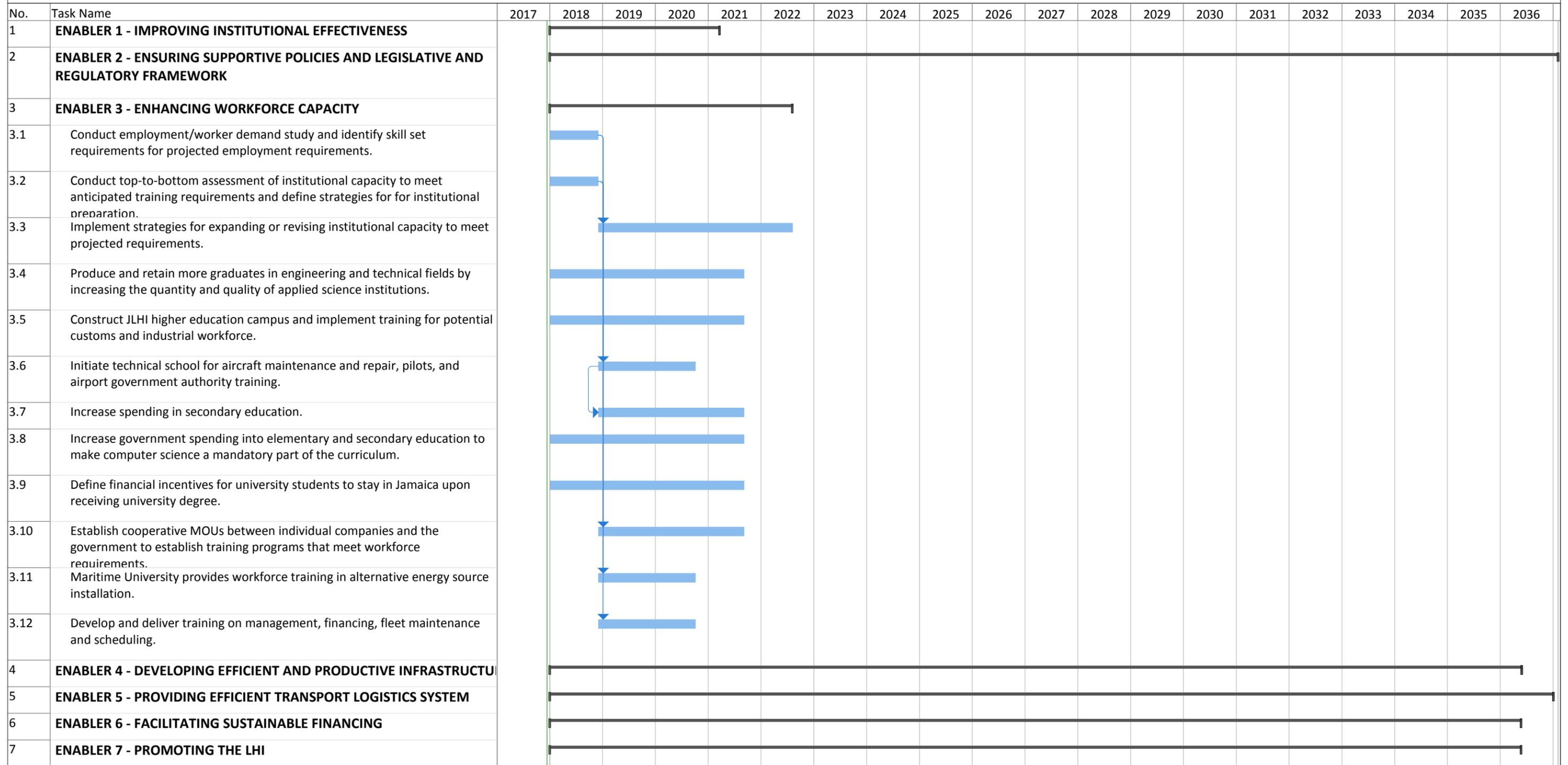
Enabler 2 - Ensuring Supportive Policies and Legislative And Regulatory Framework

No.	Task Name	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
2C.2	Promote energy conservation and efficiency and encourage the development of alternative energy sources to supply new LHI facilities.																				
2D	SEZ Regulatory Framework																				
2D.1	Increase effectiveness of SEZA in encouraging initial investment in SEZs.																				
2D.2	Transform the SEZA's existing one-stop-shop for investor services into a national virtual one-stop shop that connects all regulatory authorities through an e-government portal.																				
2D.3	Facilitate the ease of doing business in SEZs through reforms to the tax scheme and SEZ regulations.																				
2D.4	Assure prospective SEZ users' ability to deliver high quality services and customer satisfaction.																				
2E	Aviation																				
2E.1	Establish competitive tariffs across aviation services (aircraft landing, parking, use of terminal, fuel services, air traffic control) to be equal or less than than competing airports in the region, specifically: Miami, Panama, Cancun, Puerto Rico.																				
2E.2	AAJ to require airport operators to fully comply with ICAO and FAA safety and security regulatory requirements and guidelines and with all JCAA safety and security regulatory requirements and guidelines.																				
2E.3	AAJ to establish minimum processing times for passenger and cargo arriving and departing.																				
2F	Trucking																				
2F.1	Review the current licensing process and policies to ensure that freight transport regulation competition is promoted.																				
2F.2	Promote the consolidation of trucking operators in order to create larger, professionally run operators to improve freight operations and reliability.																				
2F.3	Evaluate options for use of railway ROW for KCT - Caymanas Estate freight interchange (sale, lease or transfer of ownership).																				
3	ENABLER 3 - ENHANCING WORKFORCE CAPACITY																				
4	ENABLER 4 - DEVELOPING EFFICIENT AND PRODUCTIVE INFRASTRUCTURE																				
5	ENABLER 5 - PROVIDING EFFICIENT TRANSPORT LOGISTICS SYSTEM																				
6	ENABLER 6 - FACILITATING SUSTAINABLE FINANCING																				
7	ENABLER 7 - PROMOTING THE LHI																				

JLHI Development Strategy.mpp Date: Wed 12/13/17	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	↓
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone	◆	External Milestone	◆	Manual Task		Start-only		Manual Progress	
	Summary		Inactive Task		Duration-only		Finish-only			

Jamaica Logistics Hub Initiative (JLHI) - Action Plan for Implementation of Development Strategy

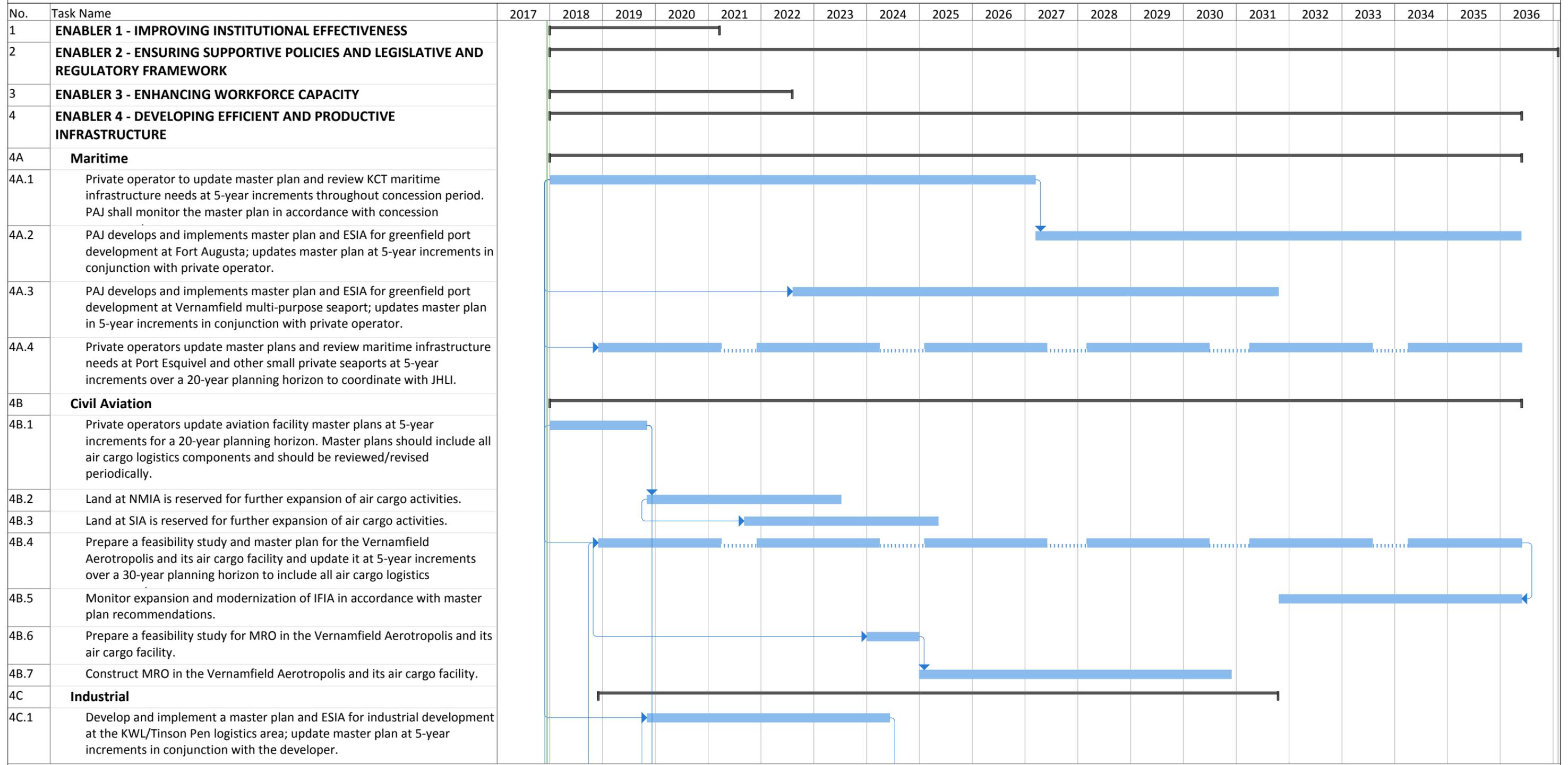
Enabler 3 - Enhancing Workforce Capacity



JLHI Development Strategy.mpp Date: Wed 12/13/17	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only		Manual Progress	
	Summary		Inactive Task		Duration-only		Finish-only			

Jamaica Logistics Hub Initiative (JLHI) - Action Plan for Implementation of Development Strategy

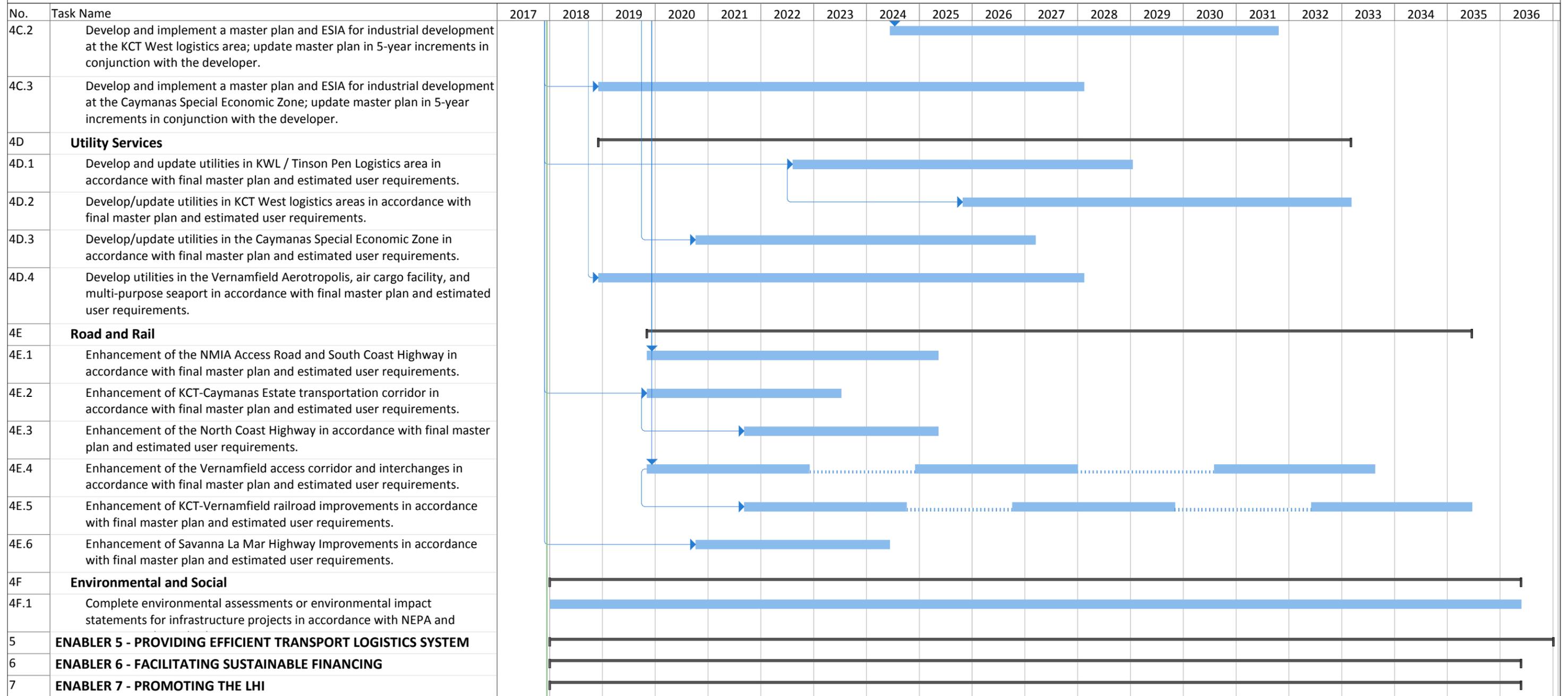
Enabler 4 - Developing Efficient and Productive Infrastructure



JLHI Development Strategy.mpp Date: Wed 12/13/17	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only		Manual Progress	
	Summary		Inactive Task		Duration-only		Finish-only			

Jamaica Logistics Hub Initiative (JLHI) - Action Plan for Implementation of Development Strategy

Enabler 4 - Developing Efficient and Productive Infrastructure

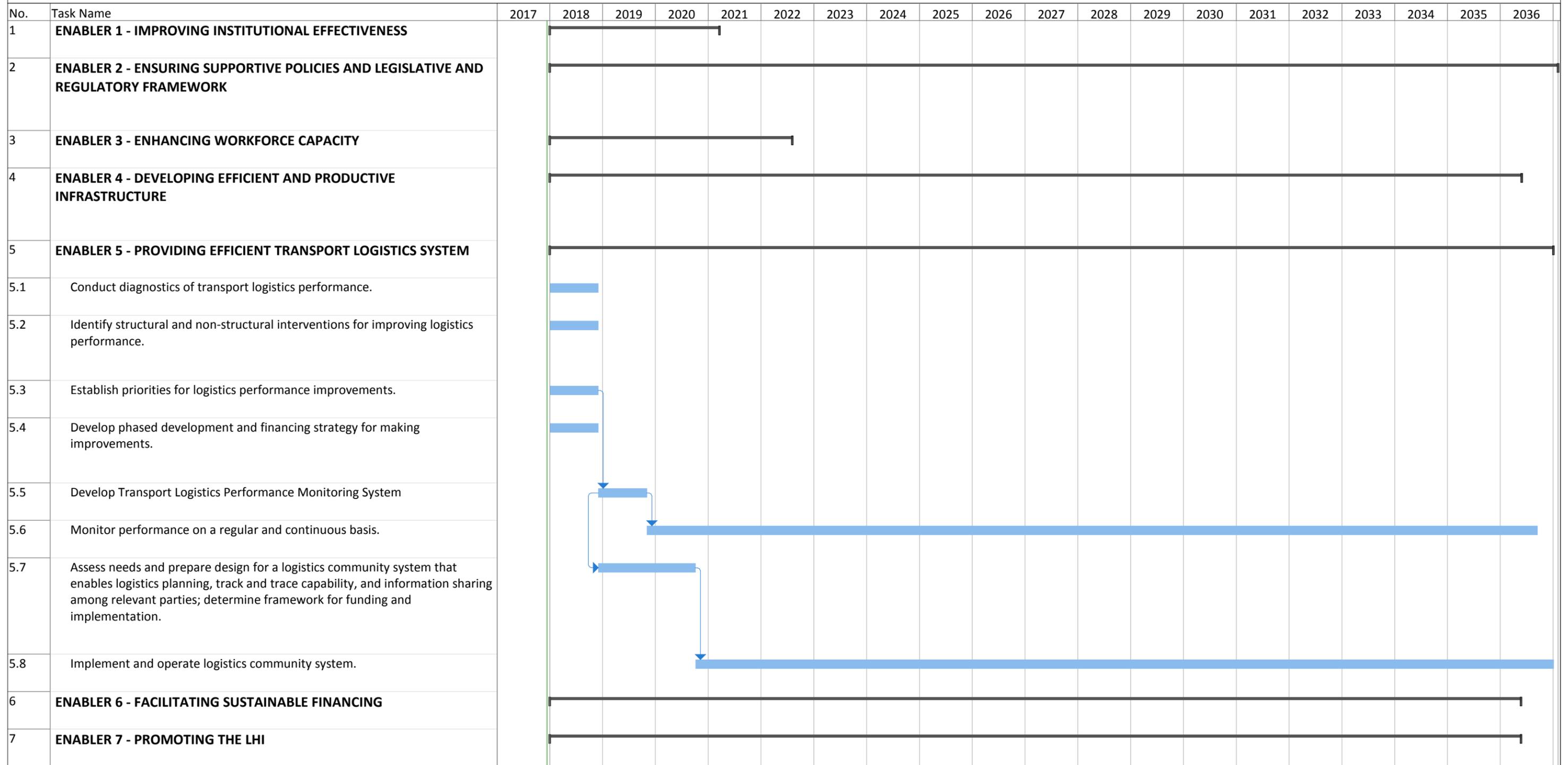


JLHI Development Strategy.mpp
Date: Wed 12/13/17

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
Split		External Tasks		Inactive Summary		Manual Summary		Progress	
Milestone		External Milestone		Manual Task		Start-only		Manual Progress	
Summary		Inactive Task		Duration-only		Finish-only			

Jamaica Logistics Hub Initiative (JLHI) - Action Plan for Implementation of Development Strategy

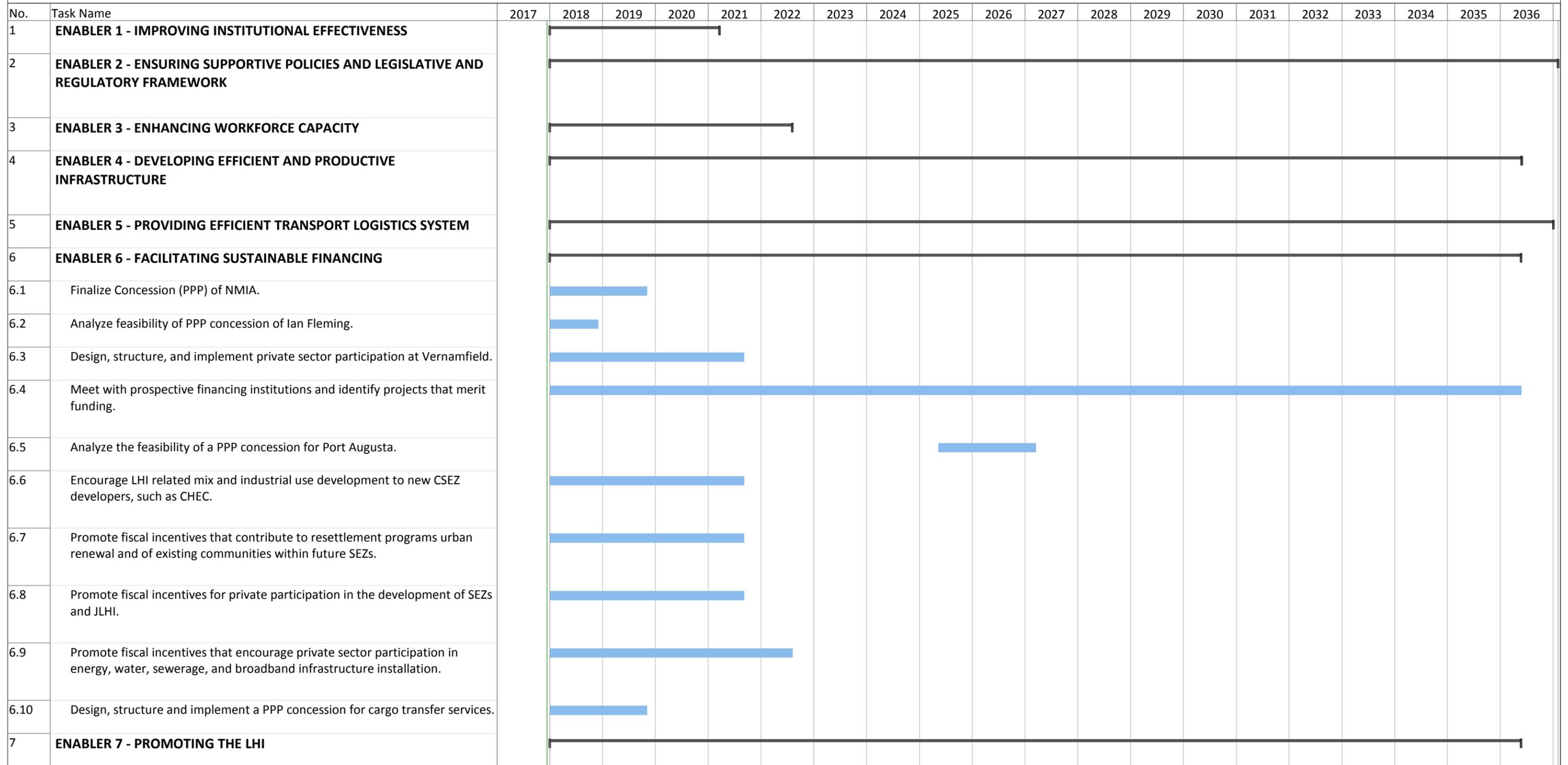
Enabler 5 - Providing Efficient Transport Logistics System



JLHI Development Strategy.mpp Date: Wed 12/13/17	Task ■ Project Summary Split ⋯ External Tasks Milestone ◆ External Milestone Summary — Inactive Task	— Inactive Milestone ■ Inactive Summary ◆ Manual Task — Duration-only	◇ Manual Summary Rollup — Manual Summary ■ Start-only ■ Finish-only	— Deadline — Progress — Manual Progress	↓ — —
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Jamaica Logistics Hub Initiative (JLHI) - Action Plan for Implementation of Development Strategy

Enabler 6 - Facilitating Sustainable Financing



JLHI Development Strategy.mpp Date: Wed 12/13/17	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only		Manual Progress	
	Summary		Inactive Task		Duration-only		Finish-only			

Jamaica Logistics Hub Initiative (JLHI) - Action Plan for Implementation of Development Strategy

Enabler 7 - Promoting the LHI

No.	Task Name	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	
1	ENABLER 1 - IMPROVING INSTITUTIONAL EFFECTIVENESS		[Timeline bar from 2018 to 2021]																			
2	ENABLER 2 - ENSURING SUPPORTIVE POLICIES AND LEGISLATIVE AND REGULATORY FRAMEWORK		[Timeline bar from 2018 to 2036]																			
3	ENABLER 3 - ENHANCING WORKFORCE CAPACITY		[Timeline bar from 2018 to 2022]																			
4	ENABLER 4 - DEVELOPING EFFICIENT AND PRODUCTIVE INFRASTRUCTURE		[Timeline bar from 2018 to 2036]																			
5	ENABLER 5 - PROVIDING EFFICIENT TRANSPORT LOGISTICS SYSTEM		[Timeline bar from 2018 to 2036]																			
6	ENABLER 6 - FACILITATING SUSTAINABLE FINANCING		[Timeline bar from 2018 to 2036]																			
7	ENABLER 7 - PROMOTING THE LHI		[Timeline bar from 2018 to 2036]																			
7.1	Identify and promote key business environments and foreign direct investor determinants that will enable Jamaica to achieve its vision.		[Blue bar from 2018 to 2019]																			
7.2	Initiate a marketing campaign to identify target anchor companies that offer global/regional supply chain management, transport and logistics, and integrated multimodal IT platform.		[Blue bar from 2018 to 2019]																			
7.3	Seek out major transport and logistics conference event management companies that will partner with the LHI Authority and other local sponsors to organise a Global or Regional Transport and Logistics Conference. Attract leading 3PL companies, manufacturing		[Blue bar from 2018 to 2022]																			
7.4	Partner with educational and research institutions in Jamaica to identify industry, sector and sub-sector players to better understand the economic impact of targeted promotion strategies for successful logistics hub developments.		[Blue bar from 2018 to 2022]																			
7.5	Utilize Jamaica’s Foreign Service Offices (FSO) to target and engage potential investors overseas.		[Blue bar from 2018 to 2022]																			
7.6	Target five “anchor investors” with the ability to bring high level visibility to Jamaica should or more decide to establish operations in the hub.		[Blue bar from 2018 to 2021]																			

JLHI Development Strategy.mpp Date: Wed 12/13/17	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only		Manual Progress	
	Summary		Inactive Task		Duration-only		Finish-only			

Jamaica Logistics Hub Initiative (JLHI) - Action Plan for Implementation of Development Strategy

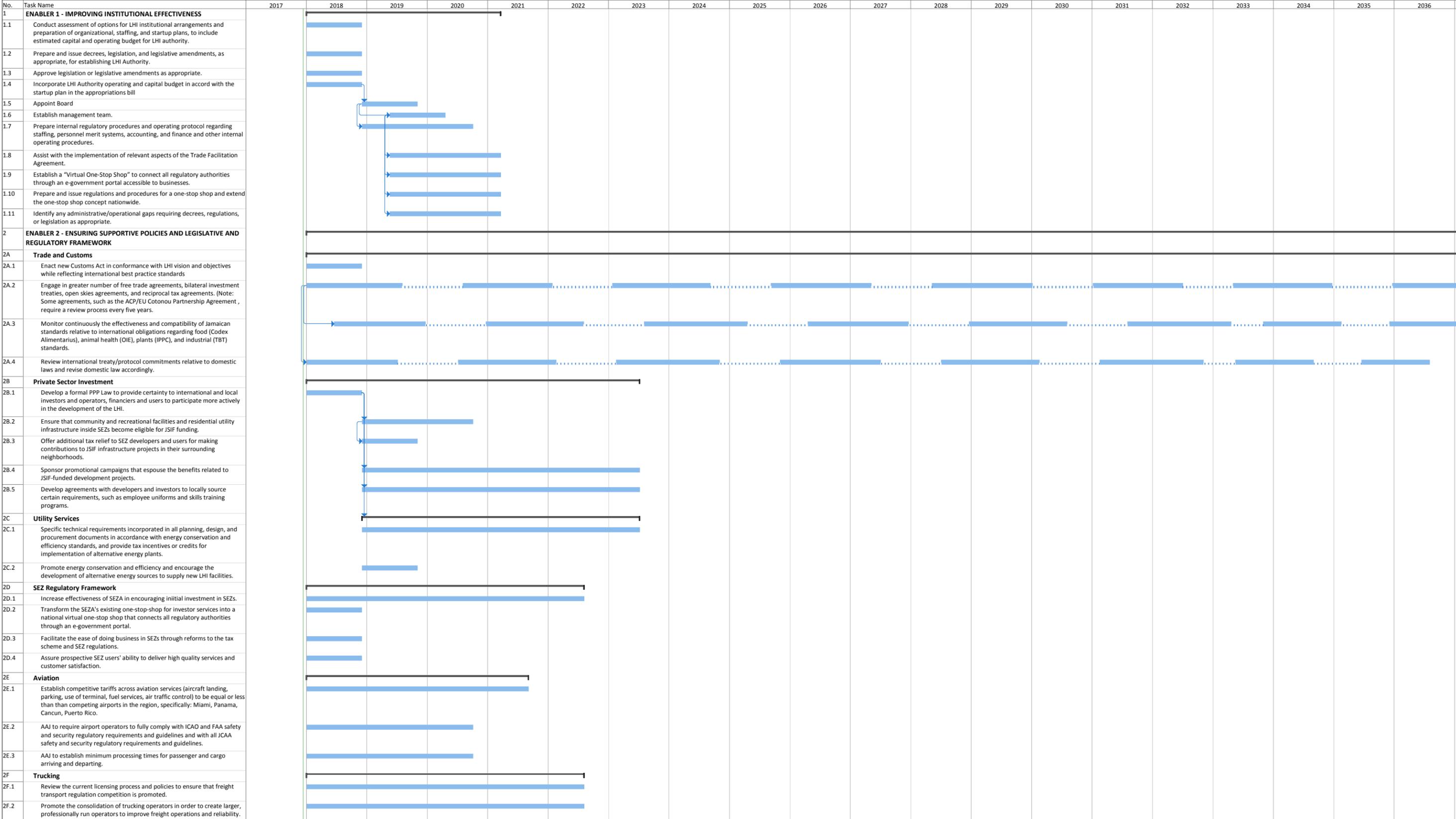
Enabler 7 - Promoting the LHI

No.	Task Name	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	
7.7	Work to increase investment from those multinational corporations which are already operating in Jamaica.		[Blue bar]																			
7.8	Conduct annual LHI Developers Conference targeting global developers, investors, and financial institutions.		[Blue bar]																			
7.9	Conduct annual road show to promote investment/development opportunities			[Blue bar]																		
7.10	Promote and incentivize publication of articles written by opinion leaders in the ports industry and published in magazines, journals and electronic media that highlight the value of the LHI.		[Blue bar]																			
7.11	Develop joint-marketing materials and a public relations campaign to promote the LHI globally.		[Blue bar]																			
7.12	Target and attract a globally recognized bunker company that will meet/exceed the needs of shipping lines (quality & quantity supplies) as part of the LHI marketing and promotion strategy.		[Blue bar]																			
7.13	Target and attract a reputable Dry Dock Company as part of the LHI marketing and promotion strategy.		[Blue bar]																			
7.14	Target and attract international ship chandlery service as part of the LHI marketing and promotion strategy.		[Blue bar]																			
7.15	Promote new routes and increased services and air connectivity through participation in air and air cargo shows and conventions organized by IATA, ICAO, AirCargoWorld, among others.		[Blue bar]																			
7.16	Promote cargo/cold storage facilities on airport sites, specifically at SIA.		[Blue bar]																			
7.17	Implement a targeted publicity campaign in international markets through social media.		[Blue bar]																			
7.18	Promote annual awards ceremonies.		[Blue bar]																			

JLHI Development Strategy.mpp Date: Wed 12/13/17	Task	[Blue bar]	Project Summary	[Grey bar]	Inactive Milestone	◇	Manual Summary Rollup	[Teal bar]	Deadline	↓
	Split	[Dotted bar]	External Tasks	[Grey bar]	Inactive Summary	[Grey bar]	Manual Summary	[Black bar]	Progress	[Blue bar]
	Milestone	◇	External Milestone	◇	Manual Task	[Teal bar]	Start-only	[C bar]	Manual Progress	[Teal bar]
	Summary	[Black bar]	Inactive Task	[White bar]	Duration-only	[Teal bar]	Finish-only	[J bar]		

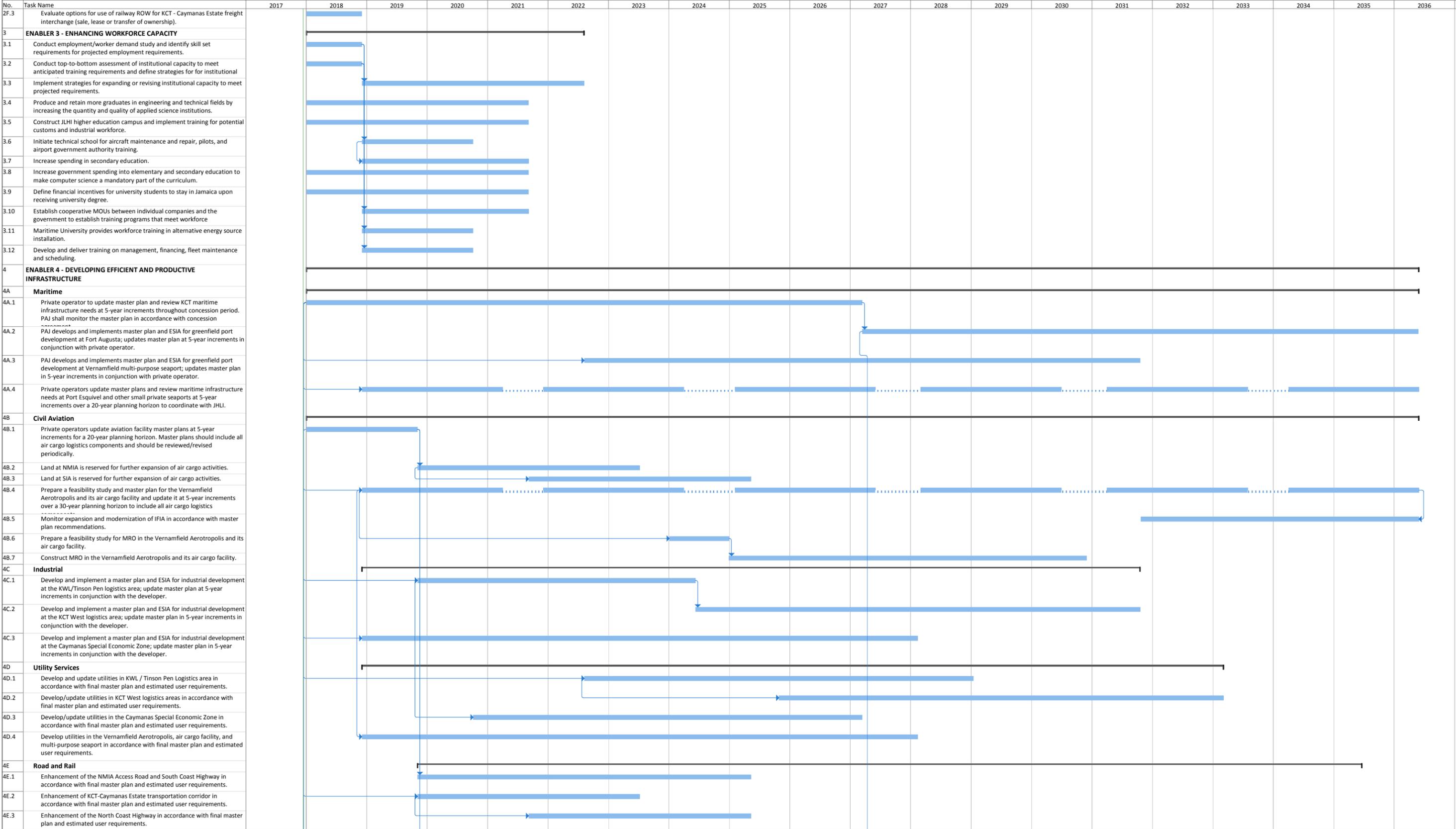
Jamaica Logistics Hub Initiative (JLHI)

Action Plan for Implementation of Development Strategy



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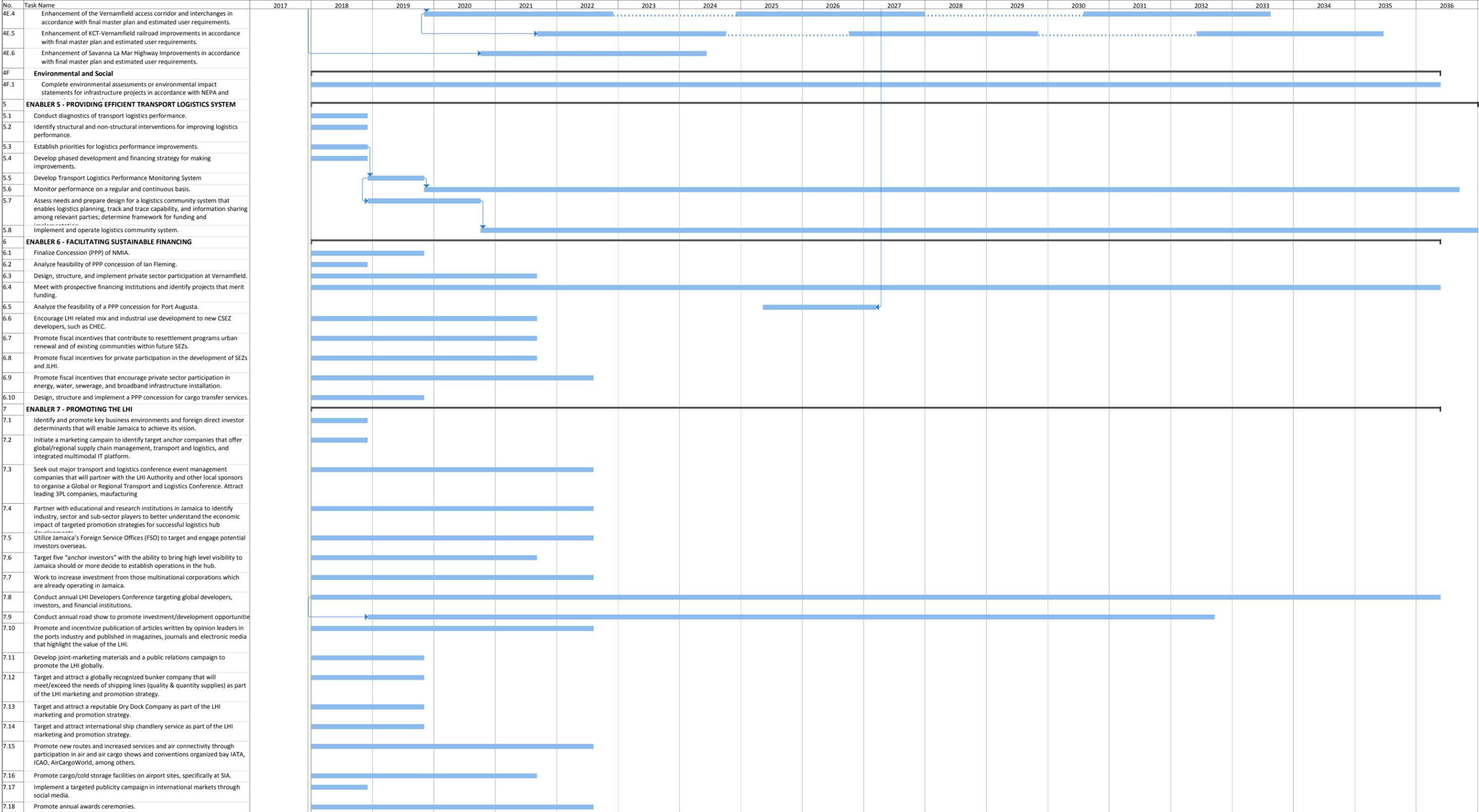


JLHI Development Strategy.mpp Task Milestone Project Summary External Milestone Inactive Milestone Manual Task Manual Summary Rollup Start-only Deadline Manual Progress

Date: Wed 12/13/17 Split Summary External Tasks Inactive Task Inactive Summary Duration-only Manual Summary Finish-only Progress

Jamaica Logistics Hub Initiative (JLHI)

Action Plan for Implementation of Development Strategy



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Appendix I.A: Project Terms of Reference

Section 7. Terms of Reference

JAMAICA

FOUNDATIONS FOR COMPETITIVENESS AND GROWTH PROJECT

Loan No.:8408-JM

Assignment Title: JAMAICA LOGISTICS HUB INITIATIVE (LHI) MARKET ANALYSIS AND MASTER PLAN

Reference No. (as per Procurement Plan): FCG/CON/011

I. Background

Strategic Location. Jamaica is strategically positioned to benefit from the expansion of the Panama Canal, which is set to double its capacity by 2016. Jamaica is situated along the main shipping lane from the Panama Canal to the Caribbean and North American markets. This allows Jamaica to potentially function as a global logistics hub serving important ports and airports in South America, along the Gulf of Mexico, and East Coast of North America.

Jamaica's unique location presents the following opportunities:

- Location of group logistics headquarters and major distribution centers for major transnational corporations (TNCs);
- Location of assembly (manufacturing) points for TNCs and their suppliers transporting goods along the major trade corridors within the western hemisphere;
- Provision of logistics services to facilitate efficient processing of increased volumes;
- Development of center(s) of excellence in logistics expertise.

Whether or not Jamaica can be a beneficiary of the Panama Canal expansion hinges on numerous factors, including increased trend of shipping lines to use the Suez Canal for shipments bound from Asia to the US East Coast, quality of port infrastructure in the Kingston Container Terminal, depth of the harbor to accommodate larger vessels, and competition from other regional ports vying for post-Panama transshipment business, including Cartagena (Colombia), Colón (Panama), Limón Moín (Costa Rica), Port of Spain (Trinidad and Tobago), Mariel (Cuba), Caucedo (Dominican Republic), Freeport (Bahamas), and others.

Logistics Hub Initiative. In order to enhance economic growth, the government of Jamaica (GoJ) is developing a "Logistics Hub Initiative" (LHI), a strategy for private sector-led growth, under which Jamaica will capitalize on its potential to become a transshipment and logistics hub. This initiative is spearheaded by the Ministry of Industry, Investment, and Commerce (MIIC), and involves development or expansion of several key infrastructure assets, including the port, airport, and ground transportation sectors. It also includes development of several special economic zones (SEZs), as a focus for private investment in the logistics industry and other economic sectors in Jamaica.

The scale and scope of the LHI will include—but not be limited to—rehabilitation of existing infrastructure, development of new large-scale infrastructure, industrial estates and SEZs, connecting road, rail, air transportation networks, upgrades of utilities such as power, water, and waste water treatment, and enhancement of digital communications infrastructure along with associated commercial and residential facilities in Kingston and elsewhere in Jamaica.

PPP Policy. It is proposed that many of the Logistics Hub Initiative developments will be implemented under Jamaica’s new Public-Private Partnership (PPP) policy. The PPP and Privatization Unit of the Development Bank of Jamaica (DBJ) coordinates the PPP program.

Strategic Approach. The GOJ is adopting a multi-pronged approach to implementing the Logistics Hub Initiative. The first strategy involves several billion dollars of private investment in logistics infrastructure and other related developments to capitalize on Jamaica’s geostrategic location along the main sea and air trade corridors of the Americas, and Kingston’s deep natural harbor. Leading global firms have already bid on some of the planned projects and other projects are in the pipeline. Secondly, the GOJ is establishing a new special economic zone (SEZ) regime to attract large globally integrated enterprises to benefit from Jamaica’s competitive position in the global logistics chain. Thirdly, the GOJ is facilitating the participation of small and medium-sized firms in export value chains through collaborations with globally integrated enterprises in various industry value chains. Finally, Jamaica also intends to develop international financial services which will complement the LHI.

The GOJ intends to provide the necessary catalysts to facilitate the growth of value chains necessary to the functioning of a globally competitive logistics hub. This includes enhancements of soft infrastructure such as universities, research institutions, and knowledge-intensive business services. This approach will result in a concentration of interconnected firms that are linked by various complementarities and externalities and development of the human capital necessary to ensure the success of the LHI. These mechanisms will enable firms to operate in an environment that allows them to achieve higher levels of efficiency and global competitiveness.

Market Analysis. For Jamaica to best benefit as a potential global logistics hub, it is necessary to rapidly and comprehensively understand how Jamaica is currently positioned as a location for different industry sectors key to a global logistics hub. A rigorous analysis is required to identify strengths, weaknesses, opportunities, and threats, and ascertain which improvements are required to transform Jamaica into a world-class logistics hub, and maximize a compelling value proposition to global and local investors. Such findings will help to guide and enrich the development of the Logistics Hub Initiative, and prioritize and optimize supporting programs and improvements.

Master Plan. In order to successfully build a global logistics hub, Jamaica requires a national logistics system development plan. This master plan will incorporate high-level land use planning to identify functional areas and land uses permitted within the designated Logistics Hub and surrounding areas. The configuration, sizing, and development phasing will be based on projected demand and the need to ensure logistics connectivity between production locations and transport facilities. Attention should be placed on locating logistics nodes to facilitate economic synergies and ensure compatibility with surrounding areas and available

resources. A national-level spatial plan is required, which addresses issues such as housing and infrastructure provision, and the interface with urban development.

The GoJ intends to apply a portion of resources obtained from the World Bank to conduct a Market Analysis and develop a Master Plan for the development of the Logistics Hub Initiative.

II. Objectives

Jamaica's Ministry of Industry, Investment and Commerce wishes to engage a world-class consulting firm to prepare a Market Analysis and Master Plan for the establishment of Jamaica as a global logistics hub. The Master Plan must emphasize the development of special economic zones, industrial parks, logistics facilities, sea port, and airport infrastructure development.

The primary objectives of the LHI Market Analysis and Master Plan are to:

- Analyze recent trends in international trade and foreign direct investment in Jamaica and globally—particularly in countries that could potentially compete with Jamaica in attracting transshipment trade and investment;
- Determine best practices in the establishment of Logistics Hubs;
- Identify market demand for logistics services as a result of the Panama Canal expansion;
- Identify sectors and activities with most potential for the Jamaica Logistics Hub;
- Develop Jamaica Logistics Hub value proposition and marketing messages;
- Act as a developmental roadmap for GOJ ministries, departments, and agencies, so that all are aligned with a single vision and direction that allows a comprehensive strategy for orderly and coordinated development of the LHI;
- Balance conflicting land use needs, such as industry, commerce, housing, parks, wetlands, forest reserves, recreation, culture, entertainment, transport, security, and community facilities given the constraints of Jamaica's limited land area;
- Consolidate the disparate development plans for key infrastructure such as ports, airports, SEZs, road, rail, power, water, waste water treatment, and telecommunications;
- Inform the integrated resource plan for the provision of utilities such as water, electricity, waste water treatment, and telecommunications;
- Encourage a diverse array of subsequent investment proposals for public and private projects in land, air, and marine infrastructure development, and power, water, waste water treatment, and telecommunications infrastructure;
- Facilitate the development of SEZs catering to enterprises that can warehouse, exhibit, pack, unpack, design, assemble, manufacture, repair, package, label, and transship all kinds of products, raw materials, components, packaging materials, containers and other commercial items for local consumption, exportation or re-exportation, and make recommendations on potential sites;
- Make recommendations on the development of hard and soft infrastructure to support the LHI, including upgrades to utilities, road networks, commercial facilities,

residential development, and institutions such as schools, hospitals, recreational facilities, and the like;

- Make recommendations on the types of jobs and human resource development that may be needed to ensure coherent development of the Logistics Hub.

These elements should be seen as components of an overall phased development strategy that requires coordinated planning and implementation.

III. Statement of Work

It is anticipated that a consulting firm will be hired to undertake this project, hereafter referred to as the “Consultant”.

The Consultant shall prepare a Market Analysis and Master Plan for the Jamaica Logistics Hub that addresses each of the eight tasks described in this Statement of Work. The Consultant shall make clear which personnel it is assigning to each task, as well as the specific methodologies, activities, and expected duration of each task.

When undertaking the Market Analysis and Master Plan, the Consultant shall remain cognizant of the following important factors, and their associated potential impacts on the Jamaica Logistics Hub Initiative. Previous studies and existing development plans should be referenced and reflected in the work of the Consultant:

- Disparate development plans for key infrastructure upgrades, including ports, airports, SEZs, road, rail, power, water, wastewater treatment, and telecommunications. Particularly, sea port and airport expansions and upgrades at the Kingston Container Terminal, Kingston Wharves, and Norman Manley International Airport, including any industrial zones planned adjacent to port facilities;
- Individual development plans for metropolitan areas and parishes surrounding the Logistics Hub;
- Plans by China Harbour Engineering Company (CHEC) to develop a port and associated industrial zones in the Portland Bight area;
- The SEZ Policy, and SEZ legal framework currently being drafted;
- The PPP Policy;
- The Feasibility Study for the Caymanas Special Economic Zone, conducted concurrently with the Logistics Hub Market Analysis and Master Plan;
- Plans by other countries in the Caribbean basin to position themselves as transshipment hubs;
- Precursor studies and industry analysis of industry clusters targeted for special economic zones.

The Consultant shall also review and reference previous studies that examined Jamaica’s competitiveness and potential to attract transshipment and logistics investments. The Consultant will also review and access international studies and sources of information that are relevant to the assignment. The GOJ will set up a Data Room to provide access of bidding firms to existing and current studies on the Logistics Hub Initiative and its various components.

The Consultant shall undertake the Jamaica Logistics Hub Market Analysis and Master Plan in two phases. Upon completion of Phase I, the Consultant shall submit a written report and oral presentation to the Ministry of Industry, Investment, and Trade (MIIC), and other important stakeholders determined by MIIC. Phase I (Tasks 1 through 5) of the study should be implemented within a period of four months, and Phase II (Tasks 6 through 8) should be implemented within a period of eight months. Upon completion of Phase II, the Consultant shall submit a final written report and final oral presentation to MIIC and other designated stakeholders.

PHASE I

Phase I of the project will provide the necessary situational and economic analyses to inform the Logistics Hub Master Plan in Phase II. The Consultant shall consider the geographical scope of the project to include the entire country of Jamaica, with a particular focus on areas key to creating a Logistics Hub. Phase I shall consist of a Market Analysis of Jamaica as a Logistics Hub. Deliverables shall include: a) a written report submitted to MIIC containing the findings of Phase I, including the following; and b) an oral presentation given to MIIC and other relevant stakeholders on the key findings of the Jamaica Logistics Hub Market Analysis. Individual task deliverables, as described below, shall each constitute a separate chapter of the written report.

The following tasks are expected to be completed as part of the Market Analysis:

TASK 1: Vision for the Jamaica Logistics Hub

The Consultant shall conduct meetings with the Ministry of Industry, Investment, and Commerce (MIIC) and other relevant stakeholders to agree upon a common vision for the Jamaica Logistics Hub. This will serve as a starting point for the Consultant, who will be tasked with recommending how to best make that vision feasible.

Task 1 Deliverable: A statement on the vision for the Jamaica Logistics Hub, as agreed upon with MIIC, and an agreed upon schedule of interim briefings to MIIC throughout the course of the study.

TASK 2: Analyze and Forecast Cargo Flows

The Consultant shall review surface and air cargo flows and market dynamics of Caribbean and international maritime and aviation cargo transportation. The Consultant shall evaluate the factors necessary for turning Jamaica into a regional transshipment and logistics hub. The analysis should draw upon market studies already completed by the government of Jamaica, as well as the Consultant's knowledge and original research conducted for this study. The transportation assessment shall include the following:

1. Analysis of sea and air cargo flows through the Caribbean, and from Europe and Asia to the Western Hemisphere;
2. Potential ways in which the expansion of the Panama Canal might trigger a shift in cargo shipment patterns in the Western Hemisphere, and the Caribbean in particular;
3. Analysis of potential regional competition from Dominican Republic, Cuba, Panama, Costa Rica, Colombia, Trinidad and Tobago, Bahamas, and others;

4. State of air, road, rail, and sea cargo transportation networks that serve the primary areas considered for the Logistics Hub, namely the Kingston Container Terminal, Kingston Wharves, Norman Manley International Airport, Goat Island/Portland Bight areas, and Vernamfield;
5. Assessment of Customs performance as it relates to cargo shipments and potential logistics and product distribution activities in Jamaica;
6. Analyze bottlenecks to multi-modal transport in Jamaica and connectivity between major production areas and ports;
7. Detailed traffic forecast for Jamaica that includes international cargo transport and supply chain management activities based on the expansion of the Panama Canal, addition of a Chinese-funded canal across Nicaragua, and other cargo transportation developments and trends. The forecast should include liquid and dry bulk freight, containerized cargo, air freight, cruise traffic, and associated and complementary logistics operations.
8. Recommendations for Jamaica to leverage itself as a transshipment hub.

Task 2 Deliverable: A transportation assessment that includes: a) cargo flows and shipment patterns—current and potential new; b) state of Jamaican cargo transportation networks and systems that serve proposed Logistics Hub areas; c) detailed cargo traffic forecast for Jamaica; and d) recommendations for improving transportation networks for the benefit of the Logistics Hub and to best position Jamaica as a regional logistics hub.

Task 3: Review and Assess Existing and Pipeline Projects

The Consultant shall aggregate and analyze the strategic development plans of the range of government ministries, departments and agencies and private sector entities that impact the Jamaica Logistics Hub. The Consultant shall evaluate existing projects to identify unnecessary components, key missing components, and critical success factors.

1. The Consultant shall review existing infrastructure projects already underway or in the pipeline, which contribute to the development of a Logistics Hub. These include, but are not limited to:
 - a. Dredging of the shipping channel in Kingston Harbour and other harbors;
 - b. Private concession of the Kingston Container Terminal (KCT);
 - c. Private concession of the Norman Manley International Airport;
 - d. Development of the Total Logistics Facility at Kingston Wharves terminal;
 - e. Feasibility study for the development of the Caymanas Special Economic Zone (CSEZ), and other proposed SEZs throughout Jamaica;
 - f. Development of ship repair and ship recycling facilities;
 - g. The development of a liquid bulk port in Cow Bay and other sites;
 - h. The expansion of Port Esquivel and other out ports;
 - i. Re-development of Vernamfield Aerodrome as a long-haul passenger and cargo facility, sea-air cargo hub, aviation training school, and maintenance repair and overhaul facility;
 - j. Expansion of Jamaica's existing international airports;
 - k. The North-South Highway, Highway 2000, and planned upgrades to main roads and parish council roads in and around the vicinity of the primary Logistics Hub locations;

1. Development of a port and industrial zones by China Harbour at Goat Island and Portland Bight Protected Area;
 - m. Planned upgrades to electricity, water and wastewater treatment, rail and telecommunications networks.
2. The Consultant shall assess Jamaica’s existing logistics infrastructure relevant to the Logistics Hub, including but not limited to: existing maritime, air, free zones, road, rail, utilities, and digital infrastructure.

Task 3 Deliverable: Review of projects, and analysis of what additional projects are required by the Logistics Hub to meet demand. Assessment of adequacy of supporting infrastructure and utilities.

Task 4: Benchmark Transshipment and Logistics Competitiveness

The Consultant shall analyze the competitive position of Jamaica as a cargo transshipment and logistics hub. The benchmarked criteria should mirror the requirements corporate investors in the logistics, manufacturing, and service sectors use to select new corporate locations. These include, but are not limited to:

1. Costs of air and surface cargo transportation, and shipment times;
2. Port fees and efficiency of port operations;
3. Size and quality of port facilities—number of berths, cranes, size of container yard, etc.
4. Shipping lines that call at the port, and frequency of calls;
5. Capacity of port berths;
6. Airlines (passenger and cargo) with regularly scheduled flights to airport;
7. Capacity of airport facilities—gates, runway lengths, etc.;
8. Customs fees, and efficiency of customs;
9. Availability and cost (i.e. lease price) of serviced land in logistics zones adjacent to port;
10. Availability and cost (i.e. lease price) serviced industrial land outside the primary port area;
11. Costs of utilities—water, power, waste water treatment, telecommunications, and reliability of utilities;
12. Price of labor in various employment categories—unskilled, skilled, technical, managerial;
13. Cost and quality of living, including safety and access to social infrastructure—international schools, hospitals, recreational areas, etc;
14. Business incentives—fiscal and others;
15. Legislation and regulations that impact on efficiency and cost of cargo movements for entry and exit at ports.

The Consultant shall benchmark the greater Kingston area against the following locations (and others recommended by MIIC or the Consultant), which are competing with Jamaica to attract transshipment and logistics investments:

1. Cartagena (Colombia);

2. Colón (Panama);
3. Limón Moín (Costa Rica);
4. Port of Spain (Trinidad and Tobago);
5. Mariel (Cuba);
6. Caucedo (Dominican Republic);
7. Freeport (Bahamas),

Task 4 Deliverable: An analysis that compares Jamaica to other countries that are competing for Caribbean and global transshipment and logistics business, based on regional and global best practices for logistics hub operations. Based on this analysis define the Jamaica Logistics Hub's competitive position in the future global transshipment and logistics, and the types of policies, infrastructure, and facilities that the country requires to be competitive in attracting transshipment and logistics activities.

Task 5: Analyze Industries

The Consultant shall conduct an industry analysis of industry sectors that could benefit from the advantages of locating in Jamaica's Logistics Hub. This analysis should take into account the Competitiveness Benchmarking exercise (Task 4) and other business environment competitiveness indicators, considering the trade and investment flows to other locations that are also competing for global transshipment and logistics investments, namely Panama, Colombia, Dominican Republic, Cuba, Bahamas, Costa Rica, and Trinidad and Tobago. The Consultant shall also conduct a survey of companies in various industries – locally and internationally – in order to understand investment needs, and understand the typical profile of firms in each industry—employment, land and facility requirements, utility usage. The goal is to identify the most promising sectors, sub-sectors and business functions as potential targets for Jamaica's Global Logistics Hub. This should entail the following:

1. Conduct investment trend analysis, highlighting overall volume of investment in a range of industry sectors—manufacturing, logistics, ICT, etc.—in Jamaica and competing locations over a span of five or more years;
2. Conduct trade flow analysis, highlighting import and export volumes in a range of industry sectors in Jamaica and competing locations over a span of five or more;
3. Consult with local and international investors in Jamaica on current sector strengths, weaknesses, opportunities, threats, and need for improvements, particularly with regard to logistics and transshipment-related activities;
4. Analyze the existing policy, legislative, and regulatory frameworks, including labor market policies and human resources;
5. Identify industry sectors and sub-sectors with the most potential for targeting to the Jamaica Logistics Hub. Include sectors that Jamaica currently lacks, but must promote in order to have a successful Logistics Hub;
6. Create a demand forecast for the number of companies related to logistics and transshipment likely to locate in the Logistics Hub areas over a period of 15 years. The forecast shall include number and types of firms, and associated land, facilities, utilities, and employment requirements. Develop at least two different demand forecast scenarios, given the level of uncertainty on how the market will develop.
7. Make recommendations for improving the competitiveness of Jamaica Logistics Hub in target sectors, including how best to ensure industry cluster and value chain

development, achieving benefits through economies of scale, business-to-business linkages, and technology transfer;

8. Specify the value proposition of the Jamaica Logistics Hub to potential investors and develop marketing recommendations.

Task 5 Deliverables: Identify the industry sectors with most potential, which should be targeted for locating within the Logistics Hub areas. Profiles of typical firms in each target sector to show number of employees, land and built space requirements, utility requirements, etc. Demand forecast for logistics and transshipment-related activities in the Logistics Hub. Recommendations for improving the competitiveness of the Logistics Hub.

PHASE II

Phase II shall constitute the second half of the study, and consist of a Master Plan and 15-year development plan for the Jamaica Logistics Hub. It will draw heavily upon the analysis in Phase I of the study. The geographical scope of the analysis in Phase II shall include the primary Logistics Hub areas throughout Jamaica identified in Phase I of the study.

Deliverables shall include: a) a written draft report submitted to the Logistics Task Force of MIIC containing Phases I and II of the study; b) an oral presentation given to MIIC and other relevant stakeholders on the Master Plan for the Jamaica Logistics Hub; c) a final report encompassing Phases I and II, based on comments received from MIIC and other stakeholders; and d) an Executive Summary of the entire study.

Task 6: Create Master Plan for the Jamaica Logistics Hub

The Master Plan will focus development in the areas of greatest importance to the Logistics Hub throughout Jamaica. It should take into account the planned expansions of ports and airports, and planned development of SEZs to help spur logistics, manufacturing, and service industry clusters and value chains. The Master Plan should proceed from a vision of future possibilities for the Logistics Hub, establish the overall character, extent, and location of various land uses, and encourage construction of various types throughout the identified Logistics Hub areas.

The Master Plan should include sustainable and “green” solutions wherever possible and feasible, and the Consultant shall make specific note of these. This includes, but is not limited to energy efficiency, green building guidelines, efficient uses of water and secondary uses of waste water, etc.

The Master Plan should include the following elements:

1. A value proposition for the Logistics Hub Initiative, based on the analysis conducted in Phase I of the study, and in line with relevant issues and stated goals and visions of MIIC and other primary stakeholders;
2. Land use plan(s) that cover the primary areas that constitute the Jamaica Logistics Hub. The consultant should dedicate specific areas to port and airport operations, logistics, industrial, services, institutional, residential (including relocation), and primary and secondary roadways. The Land Use Plan should recognize relevant development planning legislation such as the Town and Country Planning Act and the

Local Improvements Act, and integrate existing Parish Development Plans and Orders as well as the objectives of city and parish development policies and plan to maximize harmony between the Logistics Hub developments and fenceline communities.

3. Guidelines on rehabilitating brownfield spaces—existing industrial areas, airports, ports, residential areas—to develop or incorporate new logistics zones, new industrial zones, new or expanded ports and airports, and other uses deemed relevant by the Consultant. The study should also provide recommended measures to ensure the best utilization of existing facilities.
4. Recommendations for integrating existing and planned infrastructure projects into the proposed Land Use Plan, and recommended alterations to those existing plans;
5. A Development Phasing Plan detailing how the Logistics Hub should be developed over time.

Task 6 Deliverables: The Master Plan shall include a value proposition, land use plan(s), development phasing plan, and guidelines for brownfield spaces and for integrating existing projects and plans into the Logistics Hub Master Plan. A set of infrastructure drawings and land use and phasing maps shall also be included. Concept drawings should be produced at a size that can be easily reduced and included in the final report.

TASK 7: Gap Analysis

The Consultant shall conduct a gap analysis to describe the infrastructure and planning that will be required by the Logistics Hub as laid out in the Land Use Plan in Task 6, and identify any planning and infrastructure gaps. This shall include:

1. Existing zoning ordinances and planning controls that could impede Logistics Hub developments;
2. Ways in which the policy, legislative and regulatory framework varies from that which would be required to support the Logistics Hub;
3. Maritime infrastructure;
4. Aviation infrastructure;
5. Industrial infrastructure, including that appropriate for logistics, manufacturing, services, and other industries identified in Phase I of the study;
6. Utility infrastructure serving the primary Logistics Hub areas—power, water, waste water treatment, telecommunications—appropriate for industries identified in Phase I of the study;
7. Road and rail infrastructure—including widening and rerouting of roadways—necessary for developing the Logistics Hub as per the Land Use Plan in Task 6;
8. Commercial and social infrastructure—housing, educational and training institutions, recreational facilities, etc.—required to support the enhanced economic activity of the Logistics Hub;
9. Any other areas the Consultant determines to be relevant.

Task 7 Deliverables: A gap analysis that examines the above points, and identifies: a) infrastructure and planning requirements of the Logistics Hub as envisioned in the Land Use Plan in Task 6; b) government infrastructure enhancements currently underway or in the pipeline that help meet the Logistics Hub requirements; and c) infrastructure and legislative

enhancements that are currently not planned by the GOJ, but which are necessary for the Logistics Hub.

TASK 8: Prepare Logistics Hub Development Strategy

The Consultant shall prepare a Development Strategy that includes a phased roll-out of the Jamaica Logistics Hub Initiative. The Development Strategy should include:

1. Recommendations and criteria to make the Logistics Hub viable from business, legal, institutional, organizational, environmental, and financial perspectives;
2. Specification of various nodal projects based on the Master Plan, which can be separately tendered for development by the private sector, or through a PPP;
3. Project-specific action plans, including strategies for packaging the individual Logistics Hub projects for private investment and/or PPP, and full-scale implementation;
4. Recommendations for short, medium, and long-term strategies to aid in structuring the deals and creating bankable projects within the Logistics Hub, including potential sources of financing;
5. Recommended infrastructure upgrades required for each identified Logistics Hub project, and estimated costs to the GOJ for such upgrades;
6. Identify environmental and social assessment needs, and recommend any necessary future assessments;
7. Detailed implementation timelines and critical path the GOJ must take to ensure development of the necessary projects to make the Logistics Hub a success, with clear allocation of responsibilities within the GOJ for implementation of each action and project;
8. Create a market outreach program to identify best-in-class investors for the various projects identified for the Logistics Hub. Recommend means of engagement for private sector partners to develop the various components of the Logistics Hub.

Task 8 Deliverables: A Logistics Hub Development Strategy that contains the above elements.

IV. Stakeholder Engagement

The Consultant shall engage in monthly briefings with the Logistics Task Force of MIIC throughout Phases I and II of the project. The Consultant shall also adhere to the following:

Stakeholder Engagement	Timing
Agree on Common Vision for Logistics Hub	Task 1, beginning of project
Brief oral updates between Consultant and Logistics Task Force of MIIC	Monthly
Oral presentation of Phase I results	4 months after project start-up
Oral presentation of key findings and feedback from stakeholders	12 months after project start-up

V. Schedule of Deliverables

The Consultant shall prepare deliverables according to the following suggested schedule. The Logistics Task Force of MIIC shall provide timely feedback to the Consultant within two weeks of submission of each deliverable.

Deliverables	Timing
Inception Report	One month after start-up
Oral presentation of Phase I results	4 months after start-up
Draft Phase I report	4 months after start-up
The Master Plan, including infrastructure drawings and land use and phasing maps (Task 6 Deliverable)	To be determined
Oral presentation of key findings and recommendations from feasibility study	12 months after start-up
Draft report of Phase I and II	12 months after start-up
Executive Summary of Phase I and II	12 months after start-up
Master plan drawings, infrastructure upgrade cost estimates	12 months after start-up
Final Master Plan and Final Report, based on feedback from stakeholders, including all maps and drawings	14 months after start-up

All reports are to be submitted in electronic format to the Chair of the Logistics Task Force of MIIC. In addition, 10 hard copies of each final Report/Document are to be submitted to the Chair of the Logistics Task Force of MIIC.

VI. Consultant Requirements

The Consultant is expected to meet the following requirements:

1. Significant global experience working on logistics, industrial infrastructure, and transportation infrastructure;
2. Experience in urban and industrial planning and civil engineering;
3. Global experience advising companies on location strategies and decisions, and proven ability of leveraging insight gained from this experience for advising governments on economic development and inward investment strategies;
4. Significant global experience working with governments and economic development agencies on competitiveness and economic development strategies, and ability to draw upon international best practices;
5. Ability to start work quickly based on uniquely robust and customizable methodology and toolset;
6. Local Jamaican team members with working knowledge of the Jamaica Logistics Hub Initiative.

VII. Team Composition

The Consultant shall form a team of experts that includes, at minimum, the following Key Experts. The Consultant can add other positions as necessary to undertake the terms of reference of the study including engineering support staff member(s) such as CAD drafter(s), surveyor(s), etc. The Team Leader will manage the team and act as the primary liaison

between the consulting team and GOJ. The Consultant is encouraged to partner with Jamaican individual consultant(s) and/or firm(s).

Key Expert 1: Economist Masters Degree in economics, business, or similar with at least 10 years relevant experience

Key Expert 2: Urban Planner: Masters Degree in Urban Planning or related discipline with at least 10 years relevant experience

Key Expert 3: Civil/Structural/Transportation Engineer: Degree in civil/structural/engineering or equivalent with at least 5 years relevant experience

VIII. Project Coordination

The Consultant will report directly to the Chair of the Logistics Task Force of the Ministry of Industry, Investment, and Commerce (MIIC). The Planning Institute of Jamaica will provide oversight and administration of the contract. The Consultant shall also work closely with the following core stakeholders:

- The Ministry of Transport, Works and Housing (MTWH), which has portfolio and policy responsibility for the transport sector;
- Planning Institute of Jamaica (PIOJ), an agency of the Ministry of Finance and Planning responsible for long-term development planning in Jamaica;
- The Port Authority of Jamaica (PAJ), which is overseeing the public divestment of the Kingston Container Terminal to a private concessionaire;
- Development Bank of Jamaica (DBJ), which is in charge of public-private partnerships and divestments;
- Jamaica Promotions Corporation (JAMPRO), an agency of MIIC, which promotes business opportunities in export and investment to the local and international private sector.

Finally, the Consultant will also work closely with all other public and private sector stakeholders, as appropriate, in undertaking the work of this project.

IX. Client's Input and Counterpart Personnel

- The GOJ will set up a Data Room to provide access of bidding firms to existing and current studies on the Logistics Hub Initiative and its various components.

Appendix I.2: Analysis and Forecast of Cargo Flows Appendix

Appendix I.2

Cargo and Volume Data for Global Trade Flows

This appendix presents additional information on type of cargo and volumes for global trade flows described in Chapter I.2.

Methodology and Sources

Two different sources of information were accessed for the trade flow analysis and demand forecast. For all flows involving the United States, we used USA Trade Online¹, a unit under the US Census Bureau, which provides port- and airport-specific customs information for imports and exports. This database includes information on volume and value of goods at the HS Level 2 and HS Level 4.² The European Union Air Data were gathered from the Eurostat database online.³ For supplemental information, the World Integrated Trade Solution (WITS) tool⁴, hosted by the World Bank, was also consulted.

For all flows that did not involve the United States, the UN Comtrade⁵ database from the United Nations supplied data for imports and exports on a higher level, without details of specific ports. This database provides data only in terms of value at the HS Level 2. Therefore, we used discretion at the HS Level 2 level in an attempt to capture high volume but low value trade that may otherwise not appear in the top fifteen or so commodities. For example, jewelry would often be included in the top fifteen; however we know that is because the value is many times more than the volume quantity. In cases like these, we replaced jewelry with another high-ranking and more reasonable commodity more relevant to Jamaica's logistics arena, whether that be a light manufactured good or another item with value-added potential (unlike most jewelry or high value and low volume goods). Once we

¹ See www.usatrade.census.gov.

² HS Level 2 and HS Level 4 refer to the Harmonized System for classification of goods. The first two digits (HS-2) identify the chapter the goods are classified in, e.g. 09 = Coffee, Tea, Maté and Spices. The next two digits (HS-4) identify groupings within that chapter, e.g. 09.02 = Tea, whether or not flavored. The Harmonized System denotes products up to HS Level 6. Generally, the higher the level, the more detailed a product category.

³ Eurostat is the European Union's statistical center. Available at: www.ec.europa.eu/eurostat/data/database.

⁴ WITS is a software application developed by the World Bank that provides data on trade and tariffs. The database on which the tool relies is drawn from UN Comtrade, UNCTAD Trade Analysis Information System (TRAINS), WTO's Integrated Data Base (IDB), and the Global Preferential Trade Agreements Database. Available at: www.wits.worldbank.org/about_wits.html.

⁵ UN Comtrade is a database of trade statistics starting with historical information dating from 1962. Available at: www.comtrade.un.org.

were comfortable with the HS Level 2 selection while eliminating outliers that were of high value, low volume, and no potential for value-added, we used the HS Level 4 to compare trade volumes.

For each trade flow, we first identified the top countries trading with each other (by volume for US and by value for all others). For flows involving the US, we first analyzed the US as a whole to capture trade to all ports on the east and west coast. In order to focus on the cargo most relevant to Jamaica (cargo coming through the Panama Canal), we selected a sample of fifteen ports on the east coast and were able to separate this group's imports and exports. Then, we analyzed which commodities are coming from those countries to the east coast region and aggregated the top fifteen or twenty, excluding oil. After determining the top countries and commodities for each regional trade pattern, we sought more information about specific trade partners and the HS Level 4 commodity type, which is used in the analysis below.

We have focused primarily on volume measurement, with notes regarding high value commodities that Jamaica could consider for industry. The data collected were for the years 2013, 2014, and 2015, and where data were missing for one year, we used the 2014 data to represent the average. Venezuela has been excluded from Latin American export sections as 87% of its exports are crude oil. The Mid East has also been excluded for the reason that it primarily exports crude oil through the Suez Canal rather than the Panama Canal. The "east coast" selection of the United States includes the following ports: Baltimore, Boston, Buffalo, Charleston, Houston-Galveston, Miami, Mobile, New Orleans, New York City, Norfolk, Ogdensburg, Philadelphia, Portland, Providence, Savannah, Tampa, Wilmington.

Maritime Global Trade

US Import Origin Distribution

US Maritime Imports	Avg. Annual Volume (ton)	Distribution
Asia	227,864,488	34%
South/Central America	175,873,228	26%
North America	112,840,980	17%
Europe	110,028,407	16%
Africa	41,056,815	6%
Australia and Oceania	5,297,051	1%
Total	672,960,968	100%

Source: USA Trade Online. United States Census Bureau.

US Export Distribution by Destination

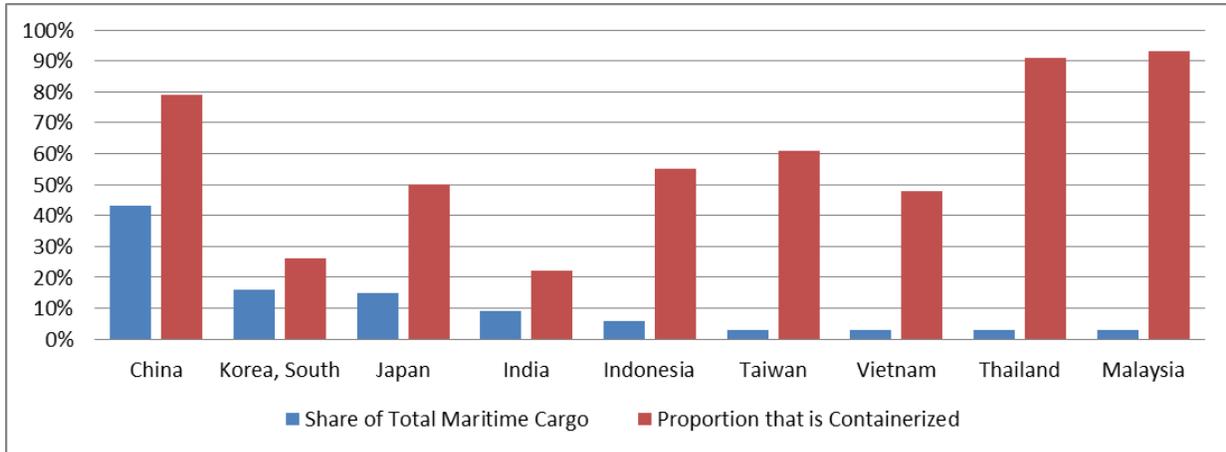
US Maritime Exports	Avg. Annual Volume (ton)	Distribution
Asia	231,920,929	39%
South/Central America	127,984,142	21%
North America	77,611,153	13%
Europe	129,204,530	22%
Africa	25,376,663	4%
Australia and Oceania	5,513,473	1%
Total	597,610,890	100%

Source: USA Trade Online. United States Census Bureau.

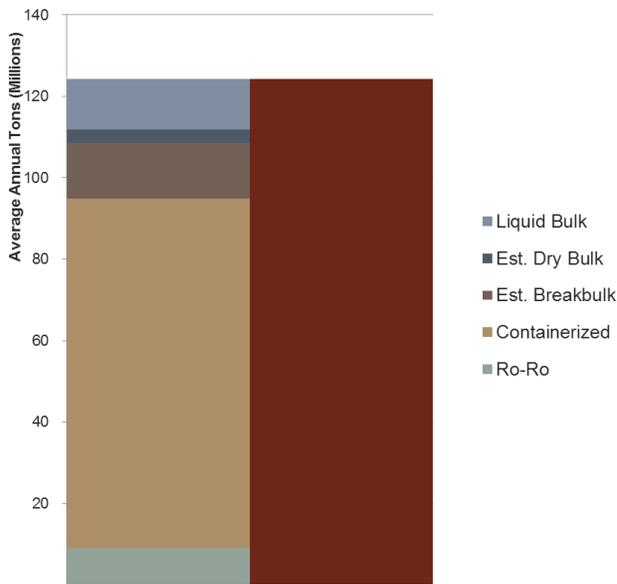
US Trade with Asia

Asia Exporting to the US (Imports)

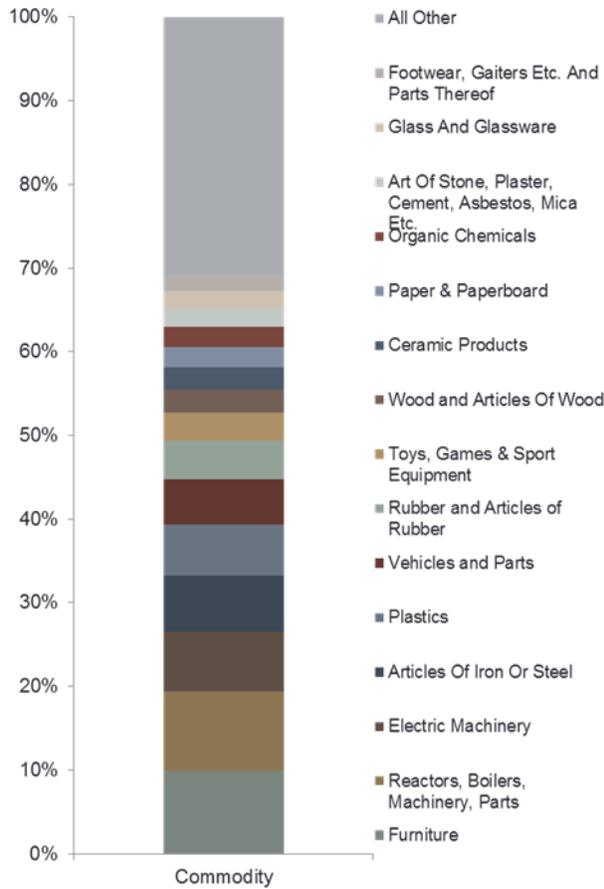
Asia to the East Coast of the US: Total and Containerized Cargo



Asia to the US: Types of Maritime Trade



Asia to the US: Top Containerized Commodities



Asia to the East Coast: Top Ports

Top Ports importing from Asia by Vessel Avg. tons/year Weight	Share of East Coast Imports from Asia
New York City, NY	11,723,825 24%
Houston-Galveston, TX	9,604,785 20%
Savannah, GA	6,662,542 14%
New Orleans, LA	6,314,873 13%

Source: UN COMTRADE

Asia to the East Coast of the US: Top Import Flows

Origin Country	Commodity	Port of Arrival	Share of East Coast Imports from Asia	Average Annual Volume (Tons)	Detailed Products (HS Level 4 breakdown)
South Korea	Articles of Iron or Steel	Houston-Galveston, TX	3%	1,603,661	Tubes and piping, structures, wiring, nails, screws, pins, tanks
China	Fertilizers	New Orleans	2%	1,090,565	Nitrogenous, mineral, phosphate fertilizer

Origin Country	Commodity	Port of Arrival	Share of East Coast Imports from Asia	Average Annual Volume (Tons)	Detailed Products (HS Level 4 breakdown)
China	Salt, Cements	Stones, New Orleans	2%	942,187	Barium sulfate, magnesite, pumice, mica, clay, Portland cement, graphite
China	Furniture	New York City, NY	1.6%	755,832	Chairs and parts, lamps, mattresses
China	Salt, Cements	Stones, Houston-Galveston, TX	1%	654,104	Portland cement, barium sulfate, pumice
China	Furniture	Savannah, GA	1.2%	584,612	Chairs and parts, medical furniture
China	Plastics	New York City, NY	1%	580,917	Tableware, containers, floor cover, tubes and piping
China	Iron and Steel	New Orleans	1%	558,503	Tubes and piping, railway construction materials, chains, nails, screws, bolts
South Korea	Salt, Cements	Stones, Houston-Galveston, TX	1%	543,332	Portland cement, granite
South Korea	Organic Chemicals	Houston-Galveston, TX	1%	536,567	Hydrocarbons, ketones and quinines, acids, ether and phenol alcohol, salts
South Korea	Vehicles and Parts	Savannah, GA	1%	509,825	Passenger vehicles, parts and accessories, tractors, trucks

Source:

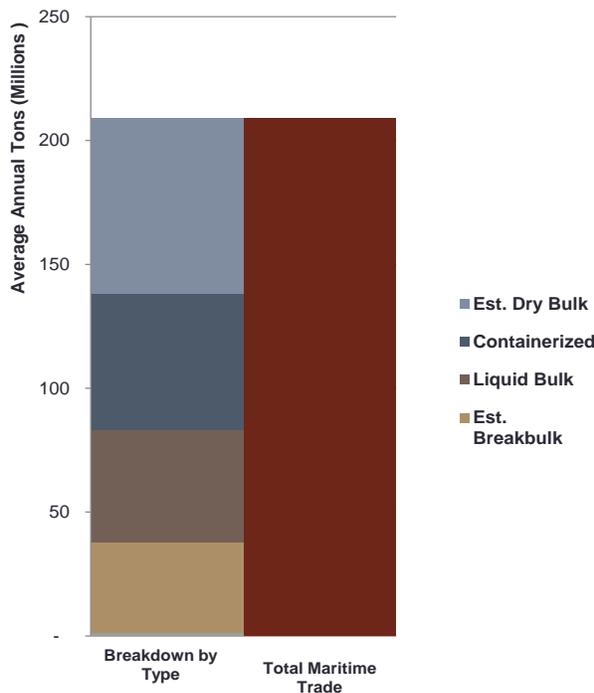
UN

COMTRADE

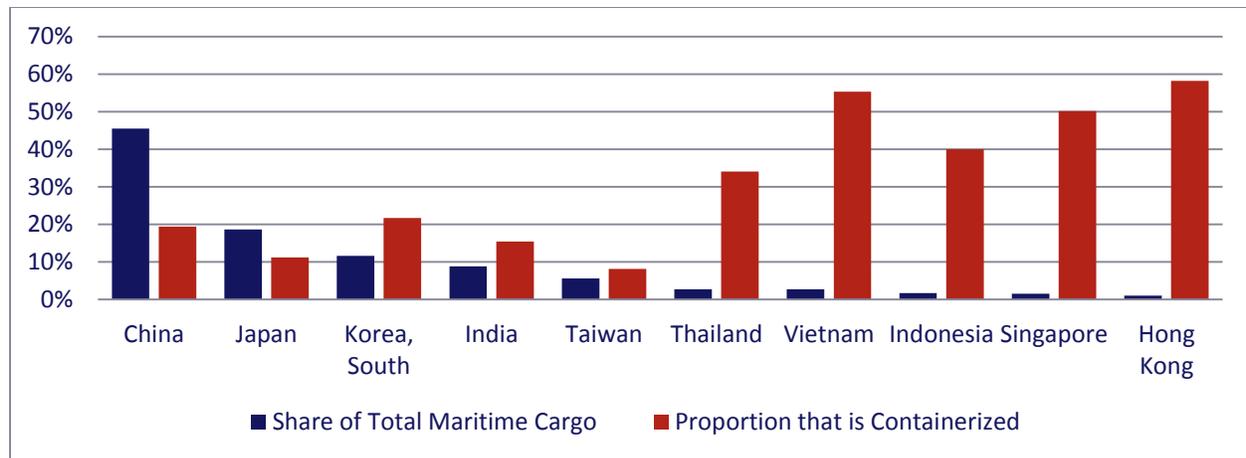
Note: Oil (crude and petrol) has been removed for this analysis because it does not offer value added opportunities for Jamaica.

US Exporting to Asia (Exports)

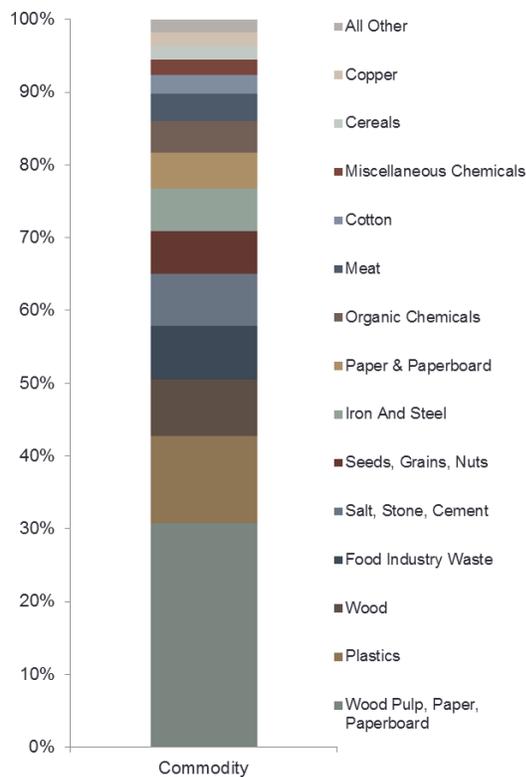
East Coast to Asia: Type of Maritime Trade



East Coast to Asia: Total and Containerized Cargo



East Coast to Asia: Top Export Commodities



East Coast to Asia: Top Ports

Exporting Port	Average Annual Volume (Tons)
New Orleans, LA	41,264,820
Houston-Galveston, TX	18,712,146
Norfolk, VA	11,501,427
New York City, NY	5,966,302
Savannah, GA	6,555,127
Baltimore, MD	7,743,273

Source: USA Trade Online. United States Census Bureau.

Top Export Flows from East Coast of US to Asia

Destination Country	Port Exporting	Commodity	Share of East Coast Exports to Asia	Average Tons/year	Detailed Products (HS Level 4 breakdown)
China	New Orleans	Seeds, Grains, Nuts	21%	14,826,019	Soybeans (100%)
Japan	New Orleans	Cereals	11%	8,189,749	Corn, Grain sorghum
China	Houston	Cereals	6%	3,978,593	Grain sorghum
China	New Orleans	Cereals	4%	2,741,891	Grain sorghum, wheat
China	New York	Wood Pulp and Paper	3%	2,158,959	Paper scrap and waste
Japan	New Orleans	Seeds, Grains, Nuts	2%	1,666,385	Soybeans, Flour
China	New Orleans	Food Industry Waste	2%	1,517,323	Starch and sugars from brewing, animal feed
China	Houston	Organic Chemicals	2%	1,086,545	Hydrocarbons, alcohols, peroxides
Japan	Houston	Organic Chemicals	2%	1,086,536	Ether alcohol
China	Norfolk	Seeds, Grains, Nuts	1%	851,355	(Not reported)
Indonesia	New Orleans	Seeds, Grains, Nuts	1%	831,325	Soybeans, seeds
China	Savannah	Wood Pulp and Paper	1%	812,071	Chemical wood pulp
India	New York	Wood Pulp and Paper	1%	809,155	Paper scrap and waste
South Korea	Houston	Organic Chemicals	1%	793,178	Hydrocarbons

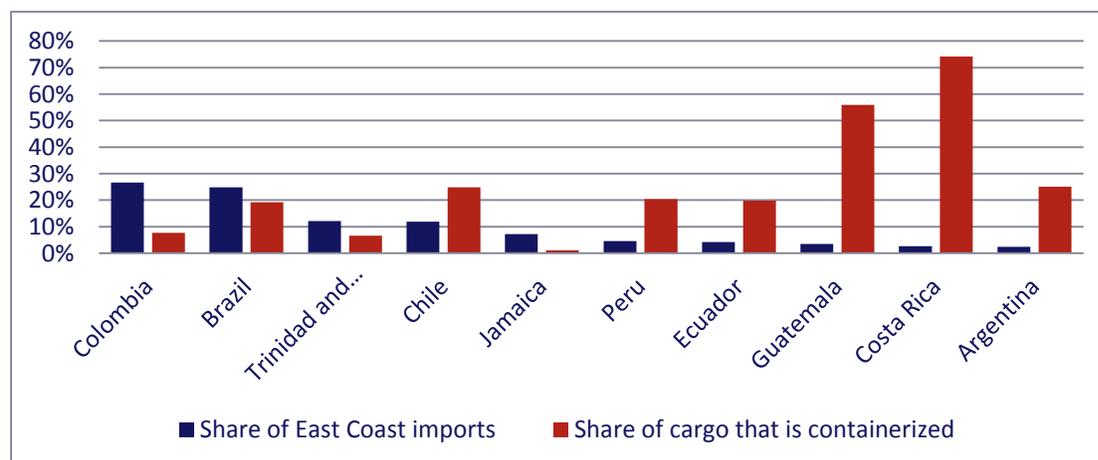
Source: USA Trade Online. United States Census Bureau.

Note: Oil (crude and petrol) has been removed for this level of analysis.

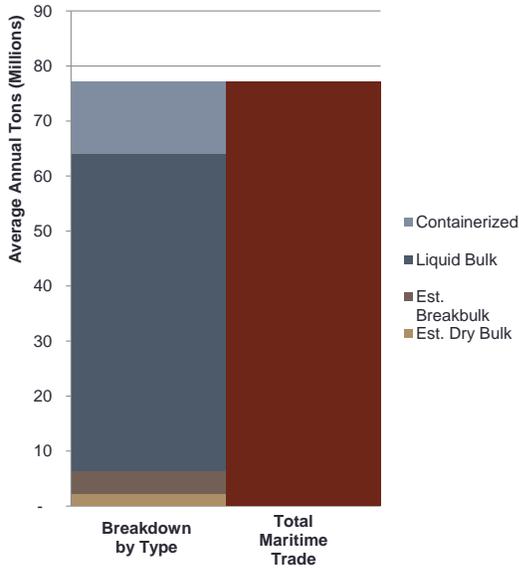
US Trade with Latin America including East Coast Market

Latin America Exporting to the US (Imports)

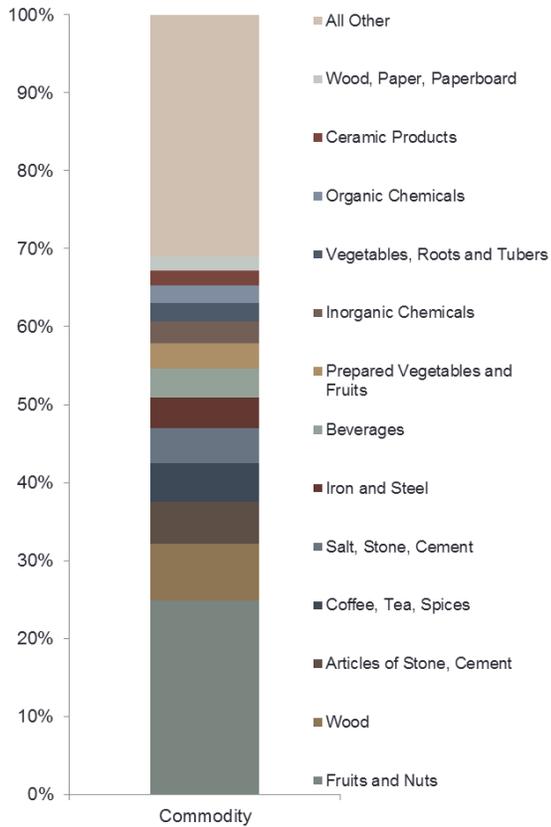
Latin America to the East Coast: Total and Containerized



Latin America to East Coast: Type of Maritime Trade



Latin America to the East Coast: Top Commodities



Latin America to the East Coast: Top Ports

Importing Port	Average Annual Volume (Tons)
Houston	22,308,716
New Orleans	17,127,394
Philadelphia	7,312,448
Mobile	6,687,584
Tampa	5,864,627

Source: USA Trade Online. United States Census Bureau.

Top Export Flows: Latin America to the East Coast

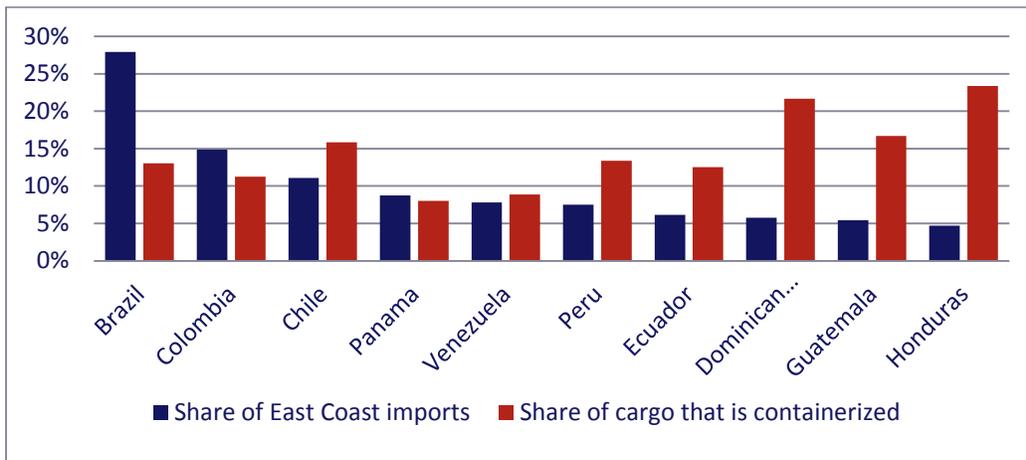
Origin Country	Importing Port	Commodity	Share of East Coast Imports from L.A.	Average Tons/year	Detailed Products (HS Level 4 breakdown)
Jamaica	New Orleans	Ores	7%	3,344,743	Aluminum, bauxite
Brazil	Houston	Ores	5%	2,784,943	Aluminum
Jamaica	Houston	Ores	4%	2,005,278	Aluminum
Chile	New York	Salts, Stone, Cement	3%	1,775,961	Sodium Chloride
Brazil	New Orleans	Ores	3%	1,519,733	Iron
Trinidad and Tobago	Houston	Organic Chemicals	3%	1,348,874	Alcohol and Halogenat
Trinidad and Tobago	Tampa	Inorganic Chemicals	2%	1,233,032	Ammonia
Peru	New Orleans	Salts, Stone, Cement	2%	1,229,574	Calcium chalk
Chile	Baltimore	Salts, Stone, Cement	2%	1,203,975	Sodium Chloride
Chile	Boston	Salts, Stone, Cement	2%	1,110,591	Sodium Chloride
Trinidad and Tobago	Houston	Inorganic Chemicals	2%	1,070,451	Ammonia
Trinidad and Tobago	New Orleans	Organic Chemicals	2%	991,776	Alcohol and Halogenat
Costa Rica	Philadelphia	Fruits, Nuts, Seeds	2%	988,518	Dates, Figs, Pineapples, Avocados, Bananas, Melon
Chile	Philadelphia	Salts, Stone, Cement	2%	919,918	Sodium Chloride
Brazil	Houston	Organic Chemicals	1%	672,311	Hydrocarbons
Chile	New Orleans	Salts, Stone, Cement	1%	655,170	Sodium Chloride
Guatemala	Philadelphia	Fruits, Nuts, Seeds	1%	630,215	Bananas
Brazil	Mobile	Wood	1%	532,275	Chemical woodpulp
Chile	Philadelphia	Fruits, Nuts, Seeds	1%	528,526	Grapes, Apples
Guatemala	Houston	Fruits, Nuts, Seeds	1%	521,830	Bananas
Brazil	Houston	Beverages	1%	405,727	Ethyl Alcohol
Trinidad	New Orleans	Fertilizers	1%	387,637	Nitrogenous fertilizer

Source: USA Trade Online. United States Census Bureau.

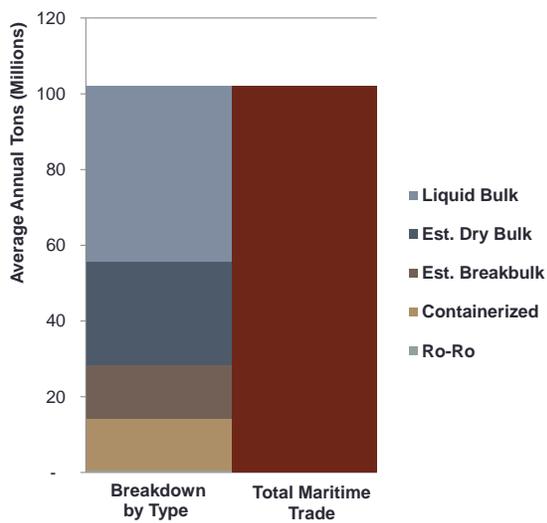
Note: Oil (crude and petrol) has been removed for this analysis because it does not offer value added opportunities for Jamaica.

US Exporting to Latin America

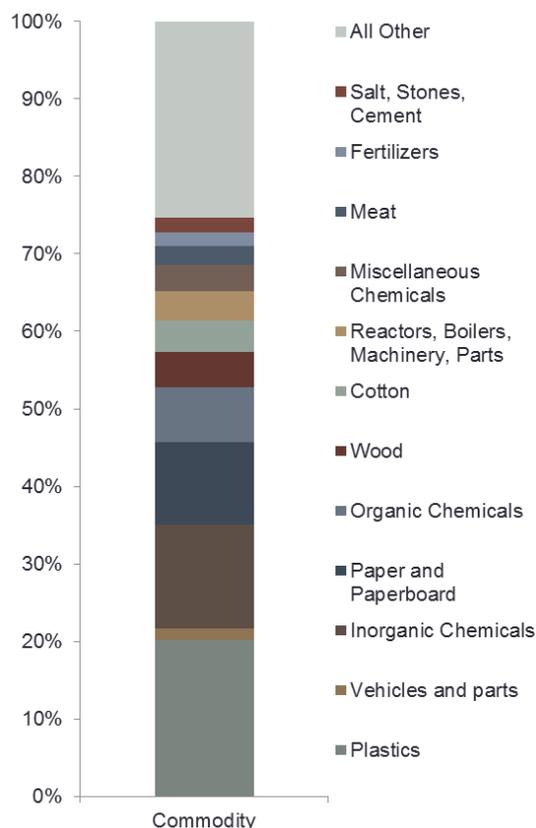
Latin America to East Coast: Total and Containerized



East Coast to Latin America: Types of Maritime Trade



East Coast to Latin America: Top Commodities



Note: Excluding oil (crude and petrol).

East Coast to Latin America: Top Ports

Top Ports	Average Annual Volume (Tons)
Houston	36,833,373
New Orleans	24,314,077
Mobile	6,318,968
Norfolk	5,456,185
Tampa	2,805,541

Source: USA Trade Online. United States Census Bureau.

East Coast to Latin America: Top Trade Flows

Destination Country	Exporting Port	Commodity	Share of East Coast Exports to L.A.	Avg. Tons/year	Detailed Products (HS Level 4 breakdown)
Peru	New Orleans	Cereals	4%	1,585,947	Corn, Wheat
Brazil	Houston	Inorganic chemicals	4%	1,403,172	Sodium Hydroxide, Peroxides
Brazil	Houston	Cereals	4%	1,382,139	Wheat and meslin
Brazil	Tampa	Fertilizers	4%	1,303,505	Nitrogenous and organic fertilizers
Venezuela	New Orleans	Cereals	3%	1,256,024	Corn, rice
Dominican	New Orleans	Cereals	2%	828,225	Wheat, meslin, corn

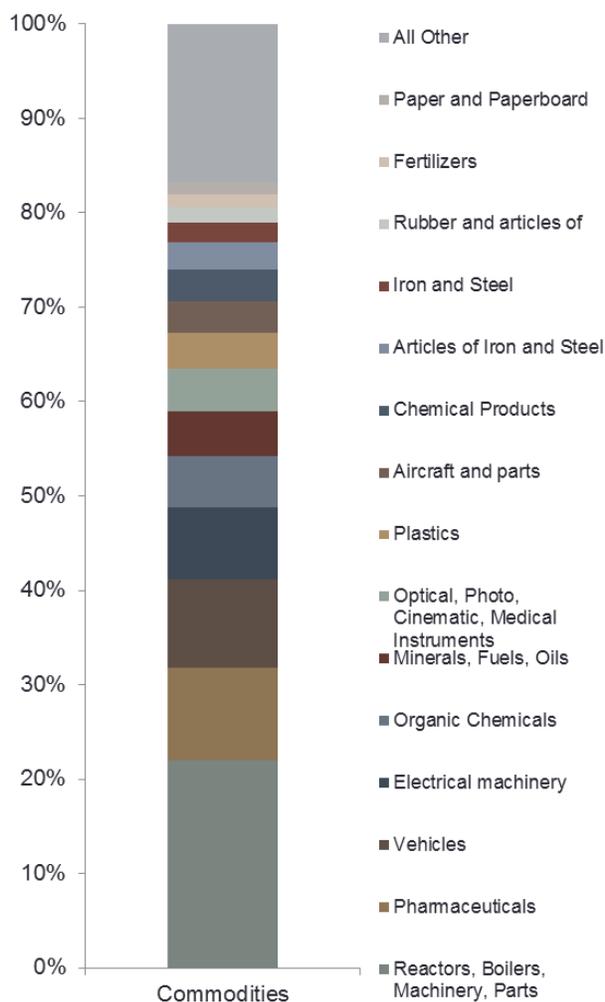
Destination Country	Exporting Port	Commodity	Share of East Coast Exports to L.A.	Avg. Tons/year	Detailed Products (HS Level 4 breakdown)
Republic					
Brazil	Houston	Organic Chemicals	2%	770,667	Hydrocarbons, acid, alcohols, sulfur, etc.
Guatemala	New Orleans	Cereals	2%	770,217	Corn, rice, wheat
Brazil	New Orleans	Inorganic chemicals	2%	724,955	Sodium Hydroxide, Peroxides
Colombia	Houston	Organic chemicals	2%	659,644	Hydrocarbons and compounds
Colombia	New Orleans	Food industry waste	2%	656,246	Soy and starch residues
Honduras	New Orleans	Cereals	2%	650,953	Corn, wheat
Venezuela	Houston	Organic chemicals	2%	589,160	Hydrocarbons, sulfur
Panama	New Orleans	Cereals	1%	492,364	Corn
Brazil	Houston	Plastics	1%	481,694	Ethylene, Polyesters, petro-resins
Venezuela	New Orleans	Food industry waste	1%	465,062	Soy residue
Guatemala	New Orleans	Food industry waste	1%	371,514	Soy and starch residue
Colombia	New Orleans	Seeds, grains, fruits	1%	354,852	Apples, grapes

Source: USA Trade Online. United States Census Bureau.

Europe with Latin America Trade

Europe exporting to Latin America

Europe to Latin America: Top Export Commodities



Note: Excluding oil (crude and petrol).

Trade Flows: Europe to Latin America

		Exporters						Grand Total
		Germany	France	Italy	Spain	United Kingdom	All Other	
I m p o r t e r s	Brazil	16%	7%	7%	5%	4%	15%	54%
	Argentina	4%	2%	2%	1%	1%	4%	14%
	Chile	3%	2%	1%	2%	1%	0%	13%
	Colombia	2%	1%	1%	1%	0%	0%	7%
	Peru	2%	0%	1%	1%	0%	0%	6%
	Venezuela	1%	0%	0%	0%	0%	0%	2%
	All Other	1%	0%	1%	1%	0%	1%	4%
	Grand Total	28%	13%	13%	11%	7%	27%	100%

Top Export Flows: Europe to Latin America

Exporter	Importer	Commodity	Share of European exports to Latin America	Avg. Annual Tons	Detailed Products (HS Level 4 breakdown)
Germany	Brazil	Reactors, Boilers, Machinery, parts	5%	143,255	Engine parts, transmissions, appliances
Germany	Brazil	Vehicles	2%	133,033	Parts, personal vehicles, special purpose vehicles such as firetrucks and street cleaners
Germany	Brazil	Pharmaceuticals	2%	5,117	Retail medicaments, blood and cultures, prescription medicaments
Germany	Brazil	Organic Chemicals	2%	86,978	Alcohols, acids, ethers
Germany	Argentina	Reactors, Boilers, Machinery, parts	1%	39,063	Engines, transmissions, agricultural equipment
Germany	Brazil	Electrical Machinery	1%	28,190	Generators, cables, circuits, motors, electrical panels
France	Brazil	Reactors, Boilers, Machinery, parts	1%	39,694	Transmissions, ball bearings, ignitions, air pumps, engines,
Germany	Brazil	Optic, Photo, Cinematic, Medical Instruments	1%	5,623	Medical equipment, measurement and scientific tools, X-Ray equipment
Germany	Chile	Reactors, Boilers, Machinery, parts	1%	36,896	Bulldozers and construction machines, forklifts, cranes,
Switzerland	Brazil	Pharmaceuticals	1%	1,656	Retail medicaments, blood and cultures
France	Chile	Aircraft and parts	1%	42	Airplanes >15,000 kg, helicopters >2,000 kg
Germany	Brazil	Plastics	1%	131,902	Polyethers, vinyl, ethylene, resins

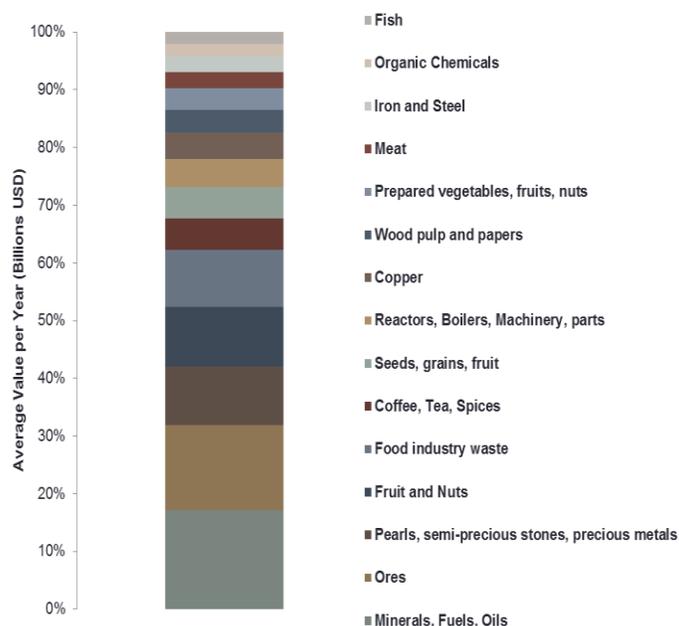
SOURCE: UN COMTRADE

Latin America exporting to Europe

Trade Flows: Latin America to Europe

		Exporters						Grand Total
		Brazil	Chile	Colombia	Argentina	Peru	All Other	
I m p o r t e r s	Germany	11%	2%	2%	2%	1%	1%	20%
	Netherlands	6%	1%	1%	2%	1%	4%	15%
	France	4%	1%	1%	1%	0%	1%	8%
	United Kingdom	4%	1%	1%	1%	0%	1%	9%
	Italy	4%	2%	1%	1%	1%	1%	9%
	Spain	4%	2%	3%	2%	2%	3%	15%
	All Other	8%	3%	2%	2%	4%	1%	24%
	Grand Total	43%	12%	11%	10%	9%	15%	100%

Top Exports: Latin America to Europe



Top Export Flows: Latin America to Europe

Exporter	Importer	Commodity	Share of Latin American Exports to Europe	Avg. Annual Exports to Europe (Tons)	Detailed Products (HS Level 4 breakdown)
Brazil	Germany	Ores	3%	9,084,301	Iron, Copper, Aluminum
Costa Rica	Netherlands	Reactors, Boilers, Machinery, Parts	2%	63,583	Computer processors, calculators and parts, word-processing machines, food prep machinery
Brazil	Netherlands	Food Industry Waste	2%	3,555,981	Soya bean and vegetable by-products in animal feed form
Brazil	Germany	Coffee, Tea, Spices	1%	409,964	Coffee, pimenta
Brazil	Spain	Seeds, Fruits, Nuts	1%	2,121,368	Soy Beans, Ground-nuts
Chile	Italy	Copper	1%	186,532	Refined alloys
Brazil	France	Food Industry Waste	1%	1,831,973	Soyabean by-products in animal feed
Brazil	Belgium	Prepared Vegetables and Fruits	1%	535,110	Fruit juices and vegetable juices, fruits and nuts (processed or unprocessed)
Brazil	France	Ores	1%	8,433,852	Iron, Manganese, Titanium
Brazil	Germany	Food Industry Waste	1%	1,508,876	Soyabean by-products in animal feed
Peru	Spain	Ores	1%	471,130	Zinc, Copper
Brazil	Netherlands	Seeds, Fruits, Nuts	1%	266,337	Melons, Dates, Pineapples, Avocados, Mangos, etc.
Brazil	Germany	Seeds, Fruits, Nuts	1%	15,344	Melons, Citrus, Banana, Grapes, etc.
Brazil	Italy	Ores	1%	7,576,555	Iron
Chile	France	Copper	1%	117,403	Refined alloys
Chile	Germany	Copper	1%	6,639	Refined alloys

Source:

UN

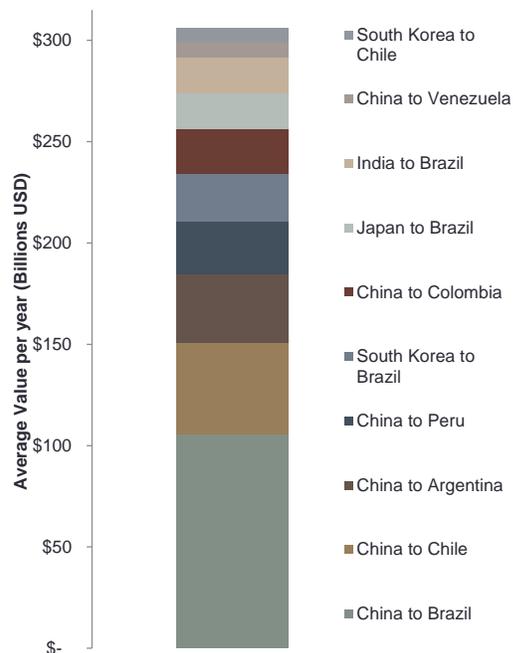
COMTRADE

Note: Oil (crude and petrol) has been removed for this analysis because it does not offer value added opportunities for Jamaica.

Asia with Latin America Trade

Asia exporting to Latin America

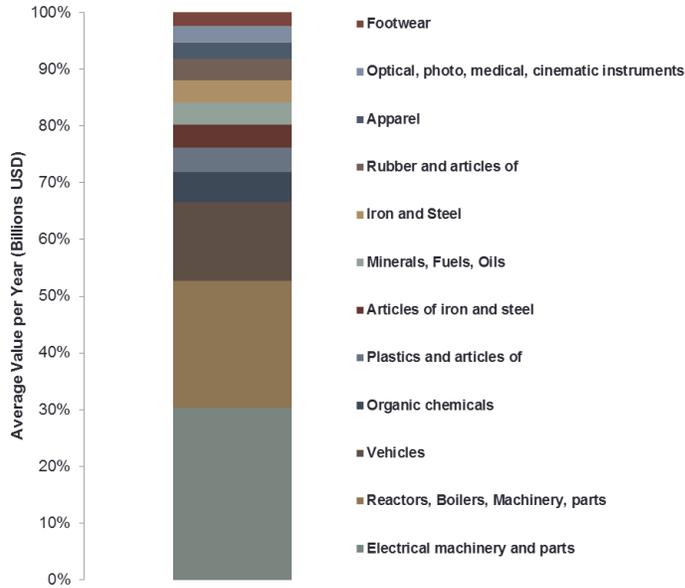
Top Asia Export partners in Latin America by Value



Trade Flows: Asia to Latin America

		Exporters						Grand Total
		China	South Korea	Japan	India	Thailand	All Other	
I m p o r t e r s	Brazil	26%	6%	4%	4%	2%	5%	47%
	Chile	11%	2%	2%	1%	1%	1%	17%
	Argentina	8%	1%	1%	1%	1%	1%	12%
	Peru	6%	1%	1%	1%	0%	1%	10%
	Colombia	5%	1%	1%	1%	0%	1%	8%
	All Other	4%	1%	1%	0%	0%	0%	6%
	Grand Total	61%	11%	9%	7%	4%	8%	100%

Regional Exports: Asia to Latin America



Top Trade Flows: Asia to Latin America Involving China and Brazil

Exporter	Importers	Commodity Type	Average Annual Tons	Detailed Products (HS Level 4 breakdown)
China	Brazil	Electrical machinery and parts	266,913	Motors and generators, transformers and converters, water and space heaters, TVs, lamps, cable and wires
		Reactors, Boilers, Machinery, parts	458,044	Air pumps, air conditioners, engines and motors, furnaces, refrigerators
		Organic Chemicals	424,590	Compounds and acids
		Plastics	354,944	Poly ethers, styrenes, floor coverings, tableware and household goods
		Fertilizers	1,712,487	Mineral and nitrogen fertilizers
		Iron and Steel	1,935,143	Flat-rolled plates of iron and steel
		Articles of Iron and Steel	598,997	Railway materials, parts of structures such as bridges, roofing, towers, doors, etc., screws and bolts
China	Argentina	Electrical machinery and parts	41,938	Wires and cables, conductors, fiber optic cables, lamps, switches, sockets, circuits, television and radio apparatus, TV screens and monitors, parts
		Reactors, Boilers, Machinery, parts	118,386	Air conditioners, bulldozers, laundry machines, air pumps
	Chile	Electrical machinery and parts	68,290	Telephone sets (fixed and mobile), water and space heaters, TVs
		Reactors, Boilers, Machinery, parts	87,252	Refrigerators, air conditioners
	Peru	Electrical machinery and parts	40,716	Cables, ignitions, TVs and electronics
		Ceramic products	300,377	Glazed and unglazed tiles and items, household items of porcelain
		Iron and Steel	836,383	Bars and rods, flat-rolled steel alloy
		Reactors, Boilers, Machinery, parts	54,634	Cranes, bulldozers, refrigerators, lifts and conveyors
	Colombia	Reactors, Boilers, Machinery, parts	76,198	Heaters and dryers, air conditioners, washing machines, elevators, escalators, conveyors, data

Exporter	Importers	Commodity Type	Average Annual Tons	Detailed Products (HS Level 4 breakdown)
				processing machines, telephone sets
		Iron and Steel	750,104	Bars and rods, flat-rolled steel alloy
		Ceramic Products	336,490	Glazed and unglazed tiles and items, household items of porcelain
		Electrical machinery and parts	49,993	Heaters, telephone sets, wire, cable, conductors, speakers, transformers, broadcasting equipment, monitors and projectors
South Korea	Brazil	Reactors, Boilers, Machinery, parts	156,016	Parts of machines like bulldozers and lifts, ignitions and engines, furnaces and ovens
		Vehicles	191,814	Passenger vehicles, tractors, trucks, vehicle accessories
		Electrical Machinery and parts	56,067	Engine parts, ignitions, telephone sets, wires
Japan		Vehicles	89,602	Passenger vehicles, parts and accessories
		Electrical machinery and parts	13,316	Carbon electrodes, sockets and plugs, ignitions, wires and lighting
Vietnam		Salt, Stone, Cement	63,540	Portland cement
	Fish	39,239	Fish fillets: fresh chilled or frozen	
Malaysia	Rubber	65,795	Rubber apparel of vulcanized rubber (gloves, mitts), natural rubber	

Source:

UN

COMTRADE

Note: Oil (crude and petrol) and ores have been removed for this level of analysis

Exports Flows: Asia to Latin America Excluding China and Brazil

Exporter	Importer	Commodity Type	Average Annual Tons	Detailed Products (HS Level 4 breakdown)
Japan	Chile	Vehicles	104,298	Passenger vehicles, vehicles for transporting goods
South Korea	Chile	Vehicles	115,036	Passenger vehicles, vehicles for transporting goods
Japan	Argentina	Reactors, boilers, machinery, parts	21,190	Diesel engines and parts, fork-lifts, tools for metal working
Japan	Colombia	Vehicles	77,958	Trucks, personal vehicles, engines
Japan	Argentina	Vehicles	12,842	Vehicle parts
South Korea	Colombia	Salt, stone, cement	251,557	Portland cement
South Korea	Colombia	Vehicles	75,050	Personal vehicles, parts, trucks, buses
India	Argentina	Salt, Stone, Cement	30,415	Natural barium sulfate
India	Argentina	Iron and Steel	51,390	Flat rolled plated iron, ferro-alloys
Japan	Colombia	Iron and Steel	437,200	Flat rolled plated iron of various types
Japan	Colombia	Rubber	23,246	Synthetic rubber and conveyor belts
Thailand	Argentina	Vehicles	22,435	Vehicle parts (frames), trucks
Thailand	Panama	Vehicles	14,808	Trucks, personal vehicles
South Korea	Colombia	Plastics	99,146	Ethylene, resins, styrene

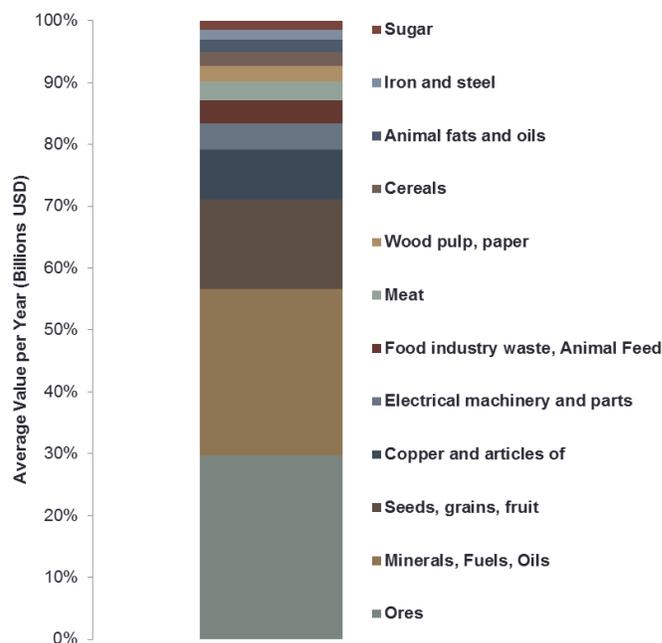
SOURCE: UN COMTRADE

Exporter	Importer	Commodity Type	Average Annual Tons	Specific Commodity
				and fiber optic cable
Chile		Wood	1,757,276	Chemical wood pulp

SOURCE: UN COMTRADE

Note: Oil (crude and petrol) and ores have been removed for this level of analysis.

Regional Exports: Latin America to Asia



Top Trade Flows: Latin America to Asia

Exporter	Importer	Commodity Type	Average Annual Tons	Specific Commodity
Panama	South Korea	Iron and Steel	73,253	Ferrous waste and scrap
Costa Rica	Malaysia	Electrical Machinery	422	Circuits (surge protectors, fuses, sockets, switches), and fiber optic cable
Colombia	Japan	Coffee, Tea, Spices	57,006	Coffee
Colombia	Japan	Iron and Steel	111,704	Ferro-alloys
Colombia	Japan	Live trees and plants	7,532	Cut flowers
Costa Rica	Japan	Electrical Machinery	128	Circuits (surge protectors, fuses, sockets, switches), and fiber optic cable
Argentina	India	Seeds, grains, fruit	13,276	Soya beans and dried legumes
Argentina	India	Animal and vegetable fats	1,668,065	Soya-bean oil not modified

SOURCE: UN COMTRADE

Maritime Regional Trade

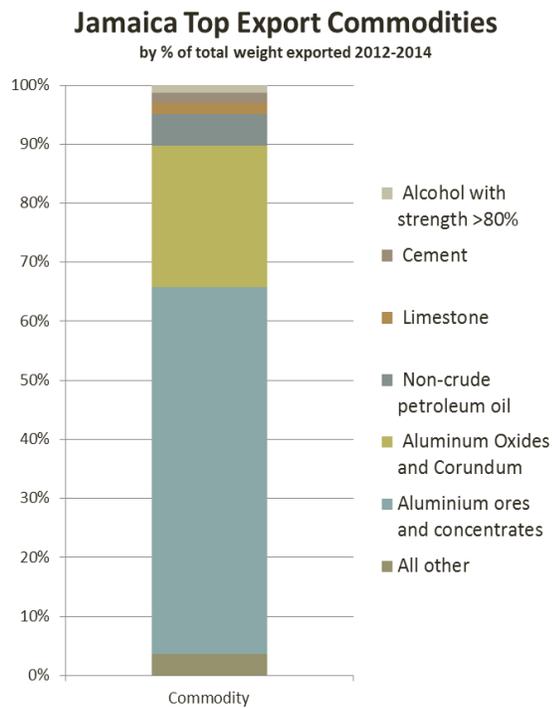
Jamaica

Jamaica's Annual Exports

Export	Weight (tons)	Value (USD)
Bauxite	9,625,082	\$130,349,791
Alumina	3,595,348	\$529,568,148
Non-crude petroleum oils	791,690	\$332,614,649
Cement	595,500	\$2,302,218
Limestone	331,590	\$10,603,348
Rum and other spirits obtained by distilling fermented sugar-cane products	28,659	\$88,170,660
Yams	21,203	\$17,543,978

SOURCE: UN COMTRADE

Jamaica Top Export Commodities

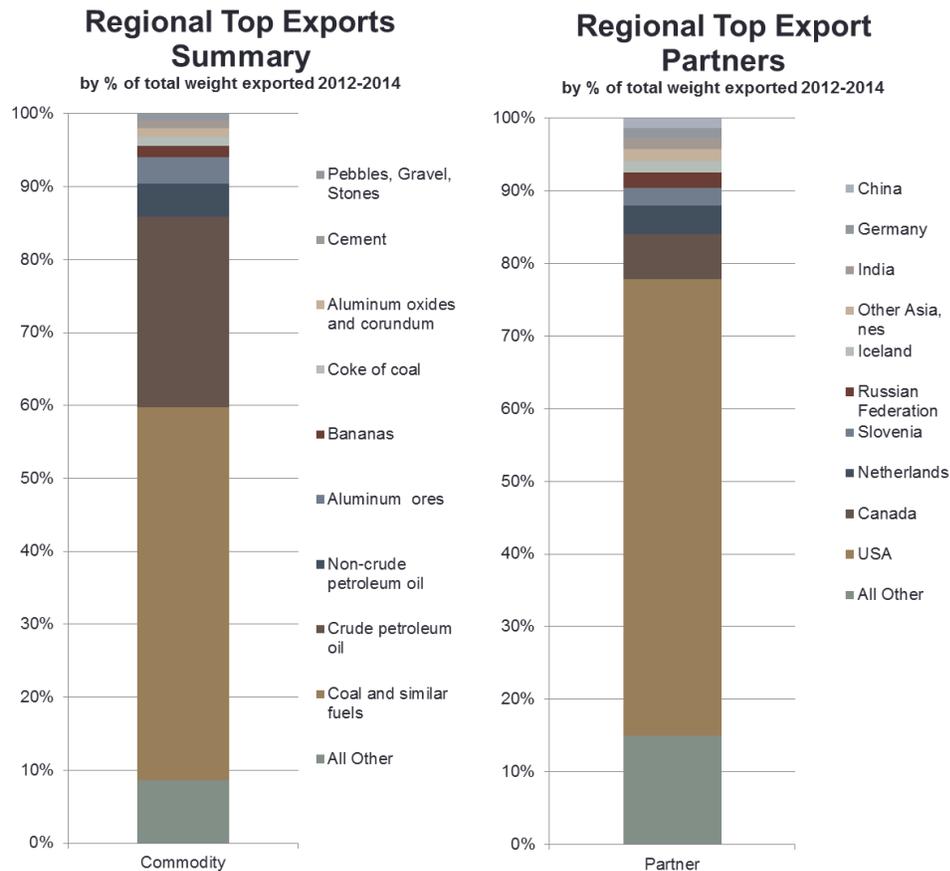


Top Import/Export Partners

Top Export Partners		Top Import Partners	
USA	39%	39%	USA
Canada	15%	11%	Venezuela
Netherlands	6%	10%	Trinidad and Tobago
United Kingdom	5%	7%	China
Russian Federation	5%	3%	Mexico

Latin America and the Caribbean

Regional Top Exports by Commodity and Export Partner



Air Regional Trade

US Global Air Freight Trade

Air Trade Flows

US Air Exports			US Air Imports			
	Average Annual Volume (tons)	Distribution		Average Annual Volume (tons)	Distribution	Import-Export Ratio
Asia	1,396,749	43%	Asia	2,080,583	51%	1.5
Europe	1,065,340	33%	Europe	1,190,508	29%	1.1

US Air Exports			US Air Imports			
South/Central America	386,422	12%	South/Central America	645,522	16%	1.7
North America	239,989	7%	North America	88,165	2%	0.4
Australia and Oceania	115,610	4%	Australia and Oceania	31,615	1%	0.3
Africa	71,070	2%	Africa	25,284	1%	0.4
Total	3,275,180	100%	Total	4,061,677	100%	

Source: USA Trade Online. United States Census Bureau.

Distribution of Air Exports by Regional Competitors

	Africa	Asia	Australia and Oceania	Europe	North America	South/Central America
Atlanta	10%	5%	3%	6%	0%	1%
Miami	2%	1%	1%	2%	2%	80%
San Juan	0%	0%	0%	0%	0%	0%
Total All US Airports	100%	100%	100%	100%	100%	100%

Top US Air Cargo Exports from Atlanta and Miami

	Commodity	Average Annual Tons
Miami Airport Top Exports	Automatic Data Process Machines	22,335
	Electric Apparatus For Telephony	16,869
	Civilian Aircraft, Engines, And Parts	9,403
	Parts & Access For Motor Vehicles	8,805
	Printers and similar machines	8,481
	Medical, Surgical, Dental Or Veterinary Instruments	7,321
	Birds' Eggs, In Shell, Fresh, Preserved Or Cooked	7,084
	Parts For Typewriters & Other Office Machines	6,869
	Insulated Wire, Cable; Opt Sheath Fiber Cables	6,381
	Taps, Cocks, Valves For Pipes, Tanks	5,818
Atlanta Airport Top Exports	Pumps For Liquids; Liquid Elevators; Parts Thereof	5,415
	Parts & Access For Motor Vehicles	5,526
	Medical, Surgical, Dental Or Veterinary Instruments	5,455
Other Notable Air Exports from Atlanta and Miami greater than 1,000 tons annually	Civilian Aircraft, Engines, And Parts	4,393
	Pharmaceuticals, vaccines	>12,000
	Diagnostic Lab Samples and Equipment	>4,000
	Video Game Consoles	>4,000
	Fresh vegetables	>3,000
	Live Fresh Crustaceans	>1,000

Source: USA Trade Online. United States Census Bureau.

Air Freight US and Asia

Asia Exporting to the US

Country	Average (tons)	Share of Total Volume
China	1,158,979	56%
Japan	239,984	12%
India	116,418	6%
Taiwan	87,065	4%
Korea, South	71,866	3%
Vietnam	69,435	3%
Thailand	63,609	3%
Malaysia	47,725	2%
Asia Near East	45,947	2%
Singapore	36,444	2%

Source: USA Trade Online. United States Census Bureau.

Asia Exporting to the US

Exporter	Importer	Commodity Type	Average Annual Tons	Specific Commodity
China	New York	Reactors, boilers, machinery, parts	41,310	Automatic Data Process Machines, Parts For Typewriters & Other Office Machines; Printers
		Electrical Machinery	25,531	Electric Apparatus Telephony, Power Supply, etc.
		Apparel, not knitted	20,845	Suits and Coats
		Apparel, knitted	17,015	Sweaters, Pullovers, T-shirts
		Footwear	6,161	Rubber and Plastic Soles
		Plastics	5,341	Plastic containers, tableware, household items
India	New York	Apparel, not knitted	9,469	Suits, Blouses, Swimwear, Athletic Gear
		Apparel, knitted	8,572	Sweaters, Pullovers, T-shirts
Japan	New York	Reactors, boilers, machinery, parts	4,766	Semi-conductors, pipe valves, turbojets, tanks
China	Savannah		21,168	Data Processing Machines, typewriter parts, office machines
	New Orleans	Electrical Machinery	8,572	Electric apparatus for telephony and media recording
	Miami		6,227	Electric apparatus for telephony and media recording

Source: USA Trade Online. United States Census Bureau.

US Exporting to Asia

Country	Average Annual Volume (Tons)	Share
China	284,941	25%
Japan	241,227	21%

Country	Average Annual Volume (Tons)	Share
Korea, South	155,240	13%
Hong Kong	121,390	10%
Singapore	119,315	10%
Taiwan	74,689	6%
India	56,295	5%
Malaysia	43,531	4%
Thailand	39,768	3%
Vietnam	20,079	2%

Source: USA Trade Online. United States Census Bureau.

Top Trade Flows: US to Asia

Exporter	Importer	Commodity Type	Average Annual Tons	Specific Commodity
New York	China	Reactors, boilers, machinery, parts	7,436	Semiconductors, data processing machines
		Plastics	2,790	Plates, sheets, film, strips
	South Korea	Reactors, boilers, machinery, parts	4,533	Tanks, Valves, Pumps, vacuums, fans, semi-conductors
	Taiwan		4,112	Semiconductors, machine tools
	Singapore		3,312	Data processing machines, transmissions and parts
	Japan	Reactors, boilers, machinery, parts	3,558	Data Processing machines, semiconductors
			Plastics	2,752
		Miscellaneous chemicals	1,298	Diagnostic lab samples and equipment, fatty acids, chemical elements
	India	Plastics	1,254	Containers, bags, plates, sheets
	Savannah	China	Reactors, boilers, machinery, parts	2,860
Houston	Singapore	3,402		Valves, tanks, parts, pumps
New Orleans	Japan	Organic chemicals	1,523	Hydrocarbons and compounds

Source: USA Trade Online. United States Census Bureau.

Air Freight US and Latin America

Latin America Exporting to the US

Exporter	Average Annual Volume (tons)	Distribution
Colombia	165,040	26%
Chile	150,576	23%

Exporter	Average Annual Volume (tons)	Distribution
Peru	106,252	17%
Ecuador	47,634	7%
Brazil	38,444	6%
Costa Rica	25,154	4%
Argentina	20,362	3%
Dominican Republic	19,184	3%
Guatemala	16,152	3%
Honduras	13,670	2%

Source: USA Trade Online. United States Census Bureau.

Top Trade Flows: Latin America to US

Exporter	Importer	Commodity Type	Average Annual Tons	Specific Commodity
Colombia	Miami	Live trees and plants	139,755	Cut Flowers and Grasses for Bouquets
		Fish	5,707	Fillets, crustaceans
Ecuador	Miami	Live trees and plants	33,249	Cut Flowers and Grasses for Bouquets
		Fish	7,465	Fillets, Dried, Salted, Smoked
Costa Rica	Miami	Live trees and plants	5,309	Cut Flowers, Mushrooms
		Fish	8,495	Fillets, crustaceans
Chile	Miami	Fish	83,789	Fillets, Dried, Salted, Smoked
		Fruit and Nuts	18,263	Fresh and frozen fruits, apricots, cherries, peaches, plums
		Cereals	14,379	Corn
	New York	Fish	6,546	Fillets, Live fish
Peru	Miami	Vegetables and Tubers	91,770	Fresh Vegetables, Lettuce, Legumes
Argentina	Miami	Fruit and Nuts	8,377	Fresh fruits

Source: USA Trade Online. United States Census Bureau.

US Exporting to Latin America

Importers	Average Annual Volume (tons)	Distribution
Brazil	113,041	30%
Colombia	60,685	16%
Chile	35,959	9%
Argentina	28,000	7%
Peru	22,294	6%
Venezuela	21,447	6%
Costa Rica	16,779	4%
Ecuador	13,892	4%
Dominican Republic	10,295	2%

**Importers Average Annual Distribution
Volume (tons)**

Paraguay 8,797 2%

Source: USA Trade Online. United States Census Bureau.

Top Trade Flows: US to Latin America

Exporter	Importer	Commodity Type	Average Annual Tons	Specific Commodity
Miami	Brazil	Reactors, boilers, machinery, parts	19,344	Data Processing Machines, typewriters, printers, and parts of office machines, valves and tanks
	Chile		10,148	Data Processing Machines, pumps, transmissions
	Colombia		17,807	Data Processing Machines, printers, pumps
	Ecuador		5,366	Data Processing Machines, printers, pumps
	Peru		8,014	Data Processing Machines, typewriters, printers, and parts of office machines
	Venezuela		4,045	Parts for bulldozers and construction equipment
	Brazil	Plastics	3,808	Plates, sheet, film, containers
	Brazil	Miscellaneous chemicals	3,680	Insecticides, Diagnostic lab samples and equipment
	Chile	Vehicles	3,005	Parts
	Brazil		1,903	Parts, trailers
	Colombia	Paper and Paperboard	1,214	Types of paper, notebooks, cartons
	Brazil	Iron and Steel	1,002	Iron and steel scrap and stainless steel products

Source: USA Trade Online. United States Census Bureau.

Europe with Latin America Trade

Europe exporting to Latin America

Top Trade Flows EU to Latin America

Exporter	Importer	Share of Total Air Exports to LA	Commodity
EU Member Countries	Brazil	11.81%	Reactors, boilers, machinery, parts
		5.35%	Electrical machinery
		2.76%	Pharmaceutical products
		3.75%	Vehicles
		2.32%	Optical, photographic, cinematographic, medical or surgical instruments
		2.55%	Miscellaneous chemical products
		2.76%	Organic chemicals
		1.82%	Plastics and articles thereof
		2.02%	Articles of iron or steel
		Chile	2.60%

Exporter Importer Share of Total Air Commodity
Exports to LA

Exporter	Importer	Share of Total Air	Commodity
	Argentina	1.81%	Reactors, boilers, machinery, parts
	Colombia	1.56%	Reactors, boilers, machinery, parts
		1.35%	Electrical machinery

SOURCE: Eurostat

Top Trade Flows Europe to Latin America

Exporter	Importer	Commodity Type	Share of Total Euro Exports to Latin America	Estimate Annual Tons*	Specific Commodity
Netherlands	Brazil	Reactors, boilers, machinery, parts	9%	9,144	Pulley, tackle, hoists, jacks, furnaces
	Argentina		2%	1,044	Telephone sets
	Colombia		2%	1,872	Telephone sets
Belgium	Brazil	Vehicles	9.2%	9,156	Vehicle Parts and Accessories
Germany			1.45%	1,416	Vehicle Parts and Accessories
		Organic Chemicals	3.7%	3,744	Nitrogen compounds
France		Miscellaneous Chemicals	2%	2,028	Insecticides
		Vehicles	1%	1,068	Vehicle Parts and Accessories

SOURCE: Eurostat.

*Extrapolated from monthly 2015 data sets.

Latin America Exporting to Europe

Top Trade Partners Latin America to the EU

Exporter Importer Share of Total Air Commodity
Exports to LA

Exporter	Importer	Share of Total Air	Commodity
Brazil	EU Member Countries	14.72%	Edible fruit and nuts
		7.34%	Wood and articles of wood; wood charcoal
		2.32%	Reactors, boilers, machinery, parts
Chile		9.84%	Copper and articles thereof
		2.42%	Edible fruit and nuts
		1.86%	Fish
Peru		8.95%	Vegetables
		4.22%	Edible fruit and nuts
Ecuador		8.56%	Live trees and plants
Colombia		6.71%	Live trees and plants
		2.33%	Mineral fuels and oils
Guatemala		2.34%	Vegetables
Dominican Republic		2.32%	Vegetables
		1.81%	Edible fruit and nuts
Argentina		1.57%	Edible fruit and nuts

SOURCE: Eurostat

Top Trade Flows: Latin America to Europe

Exporter	Importer	Commodity Type	Share of Total Euro Exports to Latin America	Estimate Annual Tons*	Specific Commodity
Peru	Netherlands	Vegetable	4%	9,276	Asparagus and other vegetables
	Spain		5%	11,592	
	United kingdom		4%	9,408	
	France	Edible Fruits and Nuts	2%	3,804	Dates, figs, pineapples, avocados, guavas, mangoes
	Germany		2%	3,948	
Brazil	Netherlands	Edible Fruits and Nuts	1%	2,580	
	Spain		1%	2,496	
	Brazil		2%	3,492	
Chile	Germany	Edible fruits and nuts	2%	4,740	Fresh berries
	Netherlands		1%	3,168	
	United Kingdom		6%	13,428	
Argentina	1%		2,316		
Dominican Republic	France	Vegetables	2%	3,564	Unknown vegetables
Ecuador	Netherlands	Live Trees and Plants	8%	18,084	Cut flowers for bouquets
	Spain		2%	4,296	
Colombia	Netherlands		4%	9,408	
	Spain		1%	2,268	
	United Kingdom		2%	4,200	

SOURCE: Eurostat

Transshipment

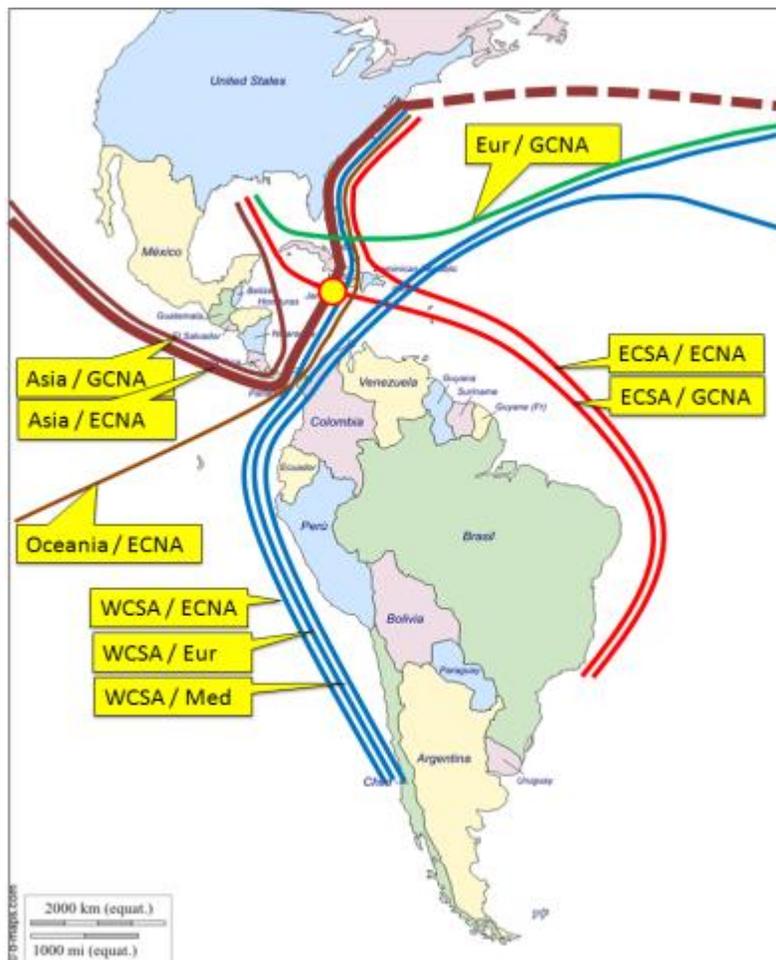
Through-Caribbean Services

A common way of categorizing the worldwide pattern of shipping services, also applicable to the Caribbean services, is into:

- ▶ **East/West Services** – Asia/ North America; and
- ▶ **North/South** – South America/North America/Europe/Oceania

A more detailed way of categorizing these patterns is according to their orientation and their involvement with Panama Canal. This categorization is useful especially for the analysis of transshipment potential, the focus of this study. The figure below shows the main, ten service patterns of the services pattern involved in the Caribbean Basin. For clarity, one service pattern, WCNA/Med was left out.

The Caribbean Basin's main Service Patterns



Accordingly, these Through-Caribbean patterns are categorized as:

Cross-Canal Services ("Horizontal")

- Asia / ECNA
- Asia /GCNA⁶

Cross-Canal Services ("Diagonal")

- Europe/ WCSA
- Mediterranean/WCSA
- Mediterranean/WCNA
- WCSA / ECNA
- Oceania/ECNA

Non-Canal Services ("Vertical")

- ECSA / ECNA
- ECSA / GCNA
- Europe/GCNA

The first two Cross-Canal services are commonly defined as All Water Panama (AWP). Some of the Asia/ECNA services, often referred to as “pendulum”, since extend their route with an additional ECNA/Europe or Transatlantic leg (see broken line). Altogether, the Through-Caribbean services include 10 separate service patterns, 2 horizontal, 5 diagonal and 3 vertical. The largest Through-Caribbean service pattern is the Asia/ECNA (AWP). Accordingly it is depicted in the thickest line.

The route of the diagonal Through-Canal services involves transiting Panama Canal; these services therefore were until recently limited to employing Panamax ships with maximum capacity of 5,000 TEUs. However, the new third lane of the Canal allows the transit of new-Panamax (NPX) ships of up to 14,000 TEUs. Indeed, long-term, NPX are expected to be deployed especially on the high-volume trade lanes such as Asia/ECNA. The vertical services are not restricted by Panama Canal and therefore are not directly impacted by its expansion. In fact, some of the vertical services already deploy ships reaching 7,000 TEUs.

Caribbean Specialist Services

The figure below shows the main service patterns of the Caribbean Specialist services. The Caribbean Basin is depicted in this figure by a light red circle. For simplicity, the intra-regional rotation is depicted by inward-pointing, black arrows. The direction of these arrows indicates that the dominant direction of the Caribbean trade is imports (inbound).

As seen in the figure below, the main service patterns of the Caribbean Specialists include:

Through-Canal Services

- Asia / Caribbean
- WCSA / Caribbean

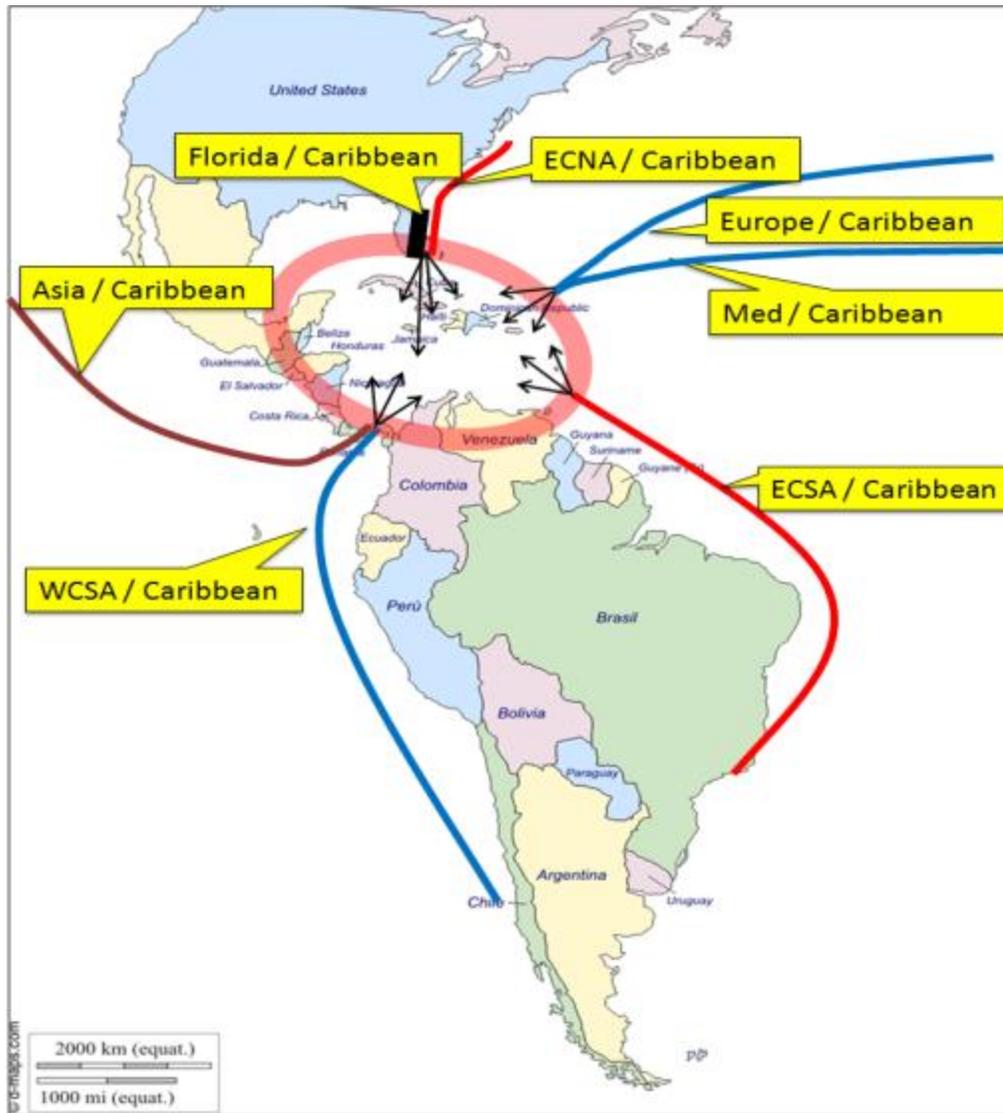
Non-Canal Services

- Florida / Caribbean
- ECNA / Caribbean
- ECSA / Caribbean
- Europe / Caribbean
- Mediterranean / Caribbean

⁶ GCNA includes both the US and Mexico.

The differentiation between the ECNA/Caribbean (violet line) and Florida/Caribbean (short, thick black line) reflects the special role that Florida fulfills in handling the Caribbean trades. Florida is the main trading partner of the Caribbean and the ports of Jacksonville, Port Everglades and Miami, are the traditional hubs of this trade and the base of several specialist lines. The Florida-based, regional shipping lines handle 3 types of trades: (a) US cargo destined to the Caribbean; (b) Transshipment of non-US cargo; and (c) a mixture of the two consolidated in the same box, often referred to as Less-Than-Container Load (LTL).

Caribbean Specialist Services



There is an overlapping between the service of the Caribbean Specialists and the Through-Caribbean services, with some shipping lines providing both types. A salient example is Maersk Line, which has a short-sea, regional subsidiary line under the name SeaLand. The history of the Caribbean Specialists can be tracked down to the time when Caribbean ports had inadequate port facilities. Accordingly, ships deployed on past services, were relatively small, geared ships. However, this era is a bygone now; the Caribbean Specialists are mostly employing modern, gearless containerships, reaching in the case of Asia/Caribbean, 5,000 TEUs. There is one exception, however, the

Florida/Caribbean Specialists, some are still deploying geared ships with capacity of about 1,000 TEUs.

Short-Sea and Feeder Services

The feeding service in the Caribbean is performed by 3 types of feeder services:

- Dedicated Feeders** – owned and operated by mainlines, among them CMA-CGM, Maersk, MSC, Zim and Hamburg Sud;
- Short-Sea** – mainly the Florida Specialists such as Crowley, Seafreight, King Ocean and Seaboard Marine and to a lesser extent Tropical Shipping, which complement their own mainline trades with feeding of mainline services of global lines; and
- Common Feeders** – such as CFS and X-Press, that only handle the traffic of mainlines.

Sometimes, common feeders partner with dedicated feeders of mainlines to provide joint common feeder services. It is estimated that worldwide, common feeders account for about 1/2 of the transshipped volume with most of the rest handled by dedicated feeders. Combined short-sea/feeder services are rare; short sea services' main revenues are from the direct trade, using feeder services serve as filler for empty slots.

CFS, using Kingston as its hub port, is the largest independent feeder operator serving the Caribbean, Mexico, Central America, Colombia and Venezuela. CFS employs a fleet of 12 containerhips with size ranging from 550 to 1,300 TEUs, most of which are geared. The figure below shows CFS service network, comprising of 8 service connecting 26 ports. The service does not cover Mexico and US ports whereby mainlines either call directly or use dedicated feeders. CFS annual volume is about 3 million TEUS.

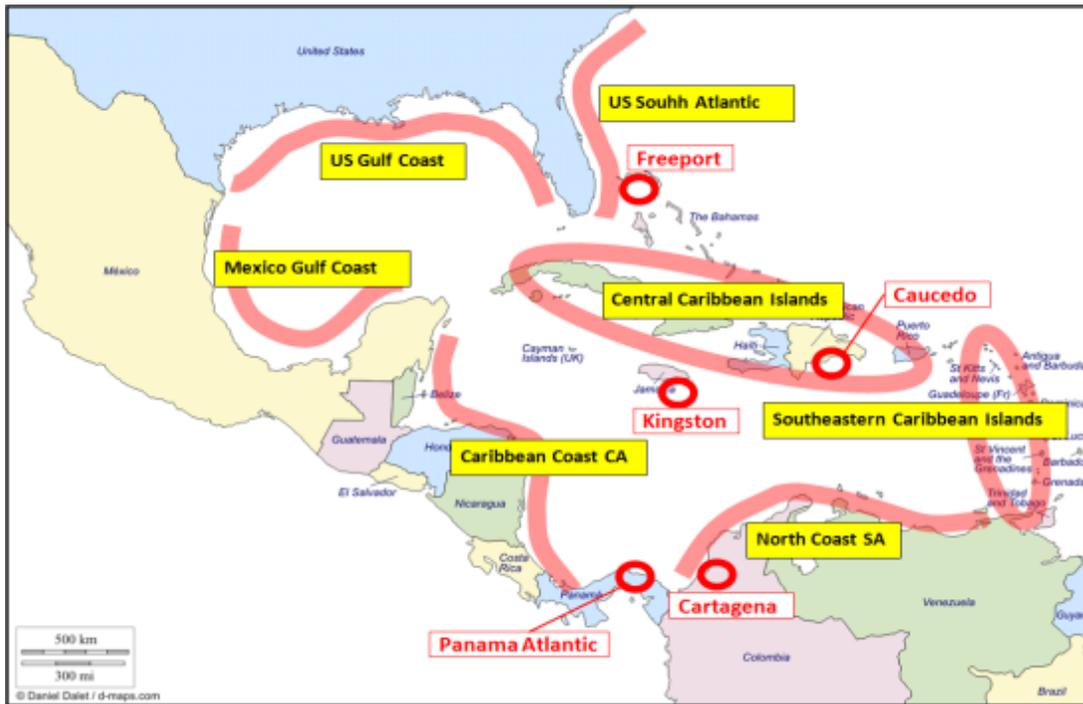
CFS Service Network



Feeding Ranges

The feeder services connect transshipment hub ports where their mainlines call and a "feeding range", one or more smaller gateway ports. The figure below provides a schematic illustration of the various ranges and the hubs that feeder them. As seen in this figures at the present the Caribbean Basin includes 7 ranges and 5 hubs.

Feeding Range in the Caribbean Basin



Naturally, because of the geographical proximity, each hub is focusing on the feeding range closer to it. However, as will be discussed later, there is a tendency by shipping lines to concentrate all their services in a single hub to increase the connectivity opportunities among their various services. In this respect, Kingston, located at the center of the Basin with almost equal distances to all ranges, may have an advantage.

Categorization of Transshipment Patterns

Transshipment patterns can be categorized according to the type of ships and services involved in the ship-to-ship transfer into:

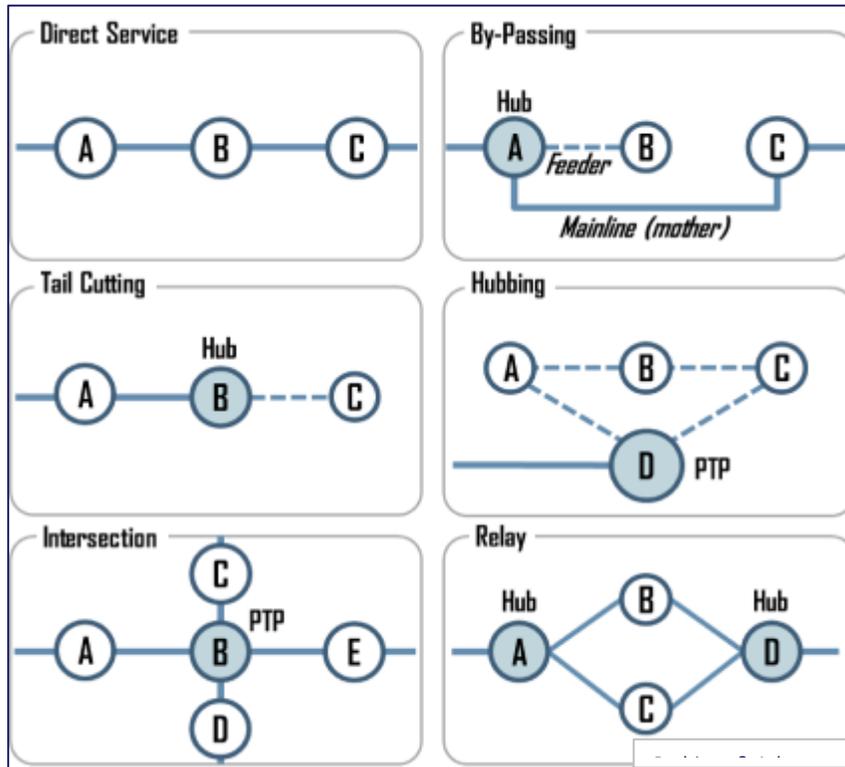
Hub & Spoke (H&S)– Involving a mother ship, deployed on an inter-regional mainline service, and a smaller, feeder ship, deployed on a regional feeder service, also defined as mother-to-feeder transfer; and

Interline or Relay – Involving two mainline services and two mother ships, also defined as mother-to-mother transfer.

The figure below provides a schematic illustration of the various transshipment patterns. The H&S transshipment is the more traditional pattern, accounting for most of present transshipment traffic worldwide, including Kingston. The upper 4 panels describe the evolution of the H&S from partial

elimination of a direct call by By-Passing and Tail Cutting patterns, to its ultimate form in which all direct calls by mainline service terminate at a regional hub port, replacing all direct calls by feeder calls. The hub port's only activity in this case is transshipment and hence defined as Pure Transshipment Port (PTP).

Figure A1-1: Transshipment Patterns



The interline transshipment and especially the intersection pattern⁷ is somewhat of a novelty and presently practiced only by few lines (see following sections on MSC and Hamburg Sud). The expansion of the Canal and the follow-up consolidation of mainline service are likely to induce this type of transshipment which, in turn, could generate massive volume of transshipment hubs. Further discussion of this pattern, which is expected to become more dominant in the future, is included later in this report.

The following includes a brief review of the two types of transshipment patterns, the rationale underlying them and the global trends that affect them in general and in the specific case of Kingston.

Feeder Ranges Revisited

The H&S transshipment is the more traditional pattern. The primary rationale underlying this transshipment is substitution of direct call by an expensive, large mother ship by a smaller and less expensive feeder ship. In the ultimate pattern, presented in the Hubbing panel of the figure above, the mother ship only calls at the hub port D, saving the cost of sailing and direct calling at the

⁷ Intersection is essentially a "cross-feeding" whereby each mainline is feeding the other one or ones when multiple services intersect at the same hub. This pattern is popular in air transportation.

regional ports A, B and C. Ideally, the hub port D should be located at the center of the feeding range and as close as possible.

The Caribbean Basin, as presented in the figure below, is a large region, way beyond the covering range of a single feeder service. For operational purposes, the region can be divided into several geographic ranges, each consisting of several adjacent gateway ports. Naturally, the hub port in proximity to the feeding range has advantage over those located further away from it. As discussed in the previous section on feeding ranges, shows the various the potential feeding ranges of the Caribbean Basin. As seen in this figure, Kingston's closest feeding range is Central Caribbean Islands; its closest competitor for feeding this Caucedo. The natural hub for the NCSA is Cartagena and their closest competitors are the hubs located in Panama Atlantic.

The largest feeding range in terms of traffic is the US South Atlantic, followed by the US Gulf Coast. However, both regions are almost exclusively served by direct services. The closest hub to US South Atlantic is Freeport. As will be seen in the section on Interline Transshipment, MSC will soon begin using Freeport for significant feeding of some ports in this range and, perhaps, even in the US North Atlantic. Another notable feeding operation is associated with MSC and Zim line, which in the past used Kingston to feeder USGC.

Hub & Spoke Limited Potential

The potential for H&S transshipment without radical restructuring of the entire service system is limited to the organic trade growth of the Caribbean Basin. The primary rationale underlying this transshipment is substitution of direct call by the expensive, large mother ship by a smaller and less expensive feeder ship. The H&S system in the Caribbean Basin seems to be mature, especially with regards to the Asian import, the main feedered cargo. As seen in the previous figure, the AWP services that sail through the region only stop at one hub port. Hence, there is no direct port call that can be substituted by feeder calls. Put differently, with regards to the Asian trade, the Caribbean Basin is already at the stage of that presented in the Hubbing panel of the figure above.

The Asia imports, the main feedered traffic depends on the demand for Asian goods, which are poised to grow at a modest pace, in line with the GDP of the Caribbean Basin's countries. The Caribbean demand for Asian goods is not affected by the size of the ships that brings them from Asia, or the route these ships select, AWP or AWS since the cost of transportation consists only of small portion of these goods.

The future growth of H&S transshipment traffic in the Caribbean Basin – and in Kingston – depends on the restructuring of the mainline services in this region. This transshipment pattern and the respective interline transshipment will be generated as a result of consolidation and integration of Through-Caribbean and Caribbean Specialist services triggered mainly by the expansion of Panama Canal.

Panama Canal Expansion and Service Consolidation

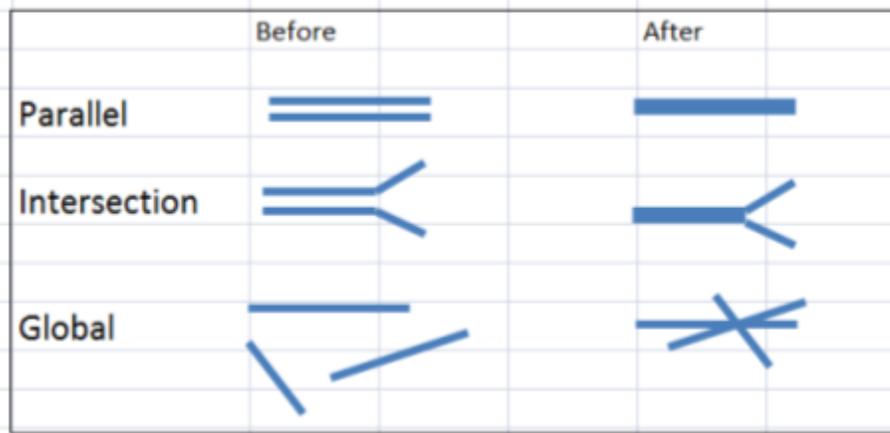
Service consolidation, or the integration of 2 or more shipping line services into a single service, is intended to accumulate traffic in order to provide for the deployment of larger and more economical ships. The Figure below illustrates the 3 common patterns of service consolidation (integration):

Parallel – Applicable when the routes of two services are mostly parallel, although each service may call at different ports in the trading region;

Intersection – Applicable when only one leg of the two routes is parallel; and

Global Restructuring – A combination parallel and intersection consolidation that may also include introduction of complimentary H&S feeder services.

Service Consolidation Patterns



Parallel consolidation is fairly simple and the first to be pursued as will be seen in the following examples. Parallel consolidation generates transshipment mainly in the case of “abandoning” regional ports. There is no much novelty in parallel consolidation; it has been practiced periodically when, due to decline in traffic, shipping services had to terminate service, shifting their traffic to a parallel services. If, due to the termination of one service, additional ports of call are required on the remaining one, its regional rotation is expanded and ships are added to the string to compensate for the longer rotation time.

Appendix I.3: Review and Assessment of Existing and Pipeline Projects

Appendix 1.3

In analyzing pipeline projects for the LHI, we reviewed a wide range of projects. Through a qualitative assessment, certain projects were categorized as less fundamental for the success of the Jamaica's vision of the LHI. Among these less relevant projects are also ones rated as "unclassified" in this section's qualitative assessment of the pipeline projects. These are projects that are either completely stalled or not of critical importance for the success of the LHI and/or are in the hands of the private sector with very little information available, often due to confidentiality restrictions. Descriptions of these projects are listed below.

Maritime Infrastructure

Goat Island Logistics Park

CHEC proposed the development of an industrial development on Goat Island to create the Portland Bight Economic Zone and a Transshipment Port. The PAJ and CHEC arrived at an initial framework agreement that provided the general terms and conditions under which discussions would continue regarding the proposed development of Portland Bight/Goat Island. The projected investment amount is US\$1.5 billion.

The initial phase would include the development of an industrial park and associated infrastructure on a total project area expected to be about 6,000 acres. Under the first phase, the industrial park would carry out the operations associated with storage, assembly and packaging of goods in light industries; heavy industry manufacturing; information technology; and skills training.

The related infrastructure needs to be developed include: bridges and roads within the project area, pipelines and water storage facilities, sewer lines and sewer treatment facilities, electricity transmission lines and electricity generation facilities, cable transmission lines, and similar services and facilities contemplated for the project.

Other investment areas include costs associated with dredging and land reclamation activities to create the port. These include creating a suitable access channel to the port facility, construction and development of a container terminal with modern fittings, technology and services, and the construction and development of berths of sufficient width, length and depth to accommodate Super Post Panamax vessels. This project would also include the construction of a coal-fired electricity generation plant that would supply the facilities within the development.

However, according to an article by *Maritime Executive*, the Jamaican Prime Minister recently announced that this facility will no longer be built at Goat Island due to the project's environmental footprint. A memorandum of understanding between GoJ and CHEC regarding the construction of this project expired in August of 2016. According to the Prime Minister, this project will still be built

but in a different location.¹ Since this project is stalled and the outcomes are unknown, this project is not considered a critical success factor for the LHI.

Additional Port Development Projects

- ▶ China Harbour Engineering Company (CHEC) has proposed establishing a transshipment port and industrial and commercial economic zone on Goat Island and the lands to the north of the islands in the Old Harbour Bay area. This development has stalled over environmental concerns.
- ▶ New Fortress Energy (NFE) and Jamaica's Public Services (JPS) have signed an agreement to develop a LNG terminal combined with a 120 megawatt power plant that would provide power for the domestic energy market and the capacity to export to other Caribbean countries, become a regional LNG hub. This aligns with the government's goal to diversify the country's energy sources. The investment is estimated to be US\$200 million.
- ▶ In Montego Bay, there is the construction of three berths and a second cruise terminal to accommodate vessels over 1,000 feet in length over all.

These additional port development projects are not considered essential for the short or mid-term success of the vision of becoming a logistics hub. With improvements and efficiencies expected from the investments in the Ports in Kingston, Jamaica will have sufficient capacity to handle the forecasted cargo flows outlined in Chapter I.2.

Air Transport

Aerodromes

There are also additional plans to develop and upgrade domestic aerodromes. The intention is to promote the participation of private investors in the development of these projects. It should be noted that investments in Jamaica's road network could reduce the number of passengers currently using local aerodromes and provide additional tourism opportunities to international passengers. We do not consider investing in aerodromes to be a prerequisite or priority for the vision of the logistics hub.

Logistics and Industrial Parks

New Fortress LNG Hub

New Fortress Energy (NFE) and JPS have signed an agreement for the supply of gas to Jamaica. The supply of LNG to the JPS will become a reality through two separate projects. First, the company is expected to invest US\$200 million to supply LNG to power the national energy grid, primarily through the JPS's Old Harbor 190-megawatt gas-fired power plant (located in between Portmore and May Pen on Hwy 2000). The facility is expected to generate more than 200,000 metric tons of LNG annually, which will initially be supplied to the domestic market. Secondly, there are also plans to expand output for delivery to other Caribbean countries using the terminal mentioned in the port

¹ "Jamaica to Relocate Planned Port Facility," Maritime-Executive, (10/2016), url: <http://www.maritime-executive.com/article/jamaica-to-relocate-planned-port-facility>

development section, thereby aiding Jamaica as a regional hub for the supply of LNG and in reducing its high energy prices. These projects are scheduled for completion and commissioning in 2017.

Spanish Town Special Economic Zone

There is a proposed investment to redevelop and expand the Spanish Town SEZ from its current 8 acres to more than 42 acres. Melchezedec Limited has entered into a concessionary agreement with lubricant blender Gulfray America's Manufacturing Limited (GULFRAY - an international corporation based in Dammam, Saudi Arabia) for the development and management of the Spanish Town Free Zone to the tune of US\$350 million. GULFRAY possesses the Free Zone license to develop the Spanish Free Zone. Other international partners include representatives from the United States, India, Dubai, Panama and Dominican Republic.

The expansion would accommodate refining and regeneration of petroleum products, manufacturing of composites and insulation material, vehicle assembly, auto parts remanufacturing and distribution, manufacturing of pharmaceuticals and nutraceutical products, as well as research and manufacturing of tobacco products. One project includes an assembly and distribution plant for the construction of motor vehicles, trucks, forklifts and buses by China National Automotive Industry International Corporation (CNAICO), a large state-owned group and a Fortune Global 500 company. The entire project schedule is for completion 2018.

LASCO Manufacturing & Distribution

LASCO Manufacturing is upgrading its capacity by adding a new filling line to quadruple production. LASCO Distribution is also expanding its warehousing capacity.

Gulfray Americas SEZ

This is a private investment project to build a blending and regeneration plant for lubricating oils at Spanish Town Free Zone.

China National Automotive Industries Assembly Plant

There are plans to build a vehicle assembly plant in Spanish Town, auto part remanufacturing of motor vehicles, trucks, forklifts and buses, and will distribute to the region.

Flager Logistics Plans in Kingston and Montego Bay

FGL is an integrated, third-party logistics provider and real estate developer. A one-stop, single-source provider for end-to-end supply chain management, perishable supply chain needs, and industrial real estate development. They have proposed logistics expansions in both Kingston and Montego Bay, but further details on such projects remain unknown.

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would carry out the operations associated with storage, assembly and packaging of goods in light industries; heavy industry manufacturing; information technology; and skills training.

The related infrastructure needs to be developed include: bridges and roads within the project area, pipelines and water storage facilities, sewer lines and sewer treatment facilities, electricity transmission lines and electricity generation facilities, cable transmission lines, and similar services and facilities contemplated for the project.

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However, according to an article by *Maritime Executive*, the Jamaican Prime Minister recently announced that this facility will no longer be built at Goat Island due to the project's environmental footprint. A memorandum of understanding between GoJ and CHEC regarding the construction of this project expired in August of 2016. According to the Prime Minister, this project will still be built but at a different location.²

Heineken – Red Stripe

Dutch beer company Heineken acquired Desnoes & Geddes Limited (D&G), brewers of Red Stripe beer, from global spirits giant Diageo Plc. in a US\$780.5 million transaction. Red Stripe has invested over US\$45 million in the production and energy capacity to expand capacity and improve efficiencies. The company intends to invest another US\$500 million over the next five years. This will involve the repatriation of the production of Red Stripe beer for export to North America in September 2016. The company also will also invest US\$10 million over the next five years to set up a cassava supply chain, as it moves to use the tuber to offset barley imports utilized in beer production.

Toyota Hino Truck Assembly

There is a proposed regional assembly hub for knock-down assembly of HINO trucks and truck bodies for distribution.

Toyota Distribution Hub for Cuba

Toyota has proposed creating a regional distribution hub for motor vehicles in Jamaica for the Cuban market. Further details on such project remain unknown.

BMW Regional Hub

ATL Automotive is seeking a regional master hub for BMW and MINI. They have named Jamaica as well as and eight other countries (including Trinidad and Tobago, the Bahamas, Cayman, Curacao,

² “Jamaica to Relocate Planned Port Facility,” *Maritime-Executive*, (10/2016), url: <http://www.maritime-executive.com/article/jamaica-to-relocate-planned-port-facility>

Barbados, Aruba, Saint Lucia, and Suriname) as possible sites for this development. Further details on such project remain unknown.

Dell Repairs / Returns Centre

This project constitutes the establishment of a Dell Repairs and Fulfillment Centre. Further details on such project remain unknown.

Amazon Fulfillment Centre

This project constitutes the establishment of an Amazon Fulfillment Centre. Further details on such project remain unknown.

Fargo Electronics

This electronics 3PL company provides assembly services for some of the top electronic manufacturing companies. They are looking to expand operations. Further details on such project remain unknown.

Naggo Head Technology Park

Naggo Head Technology Park is slated to develop a 26-acre technology park focused on information and communication technology. The Factories Corporation expansion in the Naggo Head Tech Park plans to create 750,000 square feet of BPO space. The first phase of the project plans for the construction of 120,000 square feet and employ 4,000 people.

Tables A.I.3-1 classifies our conclusions on the strategic importance of these projects to the JLHI.

Maritime-Related Infrastructure Service Projects

There are additional maritime-related service sectors, such as ship repairs and bunkering, which have projects or investments in the pipeline that would support the development of the LHI.

Ship Repair

- ▶ PAJ has signed a Memorandum of Understand (MOU) with a private consortium to develop a ship repair facility consisting of a finger pier dry dock with 1 kilometer for on-float repairs, 2 floating dry docks, and a modern (full scale) repair shop that can accommodate vessels of a maximum length over all of 265 meters. A market demand study was to be conducted in 2015.

Bunkering

- ▶ In 2013, Nanyang Technological University of Singapore, developed a study to position Jamaica as a bunkering location in the Caribbean. The study included, among other aspects, an economic impact analysis and market demand assessment, a SWOT analysis, and recommendations and policy action plans. The action plan listed various items, which included the increase of storage capacity, reduction in the bureaucracy, and development of petroleum free zones among others. Based on that study's results, Decal has proposed building a bunker terminal for a storage and distribution.
- ▶ The West Indies Petroleum company, which bought the Jamaica Broiler Group, is planning to augment bunker operations and thus augment farm storage for fuel. This project constitutes a proposed bunkering terminal at Port Esquivel, which would require investments to retrofit

and re-pipe the complex in order to store product. The project cost is estimated at between US\$30 million for a storage and distribution capacity of two million barrels of heavy fuel oil (HFO) and marine gas oil (MGO).

Ship Registry

The Maritime Authority of Jamaica is expected to engage the private sector interests for the privatization of the management, operation and promotion of the ship registry and related services. The Jamaican Ship Registry (JSR) is a full service registry committed to provide quality service to the shipping industry through its marine survey and technical support program. Such privatization could expedite the registry process.

Table A.I.3-1 classifies our conclusions on the strategic importance of these projects to the JLHI.

Additional LHI Support Projects

- ▶ CHEC has proposed the construction, in the second phase of the Highway 2000 project, for the development of three hotels with nearly 2,400 rooms and an additional housing. The project is being financed through loans provided by the China Development Bank, with additional inputs from CHEC Americas.
- ▶ Jiuquan Iron & Steel Company Ltd (JISCO) plans to acquire Alumina Partners of Jamaica (ALPART) bauxite mining and alumina processing plant. Part of the investment also involves building a 1,000 megawatt power plant to facilitate the operation the aluminum smelter and to produce value added aluminum products. Jamalco, which is owned 55 per cent by the Noble Group and 45 per cent by the GoJ, will spend roughly US\$500 million to build this coal-fired plant as a means to offset Jamaica’s current high energy costs, and sell any excess energy back the JPS to further reduce the country’s dependence on oil for generating electricity. This project is scheduled be completed by the fourth quarter of 2018. There are planned investments for hotel accommodations and the food service industry for the tourism sector. Ongoing investments in the Accommodation and Food Services Industry consist of 2,694 rooms split between new properties and expansions on existing hotels in Negril, Montego Bay, Trelawny, St Ann, and Kingston. The estimated total investment is calculated to be about US\$500 million. This industry has seen a recent surge due in part to investments being influenced by amendments to the Hotel Incentives Act which now grant tax breaks to hoteliers for refurbishing.
- ▶ The Portmore Transportation Hub is planned to improve Jamaica’s urban passenger transport.
- ▶ PAJ’s BPO complex in Portmore Town Centre consists of 5 multi-story buildings with a cumulative area of more than 147,000 square feet.

Table A.I.3-1: Qualitative Assessment of LHI Pipeline Projects (Unclassified Projects)

Pipeline Project	Proponent	Details	Project Status	Support LHI
Port infrastructure				
Goat Island Port	Private	Transshipment port construction – no studies – confidential	Conceptual	Unclassified – unknown impact

Pipeline Project	Proponent	Details	Project Status	Support LHI
NFE	Private	Agreement signed for an LNG terminal	Planned	Unclassified – direct impact
Air transport				
Sangster taxiway & aprons	Private	Rehabilitation and construction -Request for proposals 2016	Planned	Unclassified–indirect impact
Domestics aerodromes	Public	PPP related development or rehabilitation	Conceptual	Unclassified – direct impact
Inland transportation infrastructure				
Jamaica Railway	Public - PPP	Terms of reference development and negotiations with private sector. Business Case being prepared by Herzog - confidential	Conceptual /Unknown	Unclassified – direct impact
Logistics and industrial parks				
LASCO Manufacturing & Distribution	Private	Confidential – no studies	In progress	Unclassified – direct - impact
GulfRay Americas SEZ	Private	Construction of a blending and regeneration plant for lubricating oils - Confidential – no studies	Conceptual	Unclassified – indirect impact
CNAI Assembly Plant	Private	Construction of a vehicle assembly plant - Confidential – no studies	Conceptual	Unclassified – direct - impact
Flager Logistics Plans	Private	Expansion investments in Kingston and Montego Bay - Confidential – no studies	Conceptual	Unclassified – direct - impact
Goat Island Logistics Park	Private	Proposed development of park with port hub. Confidential – no studies	Conceptual	Unclassified – unknown impact
Heineken – Red Stripe	Private	Repatriation of plant for export of Red Stripe	In progress	Unclassified – direct - impact
Toyota Hino Truck Assembly	Private	Confidential – no studies	Conceptual	Unclassified – direct - impact
Toyota Distribution Hub for Cuba	Private	Confidential – no studies	Conceptual	Unclassified – indirect impact
BMW Regional Hub	Private	Confidential – no studies	Conceptual	Unclassified – direct impact
Dell Repairs/Returns Center	Private	Confidential – no studies	Conceptual	Unclassified – direct impact
Amazon Fulfillment Center	Private	Confidential – no studies	Conceptual	Unclassified – unknown impact
Other maritime infrastructure and services				
Decal Bunkering	Private	Proposal to build bunkering Confidential – no studies	Conceptual	Unclassified – direct unknown - support

Pipeline Project	Proponent	Details	Project Status	Support LHI
West Indies Petroleum	Private	proposed bunkering terminal at Port Esquivel - Confidential - no studies	Conceptual	Unclassified – indirect unknown - support
Ship Registry	PPP	Privatization of the management, operation and promotion of the Ship Registry	Conceptual	Unclassified – direct unknown - support
Portmore transportation hub	Public	Public transportation improvements. Conceptual – no studies	Conceptual	Long run - direct impact
Additional LHI support projects				
CHEC hotels	Private	Construction - Confidential – no studies	Planned	Unclassified – unknown impact
Jamalco plant	Private	M&A to build a coal-fired plant - Confidential – no studies	Conceptual	Unclassified – direct impact
Accommodation and food services	Private	Various. Confidential – no studies	Conceptual	Unclassified – unknown indirect
Naggo head technology park	Private	Expansion and construction. Confidential – no studies	Conceptual	Unclassified – unknown unknown – impact
PAJ BPO	Public	BPO complex in Portmore Town Centre - Conceptual – no studies	Conceptual	Unclassified – indirect impact

Source: Prepared by Nathan Associate with available information from various pipeline projects

Appendix I.5.1: Industry Analysis Survey Responses

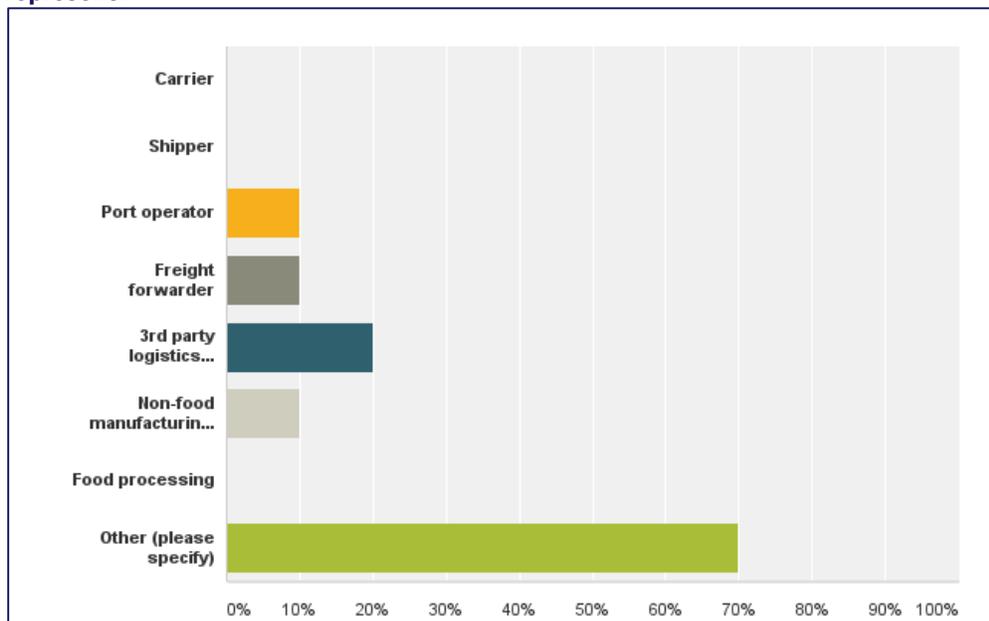
Appendix I.5.1

Survey question #1

Name of survey participants (kept confidential)

Survey question #2

Figure A.I.5.1-1: Survey question #2 responses; “Which sector/user category does your company represent?”



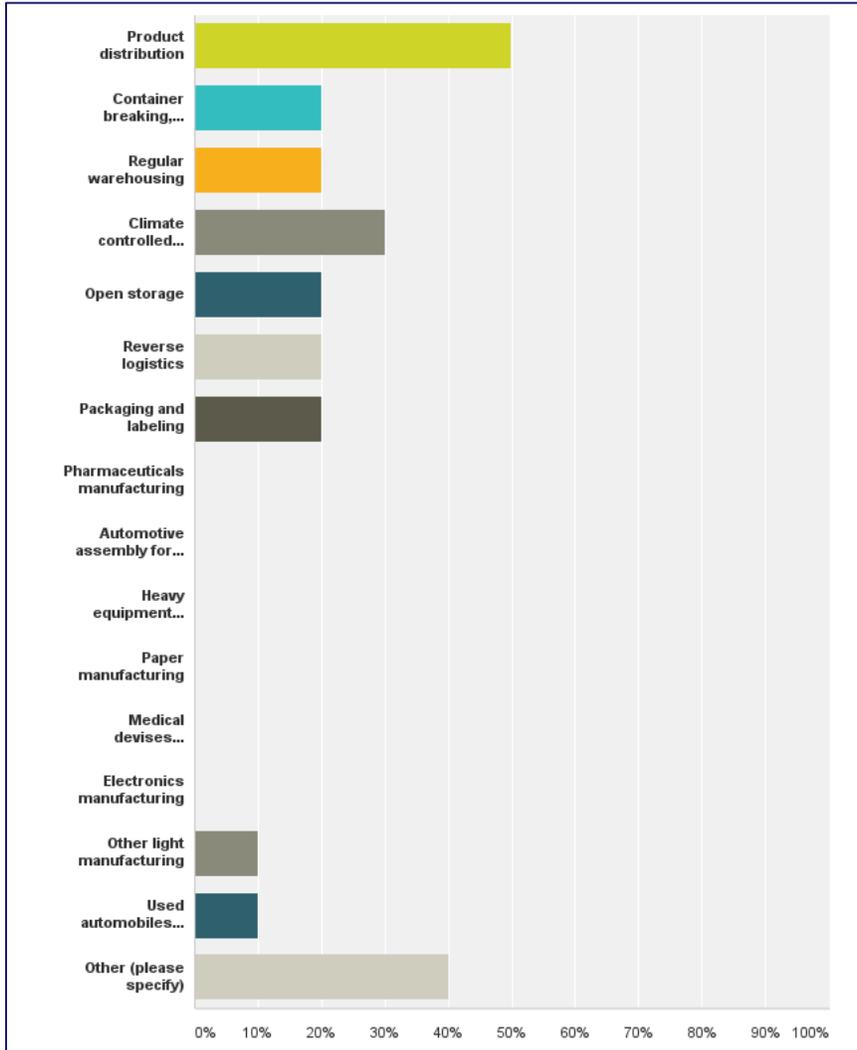
Source: Nathan Associates Inc.

The “Other (please specify)” answer category, included the following sector/user categories:

- Importer
- Independent storage facilities for petroleum products
- Transshipments and local imports
- Construction
- Ship repair company
- Information technology
- Medical disposables and pharmaceutical distributor

Survey question #3

Figure A.I.5.1-2: Survey question #3 responses; “What type of services do you offer?”
Source: Nathan Associates Inc.

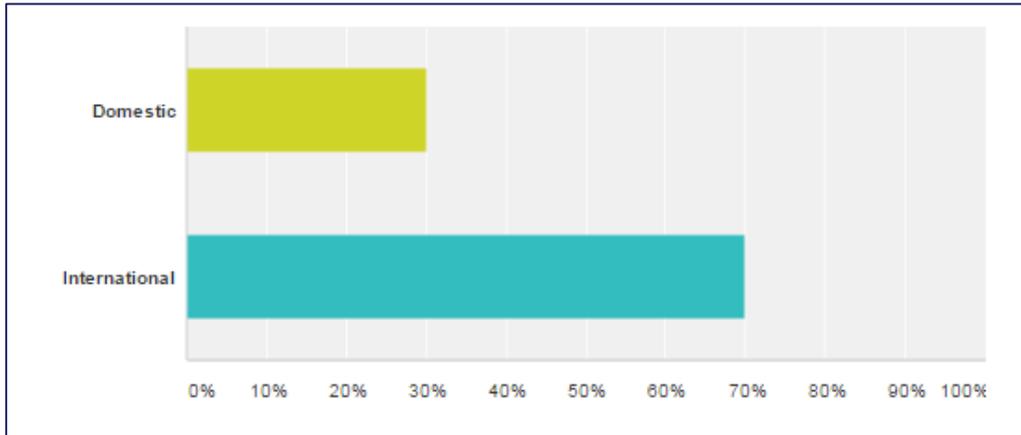


The “Other (please specify)” answer category, included the following responses:

- Design, construction, and operation of storage facility for petroleum
- Construction
- Vessel repair, hull; engines; electronics

Survey question #4

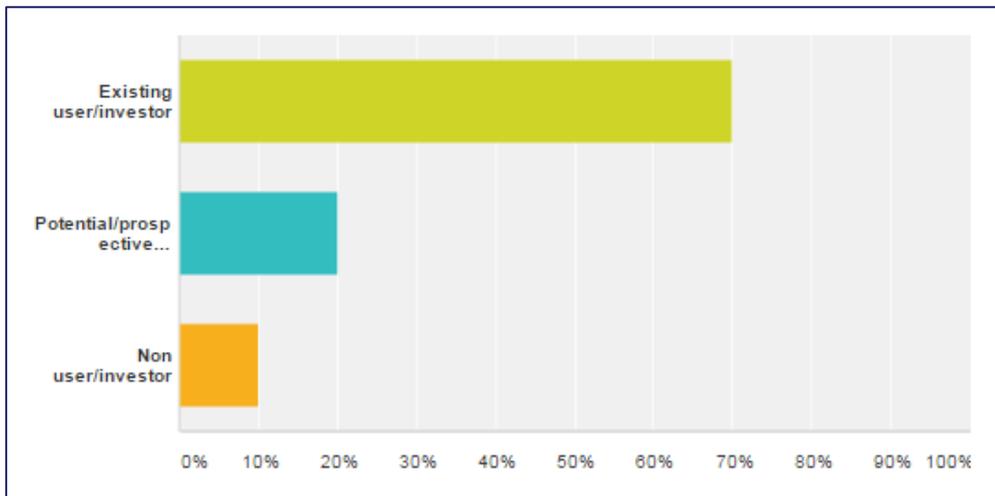
Figure A.I.5.1-3: Survey question #4 responses; “Are you a domestic or international company/business?”



Source: Nathan Associates Inc.

Survey question #5

Figure A1-4: Survey question #5 responses; “Are you an existing investor and/or user in Jamaica?”



Source: Nathan Associates Inc.

Survey question #6

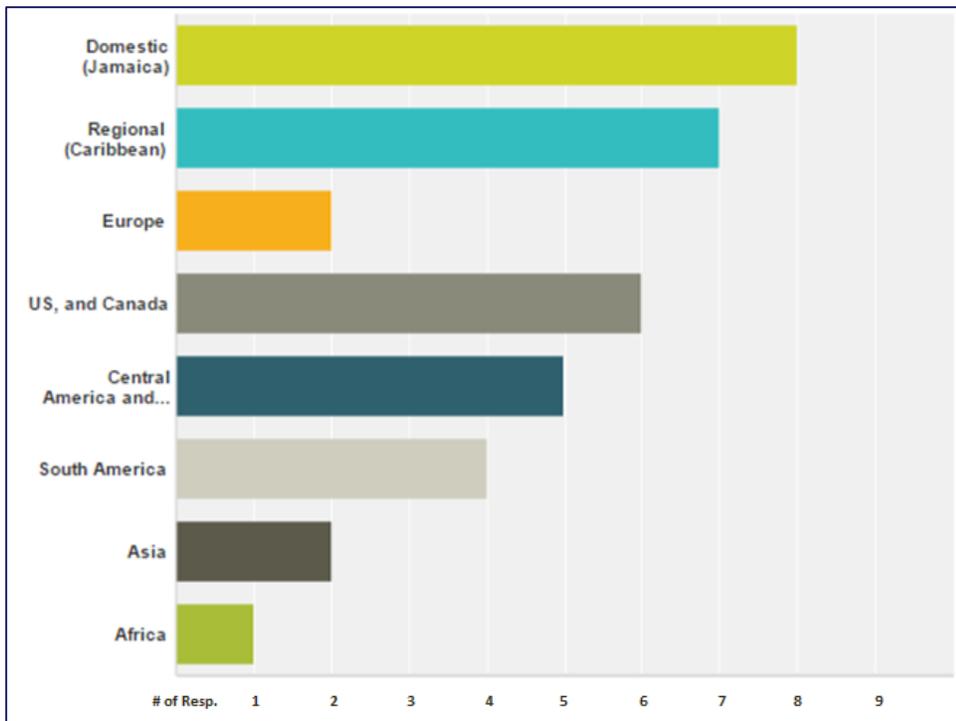
Table A.I.5.1-1: Survey question #6 responses; “What are your investment prospects/commitments”¹

Answer Choices	Average Number	Total Number
Estimated amount (USD) Responses	107,642,857	753,500,000
Estimated investment time frame (years) Responses	11	65
Total Respondents: 7		

Source: Nathan Associates Inc.

Survey question #7

Figure A.I.5.1-5: Survey question #7 responses; “What is the target market for your business?”

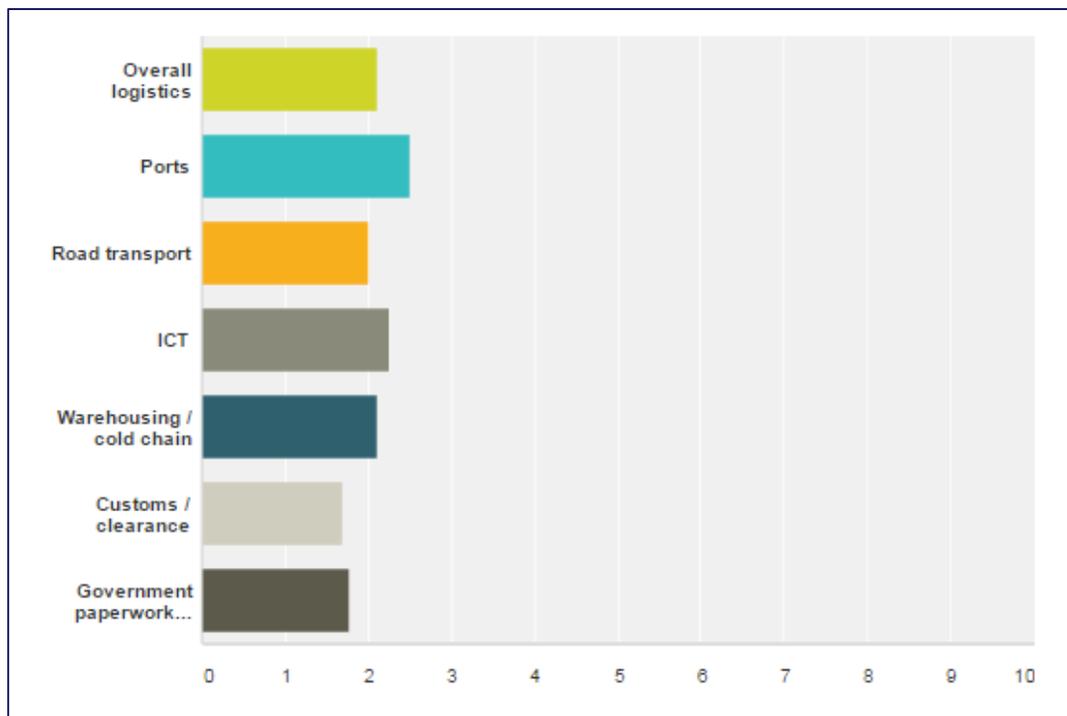


Source: Nathan Associates Inc.

¹ Based on 10 responses

Survey question #8

Figure A.I.5.1-6: Survey question #8 responses; “In terms of the strengths and weaknesses (with 1 meaning “very weak” and 4 meaning “very strong”) in Jamaica’s infrastructure and operational characteristics, how would you rate the following?”



Source: Nathan Associates Inc.

Survey question #9

Responses to “How do weaknesses in the following areas normally impact users’ business?”

Overall logistics and transshipments

- Detrimental
- Overall economy
- Strong
- Delays in Equipment can delay delivery of our services
- Increased cost which could have been avoided
- Slow business process

Ports

- Too much red tapes and staff who has no clue what they are about
- Must be improved to receive larger vessels
- Crippling
- Transshipment efficiency
- Strong
- Delays which are avoidable, hence longer waits
- Expensive and slow

Road transport

- Costly

- Transportation Efficiency
- Medium
- Generally good
- Expensive and slow

ICT

- Delays
- Operation Efficiency
- Medium
- Untrained users causes lengthy delays and expense

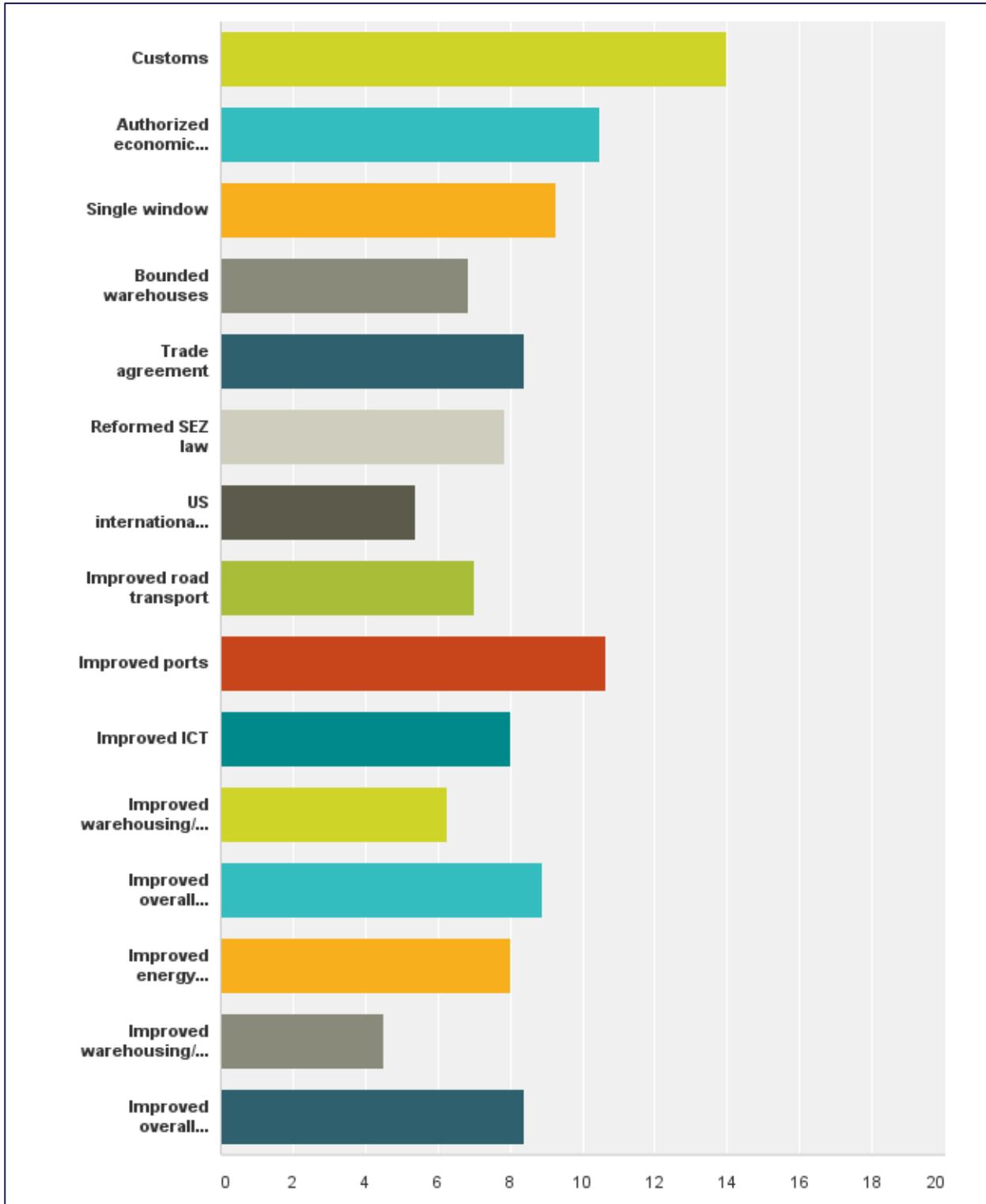
Warehousing/ cold chain

- Detrimental
- Sustainability
- Minor
- Doesn't exist
- Unavailable space. reduction in production

Source: Nathan Associates Inc.

Survey question #10

Figure A.I.5.1-7: Survey question #10 responses; “Which of the following elements are most critical for your business to succeed? (Assign ranking from 1 to 15)”



Source: Nathan Associates Inc.

Survey question #11

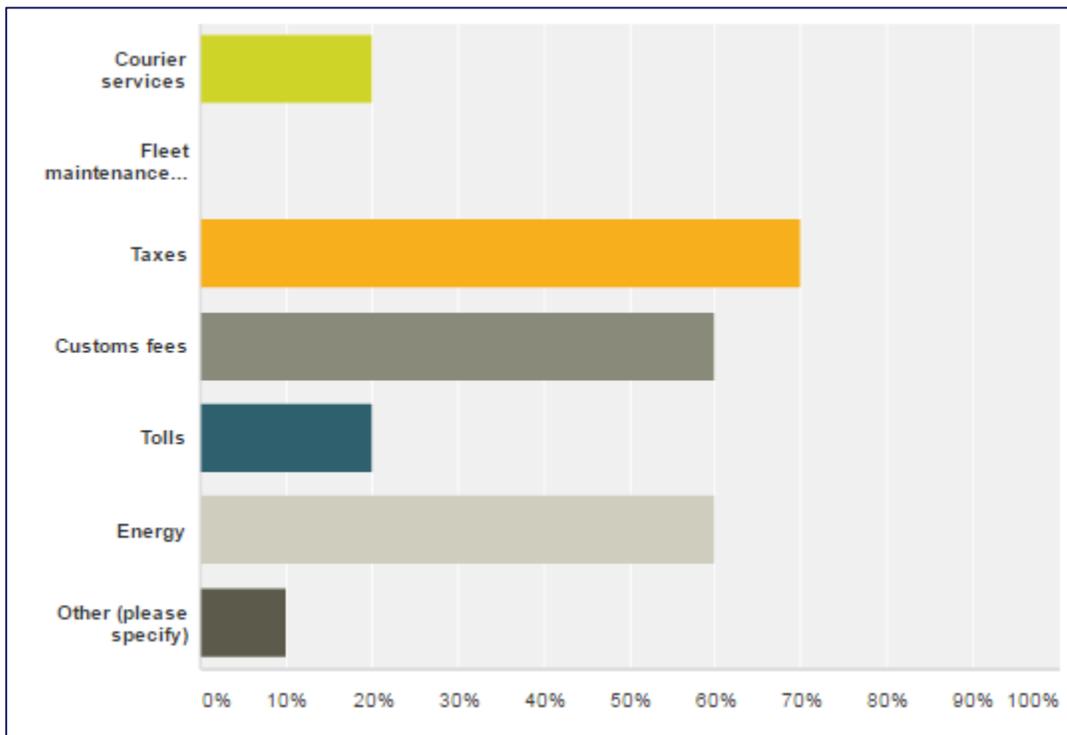
Table A.I.5.1-2: Survey question #11 responses; “How would you rate the level of service for the ports and logistics components you are familiar with in Jamaica?”

	Very Poor	Poor	Fair	Good	Total	Weighted Average
(no label)	10.00% 1	10.00% 1	80.00% 8	0.00% 0	10	2.70

Source: Nathan Associates Inc.

Survey question #12

Figure A.I.5.1-8: Survey question #12 responses; “In which of the following do you believe costs are not competitive?”



Source: Nathan Associates Inc.

Survey question #13

Table A.I.5.1-3: Survey question #13 responses; “In a hypothetical scenario, there are two countries in the Caribbean Region that are the only two choices for your company to operate in, and they are both offering average quality services at the same price. However, over a short period of time, one country is able to make significant improvements in the quality of its services, reducing paperwork submission requirements and processing times down to internationally competitive levels. Under such scenario, how much more would you be willing to pay for the following services at the country with the newly improved services?”

	Same or less	Same - 20%	+ 20% - 40%	+ 40% - 60%	+ 60% - 80%	+80%- 100%	+100% or more	Total	Weighted Average
▼ Courier services	62.50% 5	37.50% 3	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	8	1.38
▼ Fleet maintenance services	50.00% 4	37.50% 3	12.50% 1	0.00% 0	0.00% 0	0.00% 0	0.00% 0	8	1.63
▼ Taxes	55.56% 5	33.33% 3	0.00% 0	11.11% 1	0.00% 0	0.00% 0	0.00% 0	9	1.67
▼ Customs fees	55.56% 5	33.33% 3	0.00% 0	0.00% 0	0.00% 0	11.11% 1	0.00% 0	9	1.89
▼ Tolls	50.00% 4	37.50% 3	0.00% 0	0.00% 0	12.50% 1	0.00% 0	0.00% 0	8	1.88

Source: Nathan Associates Inc.

Survey question #14

Table A.I.5.1-4: Survey question #14 responses; “How do you perceive ease of doing business in Jamaica under each of the following subjects?”

	Very poor	Poor	Fair	High	Very high	Total	Weighted Average
▼ Starting a business	0.00% 0	25.00% 2	37.50% 3	37.50% 3	0.00% 0	8	3.13
▼ Dealing with construction permits	0.00% 0	71.43% 5	28.57% 2	0.00% 0	0.00% 0	7	2.29
▼ Access to electricity	0.00% 0	0.00% 0	62.50% 5	25.00% 2	12.50% 1	8	3.50
▼ Registering property	0.00% 0	42.86% 3	57.14% 4	0.00% 0	0.00% 0	7	2.57
▼ Access to credit	28.57% 2	0.00% 0	42.86% 3	14.29% 1	14.29% 1	7	2.86
▼ Paying taxes	14.29% 1	14.29% 1	57.14% 4	14.29% 1	0.00% 0	7	2.71
▼ Trading across borders	16.67% 1	0.00% 0	66.67% 4	16.67% 1	0.00% 0	6	2.83
▼ Enforcing contracts	0.00% 0	16.67% 1	33.33% 2	50.00% 3	0.00% 0	6	3.33
▼ Resolving insolvency	0.00% 0	0.00% 0	80.00% 4	20.00% 1	0.00% 0	5	3.20

Source: Nathan Associates Inc.

Survey question #15

Table A.I.5.1-5: Survey question #15 responses; “How do you expect demand for your services and products in Jamaica to be over the next years?”

	Very low	Low	Average	High	Very high	Total	Weighted Average
5 - 10 years	0.00% 0	40.00% 4	20.00% 2	40.00% 4	0.00% 0	10	3.00
10 - 20 years	0.00% 0	25.00% 2	25.00% 2	50.00% 4	0.00% 0	8	3.25
20 + years	0.00% 0	11.11% 1	22.22% 2	44.44% 4	22.22% 2	9	3.78

Source: Nathan Associates Inc.

Survey question #16

Responses to “Please explain the reason for your rating on the previous question”

- We are importing products and Jamaica is a niche Market
- Decal customers are the ones to decide if location will be in Jamaica
- Over a long we are expecting our products and services to be in high demand
- We see great potential in Jamaica
- Our primary arm of business is international and scope of work required locally may not be as financially attractive as pursuing international business.
- The industry is a cycle with peaks and deeps. It understanding the cycle and being able to adapt.
- Growing demand and improved economic conditions

Source: Nathan Associates Inc. using Survey Monkey

Survey question #17

Figure A.I.5.1-6: Survey question #17 responses; “How much would the current status in Jamaica need to improve in order to make it attractive for you to invest?”

	x 1	x 1.5	x 2	x 2.5	x 3	Total	Weighted Average
Reduction in time	20.00% 1	20.00% 1	20.00% 1	0.00% 0	40.00% 2	5	3.20
Reduction in costs	20.00% 1	20.00% 1	40.00% 2	20.00% 1	0.00% 0	5	2.60
Increase in reliability	25.00% 1	25.00% 1	50.00% 2	0.00% 0	0.00% 0	4	2.25
Improvement in ease of doing business	16.67% 1	33.33% 2	0.00% 0	50.00% 3	0.00% 0	6	2.83

Source: Nathan Associates Inc.

Appendix I.5.2: Industry Analysis MCA Procedures

Appendix I.5.2

Multi-Criteria Analysis Step 3: Weighing Criteria

The below table A.I.5.2-1 shows the initial step undertaken towards assigning weights to the selected criteria. This process involved asking the question “to what degree is a criterion in the column more (or less) relevant to each criterion in the row a more or less effective determinant for industries to achieve the vision of the LHI?”

Table A.I.5.2-1: Assigning Weights to Criteria, Step a.

	Competitive Advantage	Policy, Legal, and Regulatory Framework	Trade Flow s	Long Term Employment Generation	Potential Revenue Generation	Contributes to Improving Technical Capacity of Population
Competitive Advantage	1	0.5	2	0.5	0.333333	0.5
Policy, Legal, and Regulatory Framework	2	1	2	1	1	1
Trade Flow s	0.5	0.5	1	0.333333	0.333333	1
Long Term Employment Generation	2	1	3	1	1	1
Potential Revenue Generation	3	1	3	1	1	1
Contributes to Improving Technical Capacity of Population	2	1	1	1	1	1
	10.5	5	12	4.833333	4.666667	5.5

Source: Nathan Associates Inc.

The below table A.I.5.2-2 shows the second step undertaken towards assigning weights to the selected criteria. Final criteria weights are calculated by dividing each comparison score attained in the first step by the sum of each column. Then an average for each row is calculated to represent the weights of the criteria in each row. The ranking by criteria weigh is shown in the far right column.

Table A.I.5.2-2: Assigning Weights to Criteria, Step b

	Competitive Advantage	Policy, Legal, and Regulatory Framework	Trade Flow s	Long Term Employment Generation	Potential Revenue Generation	Contributes to Improving Technical Capacity of Population	Ave	Rank
Competitive Advantage	0.10	0.10	0.17	0.10	0.07	0.09	0.105	5
Policy, Legal, and Regulatory Framework	0.19	0.20	0.17	0.21	0.21	0.18	0.193	3
Trade Flow s	0.05	0.10	0.08	0.07	0.07	0.18	0.092	6
Long Term Employment Generation	0.19	0.20	0.25	0.21	0.21	0.18	0.207	2
Potential Revenue Generation	0.29	0.20	0.25	0.21	0.21	0.18	0.223	1
Contributes to Improving Technical Capacity of	0.19	0.20	0.08	0.21	0.21	0.18	0.179	4
	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	

Source: Nathan Associates Inc.

Multi-Criteria Analysis Step 4: Assigning Weights to Industries

The below table A.I.5.2-3 shows the initial step undertaken towards assigning weights to the industries. This process involved the use of a pairwise comparison matrix where scores were attained through asking the question “**to what degree would each industry in the left column be favored by a criterion (in this example, the “Trade Flows” is the criterion) relative to each industry in the top row?**”

Table A.I.5.2-4 shows the second step undertaken towards assigning weights to the selected industries. Like in the weighing of criteria, weights are calculated by dividing each comparison score attained in the first matrix by the sum of each column. Then, an average for each row is calculated to represent the weighys of the industries in each row (purple column on the far-right side of Table A.I.5.2-4).

This industry ranking process shown in Tables A.I.5.2-3 and A.I.5.2-4 was repeated for each of the 6 criterion. The industry ranking tables corresponding to each of the criterion are found in Tables A.I.5.2-5 to A.I.5.2-14.

Table A.I.5.2-3: Assigning Weights to Viable Industries (Example of Weighing Industries against Trade Flow Criteria; 1 out of 6), Step a

Trade Flows	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec. Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc. None! Domestic & Pts, Ir & Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und, 80% Alc; Spirit Beverage	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt ind. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fin	Assembly and distribution services of gen commodities, and General warehousing and storage	Refrigerated warehousing and storage
Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	1.00	0.50	0.50	2.00	0.50	2.00	1.00	2.00	1.00	1.00	4.00	2.00	5.00	5.00	0.33	1.00
Elec. Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	2.00	1.00	1.00	3.00	1.00	2.00	1.00	2.00	0.50	1.00	5.00	2.00	2.00	2.00	0.50	1.00
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	2.00	1.00	1.00	4.00	2.00	3.00	2.00	3.00	1.00	1.00	5.00	3.00	2.00	2.00	0.50	2.00
Stoves, Ranges Etc. None! Domestic & Pts, Ir & Steel, NESOI	0.50	0.33	0.25	1.00	3.00	2.00	1.00	4.00	0.50	1.00	4.00	2.00	3.00	4.00	0.33	1.00
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	2.00	1.00	0.50	0.33	1.00	2.00	-0.50	1.00	0.50	1.00	4.00	2.00	2.00	2.00	0.50	1.00
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.50	0.50	0.33	0.50	0.50	1.00	0.33	1.00	0.50	0.50	2.00	3.00	1.00	1.00	0.50	1.00
Ethyl Alcohol, Udenat, Und, 80% Alc; Spirit Beverage	1.00	1.00	0.50	1.00	2.00	3.00	1.00	2.00	1.00	1.00	4.00	2.00	2.00	2.00	1.00	2.00
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.50	0.50	0.33	0.25	1.00	1.00	0.50	1.00	0.50	0.50	4.00	1.00	2.00	2.00	0.50	0.50
Crude oil from petroleum and bituminous minerals	1.00	2.00	1.00	2.00	2.00	2.00	1.00	2.00	1.00	1.00	2.00	2.00	2.00	0.50	2.00	1.00
Aluminum Ores And Concentrates	1.00	1.00	1.00	1.00	1.00	2.00	1.00	2.00	1.00	1.00	4.00	4.00	2.00	2.00	0.50	0.50
Salt ind. table & dentrd, pure sodium chloride	0.25	0.20	0.20	0.25	0.25	0.50	0.25	0.25	0.50	0.25	1.00	0.33	0.50	0.50	0.33333333	0.5
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.50	0.50	0.33	0.50	0.50	0.33	0.50	1.00	0.50	0.25	3.00	1.00	1.00	1.00	1.00	1.00
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.20	0.50	0.50	0.33	0.50	1.00	0.50	0.50	0.50	0.50	2.00	1.00	1.00	2.00	0.50	1.00
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fin	0.20	0.50	0.50	0.25	0.50	1.00	0.50	0.50	2.00	0.50	2.00	1.00	0.50	1.00	0.33	0.50
Assembly and distribution services of gen commodities, and General warehousing and storage	3.00	2.00	2.00	3.00	2.00	2.00	1.00	2.00	0.50	2.00	3.00	1.00	2.00	3.00	1.00	3
Refrigerated warehousing and storage	1.00	1.00	0.50	1.00	1.00	1.00	0.50	2.00	1.00	2.00	2.00	1.00	1.00	2.00	0.33	1.00
	16.60	13.50	10.40	20.40	18.70	25.80	11.50	26.20	12.50	14.50	51.00	28.30	29.00	32.00	10.17	18.00

Source: Nathan Associates Inc.

Table A.I.5.2-4: Assigning Weights to Viable Industries (Example of Weighing Industries against Trade Flow Criteria; 1 out of 6), Step 2-b

Trade Flows	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Inc Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tri-cycle) No Motor	Stoves, Ranges Etc, Nonel Domest & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Undenat, Und. 80% Alc; Spirit Beverage	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus, Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	Assembly and distribution services of gen commodities, and General warehousing and storage	Refrigerated warehousing and storage	Sum/16
Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	0.06	0.04	0.05	0.10	0.03	0.08	0.09	0.08	0.08	0.07	0.08	0.07	0.17	0.16	0.03	0.06	0.08
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Inc Video Monitors & Projectors	0.12	0.07	0.10	0.15	0.05	0.08	0.09	0.08	0.04	0.07	0.10	0.07	0.07	0.06	0.05	0.06	0.08
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tri-cycle) No Motor	0.12	0.07	0.10	0.20	0.11	0.12	0.17	0.11	0.08	0.07	0.10	0.11	0.07	0.06	0.05	0.11	0.10
Stoves, Ranges Etc, Nonel Domest & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.03	0.02	0.02	0.05	0.16	0.08	0.09	0.15	0.04	0.07	0.08	0.07	0.10	0.13	0.03	0.06	0.07
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.12	0.07	0.05	0.02	0.05	0.08	-0.04	0.04	0.04	0.07	0.08	0.07	0.07	0.06	0.05	0.06	0.05
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.03	0.04	0.03	0.02	0.03	0.04	0.03	0.04	0.04	0.03	0.04	0.11	0.03	0.03	0.05	0.06	0.04
Ethyl Alcohol, Undenat, Und. 80% Alc; Spirit Beverage	0.06	0.07	0.05	0.05	0.11	0.12	0.09	0.08	0.08	0.07	0.08	0.07	0.07	0.06	0.10	0.11	0.08
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.03	0.04	0.03	0.01	0.05	0.04	0.04	0.04	0.03	0.03	0.08	0.04	0.07	0.06	0.05	0.03	0.04
Crude oil from petroleum and bituminous minerals	0.06	0.15	0.10	0.10	0.11	0.08	0.09	0.08	0.08	0.07	0.04	0.07	0.07	0.02	0.20	0.06	0.08
Aluminum Ores And Concentrates	0.06	0.07	0.10	0.05	0.05	0.08	0.09	0.08	0.08	0.07	0.08	0.14	0.07	0.06	0.05	0.03	0.07
Salt incl. table & dentrd, pure sodium chloride	0.02	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.04	0.02	0.02	0.01	0.02	0.02	0.03	0.03	0.02
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.03	0.04	0.03	0.02	0.03	0.01	0.04	0.04	0.02	0.06	0.04	0.03	0.03	0.03	0.10	0.06	0.04
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus, Tubes, Panels, Screen Etc., Pt	0.01	0.04	0.05	0.02	0.03	0.04	0.04	0.02	0.04	0.03	0.04	0.04	0.03	0.06	0.05	0.06	0.04
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	0.01	0.04	0.05	0.01	0.03	0.04	0.04	0.02	0.16	0.03	0.04	0.04	0.02	0.03	0.03	0.03	0.04
Assembly and distribution services of gen commodities, and General warehousing and storage	0.18	0.15	0.19	0.15	0.11	0.08	0.09	0.08	0.04	0.14	0.06	0.04	0.07	0.09	0.10	0.17	0.11
Refrigerated warehousing and storage	0.06	0.07	0.05	0.05	0.05	0.04	0.04	0.08	0.08	0.14	0.04	0.04	0.03	0.06	0.03	0.06	0.08
Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Nathan Associates Inc.

Table A.I.5.2-5: Assigning Weights to Viable Industries (Example of Weighing Industries against Competitive Advantage Criteria; 2 out of 6), Step a

Competitive Advantage	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc; Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus, Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	Assembly and distribution services of gen commodities, and general warehousing and storage	Refrigerated warehousing and storage
Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	1.00	0.50	0.33	1.00	0.50	2.00	0.50	0.50	1.00	1.00	4.00	1.00	2.00	4.00	0.33	2.00
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	2.00	1.00	0.50	2.00	0.50	4.00	0.50	1.00	1.00	1.00	5.00	2.00	2.00	3.00	0.50	2.00
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	3.00	2.00	1.00	4.00	1.00	4.00	1.00	2.00	2.00	1.00	5.00	2.00	3.00	3.00	1.00	2.00
Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	1.00	0.50	0.25	1.00	2.00	1.00	0.33	0.50	0.50	0.50	2.00	1.00	2.00	2.00	0.50	2.00
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	2.00	2.00	1.00	0.50	1.00	2.00	-0.50	1.00	0.50	0.50	4.00	1.00	3.00	3.00	0.50	3.00
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.50	0.25	0.25	1.00	0.50	1.00	1.00	1.00	1.00	0.50	1.00	2.00	2.00	2.00	0.50	2.00
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	2.00	2.00	1.00	3.00	2.00	1.00	1.00	2.00	1.00	1.00	4.00	5.00	4.00	4.00	1.00	4.00
Fruit, Nuts Etc. Prepared Or Preserved NESOI	2.00	1.00	0.50	2.00	1.00	1.00	0.50	1.00	0.50	0.50	2.00	2.00	2.00	2.00	0.50	2.00
Crude oil from petroleum and bituminous minerals	1.00	1.00	0.50	2.00	2.00	2.00	1.00	2.00	1.00	0.50	0.50	0.50	0.50	0.50	0.25	1.00
Aluminum Ores And Concentrates	1.00	1.00	1.00	2.00	2.00	1.00	1.00	2.00	2.00	1.00	2.00	2.00	2.00	4.00	0.50	2.00
Salt incl. table & dentrd, pure sodium chloride	0.25	0.20	0.20	0.50	0.25	0.50	0.25	0.50	2.00	0.50	1.00	1.00	0.50	0.50	0.33333333	1
Jams, Fruit Jellies, Marmalades Etc., Cooked	1.00	0.50	0.50	1.00	1.00	0.50	0.20	0.50	2.00	0.50	1.00	1.00	0.50	0.50	0.33	2.00
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.50	0.50	0.33	0.50	0.33	0.50	0.25	0.50	2.00	0.50	2.00	2.00	1.00	2.00	0.50	2.00
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	0.25	0.33	0.33	0.50	0.33	0.50	0.25	0.50	2.00	0.25	2.00	2.00	0.50	1.00	0.50	2.00
Assembly and distribution services of gen commodities, and general warehousing and storage	3.00	2.00	1.00	2.00	2.00	2.00	1.00	2.00	4.00	2.00	3.00	3.00	2.00	2.00	1.00	0.33333333
Refrigerated warehousing and storage	0.50	0.50	0.50	0.50	0.33	0.50	0.25	0.50	1.00	0.50	1.00	0.50	0.50	0.50	3.00	1.00
	21.00	15.28	9.20	23.50	16.75	23.50	8.53	17.50	23.00	12.25	40.50	28.00	27.50	34.00	11.25	30.33

Source: Nathan Associates Inc.

Table A.I.5.2-6: Assigning Weights to Viable Industries (Example of Weighing Industries against Competitive Advantage Criteria; 2 out of 6), Step 2-b

Normalized	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	Assembly and distribution services of gen commodities, and General warehousing and storage	Refrigerated warehousing and storage	Sum/16
Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	0.05	0.03	0.04	0.04	0.03	0.09	0.06	0.03	0.04	0.08	0.10	0.04	0.07	0.12	0.03	0.07	0.06
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	0.10	0.07	0.05	0.09	0.03	0.17	0.06	0.06	0.04	0.08	0.12	0.07	0.07	0.09	0.04	0.07	0.08
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	0.14	0.13	0.11	0.17	0.06	0.17	0.12	0.11	0.09	0.08	0.12	0.07	0.11	0.09	0.09	0.07	0.11
Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.05	0.03	0.03	0.04	0.12	0.04	0.04	0.03	0.02	0.04	0.05	0.04	0.07	0.06	0.04	0.07	0.05
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.10	0.13	0.11	0.02	0.06	0.09	-0.06	0.06	0.02	0.04	0.10	0.04	0.11	0.09	0.04	0.10	0.06
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.02	0.02	0.03	0.04	0.03	0.04	0.12	0.06	0.02	0.08	0.05	0.07	0.07	0.06	0.04	0.07	0.05
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	0.10	0.13	0.11	0.13	0.12	0.04	0.12	0.11	0.04	0.08	0.10	0.18	0.15	0.12	0.09	0.13	0.11
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.10	0.07	0.05	0.09	0.06	0.04	0.06	0.06	0.02	0.04	0.05	0.07	0.07	0.06	0.04	0.07	0.06
Crude oil from petroleum and bituminous minerals	0.05	0.07	0.05	0.09	0.12	0.09	0.12	0.11	0.04	0.04	0.01	0.02	0.02	0.01	0.02	0.03	0.06
Aluminum Ores And Concentrates	0.05	0.07	0.11	0.09	0.12	0.04	0.12	0.11	0.09	0.08	0.05	0.07	0.07	0.12	0.04	0.07	0.08
Salt incl. table & dentrd, pure sodium chloride	0.01	0.01	0.02	0.02	0.01	0.02	0.03	0.03	0.09	0.04	0.02	0.04	0.02	0.01	0.03	0.03	0.03
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.05	0.03	0.05	0.04	0.06	0.02	0.02	0.03	0.09	0.04	0.02	0.04	0.02	0.01	0.03	0.07	0.04
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.02	0.03	0.04	0.02	0.02	0.02	0.03	0.03	0.09	0.04	0.05	0.07	0.04	0.06	0.04	0.07	0.04
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	0.01	0.02	0.04	0.02	0.02	0.02	0.03	0.03	0.09	0.02	0.05	0.07	0.02	0.03	0.04	0.07	0.04
Assembly and distribution services of gen commodities, and General warehousing and storage	0.14	0.13	0.11	0.09	0.12	0.09	0.12	0.11	0.17	0.16	0.07	0.11	0.07	0.06	0.09	0.01	0.10
Refrigerated warehousing and storage	0.02	0.03	0.05	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.02	0.02	0.02	0.01	0.27	0.03	0.04
Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Nathan Associates Inc.

Table A.I.5.2-7: Assigning Weights to Viable Industries (Example of Weighing Industries Against Policy, Legal, and Regulatory Framework Criteria; 3 out of 6), Step a

Policy, Legal, and Regulatory Framework	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus, Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	Assembly and distribution services of gen commodities, and warehousing and storage	Refrigerated warehousing and storage
Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	1.00	0.50	0.33	2.00	0.50	1.00	0.50	1.00	0.50	0.50	1.00	1.00	1.00	1.00	0.50	1.00
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	2.00	1.00	0.50	1.00	1.00	1.00	0.50	0.50	1.00	0.50	1.00	1.00	1.00	1.00	0.50	1.00
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	3.00	2.00	1.00	1.00	2.00	2.00	1.00	1.00	1.00	0.50	1.00	2.00	2.00	2.00	1.00	2.00
Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.50	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.33	0.50	1.00	1.00	1.00	0.50	1.00
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	2.00	1.00	0.50	1.00	1.00	2.00	-0.50	1.00	0.50	0.50	1.00	2.00	2.00	2.00	1.00	2.00
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	1.00	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50	0.33	1.00	1.00	1.00	1.00	0.50	1.00
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	2.00	2.00	1.00	2.00	2.00	2.00	1.00	2.00	1.00	1.00	2.00	3.00	3.00	3.00	2.00	2.00
Fruit, Nuts Etc. Prepared Or Preserved NESOI	1.00	2.00	1.00	2.00	1.00	1.00	0.50	1.00	0.50	0.33	1.00	1.00	1.00	1.00	0.50	1.00
Crude oil from petroleum and bituminous minerals	2.00	1.00	1.00	2.00	2.00	2.00	1.00	2.00	1.00	1.00	2.00	3.00	3.00	3.00	1.00	2.00
Aluminum Ores And Concentrates	2.00	2.00	2.00	3.00	2.00	3.00	1.00	3.00	1.00	1.00	1.00	2.00	2.00	2.00	1.00	2.00
Salt incl. table & dentrd, pure sodium chloride	1.00	1.00	1.00	2.00	1.00	1.00	0.50	1.00	0.50	1.00	1.00	1.00	0.50	0.50	1	2
Jams, Fruit Jellies, Marmalades Etc., Cooked	1.00	1.00	0.50	1.00	0.50	1.00	0.33	1.00	0.33	0.50	1.00	1.00	1.00	1.00	0.50	1.00
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus, Tubes, Panels, Screen Etc., Pt	1.00	1.00	0.50	1.00	0.50	1.00	0.33	1.00	0.33	0.50	2.00	1.00	1.00	0.50	1.00	2.00
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	1.00	1.00	0.50	1.00	0.50	1.00	0.33	1.00	0.33	0.50	2.00	1.00	2.00	1.00	1.00	2.00
Assembly and distribution services of gen commodities, and warehousing and storage	2.00	2.00	1.00	2.00	1.00	2.00	0.50	2.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	2
Refrigerated warehousing and storage	1.00	1.00	0.50	1.00	0.50	1.00	0.50	1.00	0.50	0.50	0.50	1.00	0.50	0.50	0.50	1.00
	23.50	20.50	12.83	24.00	17.00	23.00	8.50	20.00	10.50	10.00	19.00	24.00	23.00	21.50	13.50	25.00

Source: Nathan Associates Inc.

Table A.I.5.2-8: Assigning Weights to Viable Industries (Example of Weighing Industries Against Policy, Legal, and Regulatory Framework Criteria; 3 out of 6), Step 2-b

Normalized	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	Assembly and distribution services of gen commodities, and General warehousing and storage	Refrigerated warehousing and storage	Sum/16
Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	0.04	0.02	0.03	0.08	0.03	0.04	0.06	0.05	0.05	0.05	0.05	0.04	0.04	0.05	0.04	0.04	0.04
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	0.09	0.05	0.04	0.04	0.06	0.04	0.06	0.03	0.10	0.05	0.05	0.04	0.04	0.05	0.04	0.04	0.04
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	0.13	0.10	0.08	0.04	0.12	0.09	0.12	0.05	0.10	0.05	0.05	0.08	0.09	0.09	0.07	0.08	0.08
Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.02	0.05	0.08	0.04	0.06	0.04	0.06	0.03	0.05	0.03	0.03	0.04	0.04	0.05	0.04	0.04	0.04
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.09	0.05	0.04	0.04	0.06	0.09	-0.06	0.05	0.05	0.05	0.05	0.08	0.09	0.09	0.07	0.08	0.06
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.04	0.05	0.04	0.04	0.03	0.04	0.06	0.05	0.05	0.03	0.05	0.04	0.04	0.05	0.04	0.04	0.04
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	0.09	0.10	0.08	0.08	0.12	0.09	0.12	0.10	0.10	0.10	0.11	0.13	0.13	0.14	0.15	0.08	0.11
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.04	0.10	0.08	0.08	0.06	0.04	0.06	0.05	0.05	0.03	0.05	0.04	0.04	0.05	0.04	0.04	0.05
Crude oil from petroleum and bituminous minerals	0.09	0.05	0.08	0.08	0.12	0.09	0.12	0.10	0.10	0.10	0.11	0.13	0.13	0.14	0.07	0.08	0.10
Aluminum Ores And Concentrates	0.09	0.10	0.16	0.13	0.12	0.13	0.12	0.15	0.10	0.10	0.05	0.08	0.09	0.09	0.07	0.08	0.10
Salt incl. table & dentrd, pure sodium chloride	0.04	0.05	0.08	0.08	0.06	0.04	0.06	0.05	0.05	0.10	0.05	0.05	0.04	0.02	0.07	0.08	0.06
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.04	0.05	0.04	0.04	0.03	0.04	0.04	0.05	0.03	0.05	0.05	0.04	0.04	0.05	0.04	0.04	0.04
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.04	0.05	0.04	0.04	0.03	0.04	0.04	0.05	0.03	0.05	0.11	0.04	0.04	0.02	0.07	0.08	0.05
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	0.04	0.05	0.04	0.04	0.03	0.04	0.04	0.05	0.03	0.05	0.11	0.04	0.09	0.05	0.07	0.08	0.05
Assembly and distribution services of gen commodities, and General warehousing and storage	0.09	0.10	0.08	0.08	0.06	0.09	0.06	0.10	0.10	0.10	0.05	0.08	0.04	0.05	0.07	0.08	0.08
Refrigerated warehousing and storage	0.04	0.05	0.04	0.04	0.03	0.04	0.06	0.05	0.05	0.05	0.03	0.04	0.02	0.02	0.04	0.04	0.04
Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Nathan Associates Inc.

Table A.I.5.2-9: Assigning Weights to Viable Industries (Example of Weighing Industries against Long Term Employment Generation Criteria; 4 out of 6), Step a

Long Term Employment Generation	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc, Nonel Domest & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	Assembly and distribution services of gen commodities, and General warehousing and storage	Refrigerated warehousing and storage
Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	1.00	2.00	0.50	3.00	4.00	4.00	2.00	4.00	10.00	5.00	4.00	4.00	2.00	2.00	1.00	2.00
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	0.50	1.00	0.50	2.00	4.00	4.00	2.00	4.00	10.00	5.00	4.00	4.00	2.00	2.00	1.00	2.00
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	2.00	2.00	1.00	4.00	4.00	4.00	2.00	4.00	10.00	5.00	4.00	4.00	2.00	2.00	1.00	2.00
Stoves, Ranges Etc, Nonel Domest & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.33	0.50	0.25	1.00	2.00	2.00	1.00	2.00	4.00	4.00	4.00	4.00	1.00	1.00	0.50	2.00
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.25	0.25	0.25	0.50	1.00	1.00	-0.50	1.00	2.00	2.00	1.00	1.00	0.33	0.33	0.25	0.50
Sauces & Prep, Mixed Condiments, Mustard Flour Etc.	0.25	0.25	0.25	0.50	1.00	1.00	0.50	1.00	2.00	2.00	1.00	1.00	0.33	0.33	0.25	0.50
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	0.50	0.50	0.50	1.00	2.00	2.00	1.00	2.00	4.00	4.00	2.00	2.00	0.50	0.50	0.50	2.00
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.25	0.25	0.25	0.50	1.00	1.00	0.50	1.00	2.00	2.00	1.00	1.00	0.33	0.33	0.25	0.50
Crude oil from petroleum and bituminous minerals	0.10	0.10	0.10	0.25	0.50	0.50	0.25	0.50	1.00	0.50	0.33	0.33	0.25	0.25	0.20	0.33
Aluminum Ores And Concentrates	0.20	0.20	0.20	0.25	0.50	0.50	0.25	0.50	2.00	1.00	0.50	0.50	0.33	0.33	0.25	0.50
Salt incl. table & dentrd, pure sodium chloride	0.25	0.25	0.25	0.25	1.00	1.00	0.50	1.00	3.00	2.00	1.00	1.00	0.33	0.33	0.25	0.5
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.25	0.25	0.25	0.25	1.00	1.00	0.50	1.00	3.00	2.00	1.00	1.00	0.33	0.33	0.25	0.50
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.50	0.50	0.50	1.00	3.00	3.00	2.00	3.00	4.00	3.00	3.00	3.00	1.00	2.00	2.00	3.00
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	0.50	0.50	0.50	1.00	3.00	3.00	2.00	3.00	4.00	3.00	3.00	3.00	0.50	1.00	1.00	3.00
Assembly and distribution services of gen commodities, and General warehousing and storage	1.00	1.00	1.00	2.00	4.00	4.00	2.00	4.00	5.00	4.00	4.00	4.00	0.50	1.00	1.00	2.00
Refrigerated warehousing and storage	0.50	0.50	0.50	0.50	2.00	2.00	0.50	2.00	3.00	2.00	2.00	2.00	0.33	0.33	0.50	1.00
	8.38	10.05	6.80	18.00	34.00	34.00	16.50	34.00	69.00	46.50	35.83	35.83	12.08	14.08	10.20	22.33

Source: Nathan Associates Inc.

Table A.I.5.2-10: Assigning Weights to Viable Industries (Example of Weighing Industries against Long Term Employment Generation Criteria; 4 out of 6), Step 2-b

Normalized	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc Fm	Assembly and distribution services of gen commodities, and General warehousing and storage	Refrigerated warehousing and storage	Sum/17
Air Conditioning Machines (Temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	0.12	0.20	0.07	0.17	0.12	0.12	0.12	0.12	0.14	0.11	0.11	0.11	0.17	0.14	0.10	0.09	0.13
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	0.06	0.10	0.07	0.11	0.12	0.12	0.12	0.12	0.14	0.11	0.11	0.11	0.17	0.14	0.10	0.09	0.11
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	0.24	0.20	0.15	0.22	0.12	0.12	0.12	0.12	0.14	0.11	0.11	0.11	0.17	0.14	0.10	0.09	0.14
Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.04	0.05	0.04	0.06	0.06	0.06	0.06	0.06	0.06	0.09	0.11	0.11	0.08	0.07	0.05	0.09	0.07
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.03	0.02	0.04	0.03	0.03	0.03	-0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.03
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.03	0.02	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.03
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	0.06	0.05	0.07	0.06	0.06	0.06	0.06	0.06	0.06	0.09	0.06	0.06	0.04	0.04	0.05	0.09	0.06
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.03	0.02	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.03
Crude oil from petroleum and bituminous minerals	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01
Aluminum Ores And Concentrates	0.02	0.02	0.03	0.01	0.01	0.01	0.02	0.01	0.03	0.02	0.01	0.01	0.03	0.02	0.02	0.02	0.02
Salt incl. table & dentrd, pure sodium chloride	0.03	0.02	0.04	0.01	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.03
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.03	0.02	0.04	0.01	0.03	0.03	0.03	0.03	0.04	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.03
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.06	0.05	0.07	0.06	0.09	0.09	0.12	0.09	0.06	0.06	0.08	0.08	0.08	0.14	0.20	0.13	0.09
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	0.06	0.05	0.07	0.06	0.09	0.09	0.12	0.09	0.06	0.06	0.08	0.08	0.04	0.07	0.10	0.13	0.08
Assembly and distribution services of gen commodities, and General warehousing and storage	0.12	0.10	0.15	0.11	0.12	0.12	0.12	0.12	0.07	0.09	0.11	0.11	0.04	0.07	0.10	0.09	0.10
Refrigerated warehousing and storage	0.06	0.05	0.07	0.03	0.06	0.06	0.03	0.06	0.04	0.04	0.06	0.06	0.03	0.02	0.05	0.04	0.05
Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Nathan Associates Inc.

Table A.I.5.2-11: Assigning Weights to Viable Industries (Example of Weighing Industries against Revenue Generation Criteria; 5 out of 6), Step a

Revenue Generation	Air Conditioning Machines (temp & Hum Change), Pts, and Freezers Etc.; Heat Pumps NESOI, Pts	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	PARTS & ACCESS FOR Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	Assembly and distribution services of gen commodities, and General warehousing and storage	Refrigerated warehousing and storage
Air Conditioning Machines (temp & Hum Change), Pts, and Freezers Etc.; Heat Pumps NESOI, Pts	1.00	0.50	1.00	2.00	3.00	4.00	3.00	4.00	1.00	1.00	10.00	3.00	0.50	0.33	1.00	2.00
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	2.00	1.00	2.00	3.00	4.00	5.00	4.00	5.00	1.00	2.00	20.00	4.00	1.00	0.50	1.00	2.00
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	1.00	0.50	1.00	2.00	3.00	4.00	4.00	5.00	1.00	1.00	10.00	3.00	0.50	0.33	0.50	2.00
Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.50	0.33	0.50	1.00	2.00	3.00	3.00	4.00	0.50	0.50	5.00	2.00	0.33	0.25	0.33	0.50
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.33	0.25	0.33	0.50	1.00	2.00	-0.50	0.50	0.25	0.25	2.00	2.00	0.25	0.20	0.25	0.33
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.25	0.20	0.25	0.33	0.50	1.00	0.25	0.33	0.20	0.20	1.00	1.00	0.20	0.17	0.20	0.20
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	0.33	0.25	0.25	0.33	2.00	4.00	1.00	2.00	0.50	0.50	4.00	4.00	0.33	0.33	0.33	0.50
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.25	0.20	0.20	0.25	2.00	3.00	0.50	1.00	0.33	0.33	2.00	2.00	0.25	0.25	0.25	0.33
Crude oil from petroleum and bituminous minerals (transshipment & export)	1.00	1.00	1.00	2.00	4.00	5.00	2.00	3.00	1.00	1.00	10.00	0.25	0.50	0.50	1.00	2.00
Aluminum Ores And Concentrates	1.00	0.50	1.00	2.00	4.00	5.00	2.00	3.00	1.00	1.00	10.00	0.25	0.50	0.50	1.00	2.00
Salt incl. table & dentrd, pure sodium chloride	0.10	0.05	0.10	0.20	0.50	1.00	0.25	0.50	0.10	0.10	1.00	1.00	0.20	0.17	0.2	0.2
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.33	0.25	0.33	0.50	0.50	1.00	0.25	0.50	4.00	4.00	1.00	1.00	0.33	0.25	0.25	0.33
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	2.00	1.00	2.00	3.00	4.00	5.00	3.00	4.00	2.00	2.00	5.00	3.00	1.00	0.50	3.00	4.00
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	3.00	2.00	3.00	4.00	5.00	6.00	3.00	4.00	2.00	2.00	6.00	4.00	2.00	1.00	2.00	3.00
Assembly and distribution services of gen commodities, and General warehousing and storage	1.00	1.00	2.00	3.00	4.00	5.00	3.00	4.00	1.00	1.00	5.00	4.00	0.33	0.50	1.00	2
Refrigerated warehousing and storage	0.50	0.50	0.50	2.00	3.00	5.00	2.00	3.00	0.50	0.50	5.00	3.00	0.25	0.33	0.50	1.00
	14.60	9.53	15.47	26.12	42.50	59.00	30.75	43.83	16.38	17.38	97.00	37.50	8.48	6.12	12.82	22.40

Source: Nathan Associates Inc.

Table A.I.5.2-12: Assigning Weights to Viable Industries (Example of Weighing Industries against Revenue Generation Criteria; 5 out of 6), Step 2-b

Normalized	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	Assembly and distribution services of gen commodities, and General warehousing and storage	Refrigerated warehousing and storage	Sum/16
Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	0.07	0.05	0.06	0.08	0.07	0.07	0.10	0.09	0.06	0.06	0.10	0.08	0.06	0.05	0.08	0.09	0.07
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	0.14	0.10	0.13	0.11	0.09	0.08	0.13	0.11	0.06	0.12	0.21	0.11	0.12	0.08	0.08	0.09	0.11
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	0.07	0.05	0.06	0.08	0.07	0.07	0.13	0.11	0.06	0.06	0.10	0.08	0.06	0.05	0.04	0.09	0.07
Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.03	0.03	0.03	0.04	0.05	0.05	0.10	0.09	0.03	0.03	0.05	0.05	0.04	0.04	0.03	0.02	0.04
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.02	0.03	0.02	0.02	0.02	0.03	-0.02	0.01	0.02	0.01	0.02	0.05	0.03	0.03	0.02	0.01	0.02
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.02	0.02	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.03	0.02	0.03	0.02	0.01	0.02
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	0.02	0.03	0.02	0.01	0.05	0.07	0.03	0.05	0.03	0.03	0.04	0.11	0.04	0.05	0.03	0.02	0.04
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.02	0.02	0.01	0.01	0.05	0.05	0.02	0.02	0.02	0.02	0.02	0.05	0.03	0.04	0.02	0.01	0.03
Crude oil from petroleum and bituminous minerals	0.07	0.10	0.06	0.08	0.09	0.08	0.07	0.07	0.06	0.06	0.10	0.01	0.06	0.08	0.08	0.09	0.07
Aluminum Ores And Concentrates	0.07	0.05	0.06	0.08	0.09	0.08	0.07	0.07	0.06	0.06	0.10	0.01	0.06	0.08	0.08	0.09	0.07
Salt incl. table & dentrd, pure sodium chloride	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.03	0.02	0.03	0.02	0.01	0.01
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.02	0.03	0.02	0.02	0.01	0.02	0.01	0.01	0.24	0.23	0.01	0.03	0.04	0.04	0.02	0.01	0.05
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.14	0.10	0.13	0.11	0.09	0.08	0.10	0.09	0.12	0.12	0.05	0.08	0.12	0.08	0.23	0.18	0.11
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	0.21	0.21	0.19	0.15	0.12	0.10	0.10	0.09	0.12	0.12	0.06	0.11	0.24	0.16	0.16	0.13	0.14
Assembly and distribution services of gen commodities, and General warehousing and storage	0.07	0.10	0.13	0.11	0.09	0.08	0.10	0.09	0.06	0.06	0.05	0.11	0.04	0.08	0.08	0.09	0.08
Refrigerated warehousing and storage	0.03	0.05	0.03	0.08	0.07	0.08	0.07	0.07	0.03	0.03	0.05	0.08	0.03	0.05	0.04	0.04	0.05
Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Nathan Associates Inc.

Table A.I.5.2-13: Assigning Weights to Viable Industries (Example of Weighing Industries against Contributes to Improving Technical Capacity of Population Criteria; 6 out of 6), Step a

Contributes to Improving Technical Capacity of Population	Air Conditioning Machines (Temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec. Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc, Nonel Domest & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	Assembly and distribution services of gen commodities, and General warehousing and storage	Refrigerated warehousing and storage
Air Conditioning Machines (Temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	1.00	0.50	2.00	2.00	5.00	5.00	3.00	3.00	5.00	4.00	3.00	3.00	0.33	0.25	2.00	2.00
Elec. Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	2.00	1.00	0.50	0.50	10.00	10.00	4.00	4.00	10.00	5.00	4.00	4.00	0.50	0.33	3.00	3.00
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	0.50	2.00	1.00	0.20	5.00	5.00	3.00	3.00	4.00	4.00	3.00	3.00	0.33	0.25	2.00	2.00
Stoves, Ranges Etc, Nonel Domest & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.50	2.00	5.00	1.00	3.00	3.00	2.00	2.00	3.00	3.00	2.00	2.00	0.25	0.20	1.00	1.00
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.20	0.10	0.20	0.33	1.00	1.00	-0.50	1.00	2.00	2.00	2.00	1.00	0.20	0.17	0.50	0.50
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.20	0.10	0.20	0.33	1.00	1.00	0.33	1.00	2.00	1.00	1.00	1.00	0.20	0.17	0.50	0.50
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	0.33	0.25	0.33	0.50	2.00	3.00	1.00	2.00	3.00	3.00	3.00	2.00	0.20	0.20	1.00	1.00
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.33	0.25	0.33	0.50	1.00	1.00	0.50	1.00	2.00	1.00	1.00	1.00	0.20	0.17	0.50	0.50
Crude oil from petroleum and bituminous minerals	0.20	0.10	0.25	0.33	0.50	0.50	0.33	0.50	1.00	1.00	0.50	0.50	0.17	0.14	0.33	0.33
Aluminum Ores And Concentrates	0.25	0.20	0.25	0.33	0.50	1.00	0.33	1.00	1.00	1.00	0.50	0.50	0.17	0.14	0.33	0.33
Salt incl. table & dentrd, pure sodium chloride	0.33	0.25	0.33	0.50	0.50	1.00	0.33	1.00	2.00	2.00	1.00	1.00	0.20	0.17	0.5	0.5
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.33	0.25	0.33	0.50	1.00	1.00	0.50	1.00	2.00	2.00	1.00	1.00	0.20	0.17	0.50	0.50
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	3.00	2.00	3.00	4.00	5.00	5.00	5.00	5.00	6.00	6.00	5.00	5.00	1.00	0.50	1.00	2.00
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	4.00	3.00	4.00	5.00	6.00	6.00	5.00	6.00	7.00	7.00	6.00	6.00	2.00	1.00	2.00	3.00
Assembly and distribution services of gen commodities, and General warehousing and storage	0.50	0.33	0.50	1.00	2.00	2.00	1.00	2.00	3.00	3.00	2.00	2.00	1.00	0.50	1.00	2
Refrigerated warehousing and storage	0.50	0.33	0.50	1.00	2.00	2.00	1.00	2.00	3.00	3.00	2.00	2.00	0.50	0.33	0.50	1.00
	14.18	12.67	18.73	18.03	45.50	47.50	26.83	35.50	56.00	48.00	37.00	35.00	7.45	4.69	16.67	20.17

Source: Nathan Associates Inc.

Table A.I.5.2-14: Assigning Weights to Viable Industries (Example of Weighing Industries against Contributes to Improving Technical Capacity of Population Criteria; 6 out of 6), Step 2-b

Normalized	Air Conditioning Machines (Temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	Stoves, Ranges Etc, Nonel Domest & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	Fruit, Nuts Etc. Prepared Or Preserved NESOI	Crude oil from petroleum and bituminous minerals	Aluminum Ores And Concentrates	Salt incl. table & dentrd, pure sodium chloride	Jams, Fruit Jellies, Marmalades Etc., Cooked	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	Assembly and distribution services of gen commodities, and General warehousing and storage	Refrigerated warehousing and storage	Sum/17
Air Conditioning Machines (Temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	0.07	0.04	0.11	0.11	0.11	0.11	0.11	0.08	0.09	0.08	0.08	0.09	0.04	0.05	0.12	0.10	0.09
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	0.14	0.08	0.03	0.03	0.22	0.21	0.15	0.11	0.18	0.10	0.11	0.11	0.07	0.07	0.18	0.15	0.12
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	0.04	0.16	0.05	0.01	0.11	0.11	0.11	0.08	0.07	0.08	0.08	0.09	0.04	0.05	0.12	0.10	0.08
Stoves, Ranges Etc, Nonel Domest & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.04	0.16	0.27	0.06	0.07	0.06	0.07	0.06	0.05	0.06	0.05	0.06	0.03	0.04	0.06	0.05	0.07
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.01	0.01	0.01	0.02	0.02	0.02	-0.02	0.03	0.04	0.04	0.05	0.03	0.03	0.04	0.03	0.02	0.02
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.03	0.04	0.02	0.03	0.03	0.03	0.04	0.03	0.02	0.02
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	0.02	0.02	0.02	0.03	0.04	0.06	0.04	0.06	0.05	0.06	0.08	0.06	0.03	0.04	0.06	0.05	0.05
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.02	0.03	0.03	0.03	0.04	0.03	0.02	0.03
Crude oil from petroleum and bituminous minerals	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.03	0.02	0.02	0.02
Aluminum Ores And Concentrates	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.03	0.02	0.02	0.01	0.01	0.02	0.03	0.02	0.02	0.02
Salt incl. table & dentrd, pure sodium chloride	0.02	0.02	0.02	0.03	0.01	0.02	0.01	0.03	0.04	0.04	0.03	0.03	0.03	0.04	0.03	0.02	0.03
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.04	0.04	0.03	0.03	0.03	0.04	0.03	0.02	0.03
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.21	0.16	0.16	0.22	0.11	0.11	0.19	0.14	0.11	0.13	0.14	0.14	0.13	0.11	0.06	0.10	0.03
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	0.28	0.24	0.21	0.28	0.13	0.13	0.19	0.17	0.13	0.15	0.16	0.17	0.27	0.21	0.12	0.15	0.19
Assembly and distribution services of gen commodities, and General warehousing and storage	0.04	0.03	0.03	0.06	0.04	0.04	0.04	0.06	0.05	0.06	0.05	0.06	0.13	0.11	0.06	0.10	0.06
Refrigerated warehousing and storage	0.04	0.03	0.03	0.06	0.04	0.04	0.04	0.06	0.05	0.06	0.05	0.06	0.07	0.07	0.03	0.05	0.05
Sum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Nathan Associates Inc.

Step 5: Attaining Industry Scores to Determine Industry Rankings

Industry weights attained from each of the six matrices in Step 4 were then multiplied by each criterion weight attained in Step 3. Then, these resulting industry weights that were attained for each of the 6 criteria were aggregated under each industry to attain a final score per industry.

Table A.I.5.2-15 shows final industry weights attained for each of the 6 criteria displayed in the purple columns.

Table A.I.5.2-16 shows the results from having multiplied each industry weight under each criterion (shown in the purple columns from the previous table) by each criteria weigh that was attained in Step 3. Those results were aggregated across each row to attain the final industry scores (displayed in the far-right column), which determined how each industry was ranked.¹

¹ Reference to Table A.I.5.2-16: Because this table displays rounded numbers, the numbers on the right column do not always represent the sum of the rounded numbers across each row.

Table A.I.5.2-15: Scoring of Viable Industries, Step a

Industries	Against Trade Flows	Against Competitive Advantage	Against Policy, Legal, and Regulatory Framework	Against Long Term Employment Generation	Against Potential Revenue Generation	Against Contributes to Improving Technical Capacity of Population
Air Conditioning Machines (Temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	0.08	0.06	0.04	0.13	0.07	0.09
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	0.08	0.08	0.05	0.11	0.11	0.12
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (incl Del Tricycle) No Motor	0.10	0.11	0.08	0.14	0.07	0.08
Stoves, Ranges Etc, Nonel Domestic & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.07	0.05	0.04	0.07	0.04	0.07
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith	0.05	0.06	0.06	0.03	0.02	0.02
Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.04	0.05	0.04	0.03	0.02	0.02
Ethyl Alcohol, Undenat, Und. 80% Alc; Spirit Beverag	0.08	0.11	0.11	0.06	0.04	0.05
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.04	0.06	0.05	0.03	0.03	0.03
Crude oil from petroleum and bituminous minerals	0.08	0.06	0.10	0.01	0.07	0.02
Aluminum Ores And Concentrates	0.07	0.08	0.10	0.02	0.07	0.02
Salt incl. table & dentrd, pure sodium chloride	0.02	0.03	0.06	0.03	0.01	0.03
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.04	0.04	0.04	0.03	0.05	0.03
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.04	0.04	0.05	0.09	0.11	0.14
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	0.04	0.04	0.05	0.08	0.14	0.19
Assembly and distribution services of gen commodities, and General warehousing and storage	0.11	0.10	0.08	0.10	0.08	0.06
Refrigerated warehousing and storage	0.06	0.04	0.04	0.05	0.05	0.05
	1.00	1.00	1.00	1.00	1.00	1.00

Source: Nathan Associates Inc.

Table A.I.5.2-16: Scoring of Viable Industries, Step b

	X	X	X	X	X	X	X	Total Scores
Criteria	Trade Flows	Competitive Advantage	Policy, Legal, and Regulatory Framework	Long Term Employment Generation	Potential Revenue Generation	Contributes to Improving Technical Capacity of Population		
Criteria Weigh	0.09	0.10	0.19	0.21	0.22	0.18		1.00
Industries multiplied by criteria weights								
Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts	0.01	0.01	0.01	0.03	0.02	0.02		0.08
Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Recvrs, Incl Video Monitors & Projectors	0.01	0.01	0.01	0.02	0.02	0.02		0.09
Parts & Access For Motor Vehicles, and Motorcycles (incl Mopeds) & Cycles With Aux Motor, and Bicycles & Oth Cycles (inc Del Tricycle) No Motor	0.01	0.01	0.02	0.03	0.02	0.01		0.10
Stoves, Ranges Etc, Nonel Domest & Pts, Ir & Steel and Articles of Iron or Steel, NESOI	0.01	0.01	0.01	0.01	0.01	0.01		0.06
Cassava, Arrowroot Etc., Fresh Or Dry; Sago Pith Sauces & Prep; Mixed Condiments, Mustard Flour Etc.	0.01	0.01	0.01	0.01	0.00	0.00		0.04
Ethyl Alcohol, Udenat, Und. 80% Alc; Spirit Beverag	0.01	0.01	0.02	0.01	0.01	0.01	SUM	0.07
Fruit, Nuts Etc. Prepared Or Preserved NESOI	0.00	0.01	0.01	0.01	0.01	0.00		0.04
Crude oil from petroleum and bituminous minerals	0.01	0.01	0.02	0.00	0.02	0.00		0.05
Aluminum Ores And Concentrates	0.01	0.01	0.02	0.00	0.02	0.00		0.06
Salt incl. table & dentrd, pure sodium chloride	0.00	0.00	0.01	0.01	0.00	0.00		0.03
Jams, Fruit Jellies, Marmalades Etc., Cooked	0.00	0.00	0.01	0.01	0.01	0.00		0.04
Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt	0.00	0.00	0.01	0.02	0.03	0.02		0.09
Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc. Fm	0.00	0.00	0.01	0.02	0.03	0.03		0.10
Assembly and distribution services of gen commodities, and General warehousing and storage	0.01	0.01	0.01	0.02	0.02	0.01		0.09
Refrigerated warehousing and storage	0.01	0.00	0.01	0.01	0.01	0.01		0.05
								1.00

Source: Nathan Associates Inc.

Appendix I.5.3: Industry Analysis Cluster Linkages

Appendix I.5.3

Table A.I.5.3-1: List of Industries that are Linked to the “Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc.” industry

HS Code	Cluster Linkages for Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc.
38	Miscellaneous Chemical Products
4014	Hygienic or Pharm Articles of Unhardened Vulcan Rubber
9953 and 9954	Education/Teaching & Training
9958	Assembly and Distribution Services of Gen Commodities
99	Other Business Services
9838	General Warehousing and Storage
9837	Refrigerated Warehousing and Storage
9841	Deep Sea Foreign Freight Transportation of Freight
9845	Marine Cargo Handling
9852	Freight Transportation Arrangement, NVOCC, Customs Brokerage
8609	Containers for one or More Modes of Transport
9847	Air Transportation, Scheduled
9848	Air Courier Services
9870 and 9872	Commercial and Non-Commercial Physical Research
9967	Marketing
9977, 9818, 9817, 2716, 9866	Forfaiting, Factoring & Other Int'l Finance Services, Heavy Construction, Water, Sewer, Pipeline, and Communications Construction, Electrical Energy, and Engineering Services
9910	Building Maintenance Services
9914	Employment Agencies
9922	Computer Maintenance & Repair
9936	Commercial Banks/Financing
9937	Foreign Trade & International Banks
9939	Legal Services
9938	Insurance Agents, Brokers, & Service

Source: Nathan Associates Inc., UN COMTRADE

A.I.5.3-2: List of Industries that are Linked to the “Parts & Access For Motor Vehicles, and Motorcycles (INCL Mopeds) & Cycles With Aux Motor, and Bicycles & Other Cycles (INCL Del Tricycle) No Motor” industry

HS Code	Cluster Linkages for Parts & Access For Motor Vehicles, and Motorcycles (INCL Mopeds) & Cycles With Aux Motor, and Bicycles & Other Cycles (INCL Del Tricycle) No Motor
8463	Machine Tools for Working Metal, NESOI
8468	Machines, Solder Etc., Gas Surf Temper Machines, Pt
8479	Machines Etc. Having Individual Functions NESOI, Pt
8427	Fork-Lift Trucks, Other Works Trucks With Lifts Etc.
8428	Lifting, Handling, Loading & Unload Machines NESOI
4010	Conveyor or Transmission Belts of Vulcanized Rubber
3902	Polymers of Propylene or Other Olefins, Prim Forms
4011	New and Used Pneumatic Tires, of Rubber
4014	Hygienic or Pharm Articles of Unhardened Vulcan Rubber
8541	Semiconductor Devices, Light-Emit Diodes Etc., Pts
8534	Printed Circuits
8501	Electric Motors and Generators (No Sets)
8507	Electric Storage Batteries, Including Separators, Parts
8508	Electromechanical Tools, Working In Hand, Parts
9838	General Warehousing and Storage
9841	Deep Sea Foreign Freight Transportation of Freight
9845	Marine Cargo Handling
9846	Towing and Tugboat Service
9852	Freight Transportation Arrangement, NVOCC, Customs Brokerage
8609	Containers for one or More Modes of Transport
8704	Motor vehicles for transport of goods
9870 and 9872	Commercial and Non-Commercial Physical Research
9953 and 9954	Education/Teaching & Training
9967	Marketing
9977, 9818, 9817, 2716, 9866	Forfating, Factoring & Other Int'l Finance Services, Heavy Construction, Water, Sewer, Pipeline, and Communications Construction, Electrical Energy, and Engineering Services
9910	Building Maintenance Services
9914	Employment Agencies
9922	Computer Maintenance & Repair
9936	Commercial Banks/Financing
9937	Foreign Trade & International Banks
9939	Legal Services
9938	Insurance Agents, Brokers, & Service

Source: Nathan Associates Inc., UN COMTRADE

A.I.5.3-3: List of Industries that are Linked to the “Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Receivers, INCL Video Monitors & Projectors” industry

HS Code	Cluster Linkages for Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Receivers, INCL Video Monitors & Projectors
3902	Polymers of styrene, in primary forms
4010	Conveyor or Transmission Belts of Vulcanized Rubber
8468	Machines, Solder Etc., Gas Surf Temper Machines, Pt
8479	Machines Etc. Having Individual Functions NESOI, Pt
8427	Fork-Lift Trucks, Other Works Trucks With Lifts Etc.
8428	Lifting, Handling, Loading & Unload Machines NESOI
7616	Articles Of Aluminum NESOI
7322	Radiators, Air Heaters Etc., Non-electrical & Parts, Iron & Steel
8541	Semiconductor Devices, Light-Emit Diodes Etc., Pts
8534	Printed Circuits
8501	Electric Motors and Generators (No Sets)
8507	Electric Storage Batteries, Including Separators, Parts
8508	Electromechanical Tools, Working In Hand, Parts
8512	Electric Light Etc. Equip, Windshield Wipers Etc., Parts
9838	General Warehousing and Storage
9837	Refrigerated Warehousing and Storage
9841	Deep Sea Foreign Freight Transportation of Freight
9845	Marine Cargo Handling
9846	Towing and Tugboat Service
9852	Freight Transportation Arrangement, NVOCC, Customs Brokerage
8609	Containers for one or More Modes of Transport
8704	Motor vehicles for transport of goods
9022	X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt
9870 and 9872	Commercial and Non-Commercial Physical Research
9953 and 9954	Education/Teaching & Training
9967	Marketing
9977, 9818, 9817, 2716, 9866	Forfeiting, Factoring & Other Int'l Finance Services, Heavy Construction, Water, Sewer, Pipeline, and Communications Construction, Electrical Energy, and Engineering Services
9910	Building Maintenance Services
9914	Employment Agencies
9922	Computer Maintenance & Repair
9936	Commercial Banks/Financing
9937	Foreign Trade & International Banks
9939	Legal Services
9938	Insurance Agents, Brokers, & Service

Source: Nathan Associates Inc., UN COMTRADE

A.I.5.3-4: List of Industries that are Linked to the “Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt” industry

HS Code	Cluster Linkages for Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt
3902	Polymers of styrene, in primary forms
4010	Conveyor or Transmission Belts of Vulcanized Rubber
8468	Machines, Solder Etc., Gas Surf Temper Machines, Pt
8479	Machines Etc. Having Individual Functions NESOI, Pt
8427	Fork-Lift Trucks, Other Works Trucks With Lifts Etc.
8428	Lifting, Handling, Loading & Unload Machines NESOI
7616	Articles Of Aluminum NESOI
8541	Semiconductor Devices, Light-Emit Diodes Etc., Pts
8534	Printed Circuits
8501	Electric Motors and Generators (No Sets)
8507	Electric Storage Batteries, Including Separators, Parts
8508	Electromechanical Tools, Working In Hand, Parts
9838	General Warehousing and Storage
9837	Refrigerated Warehousing and Storage
9841	Deep Sea Foreign Freight Transportation of Freight
9845	Marine Cargo Handling
9846	Towing and Tugboat Service
9852	Freight Transportation Arrangement, NVOCC, Customs Brokerage
8609	Containers for one or More Modes of Transport
8704	Motor vehicles for transport of goods
9847	Air Transportation, Scheduled
9848	Air Courier Services
9870 and 9872	Commercial and Non-Commercial Physical Research
9953 and 9954	Education/Teaching & Training
9967	Marketing
9977, 9818, 9817, 2716, 9866	Forfaiting, Factoring & Other Int'l Finance Services, Heavy Construction, Water, Sewer, Pipeline, and Communications Construction, Electrical Energy, and Engineering Services
9910	Building Maintenance Services
9914	Employment Agencies
9922	Computer Maintenance & Repair
9936	Commercial Banks/Financing
9937	Foreign Trade & International Banks
9939	Legal Services
9938	Insurance Agents, Brokers, & Service

Source: Nathan Associates Inc., UN COMTRADE

A.I.5.3-5: List of Industries that are Linked to the “Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts” industry

HS Code	Cluster Linkages for Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts
7322	Radiators, Air Heaters Etc., Non-electrical & Parts, Iron & Steel
3902	Polymers of styrene, in primary forms
4010	Conveyor or Transmission Belts of Vulcanized Rubber
8463	Machine Tools for Working Metal, NESOI
8468	Machines, Solder Etc., Gas Surf Temper Machines, Pt
8479	Machines Etc. Having Individual Functions NESOI, Pt
8427	Fork-Lift Trucks, Other Works Trucks With Lifts Etc.
8428	Lifting, Handling, Loading & Unload Machines NESOI
7616	Articles Of Aluminum NESOI
8541	Semiconductor Devices, Light-Emit Diodes Etc., Pts
8534	Printed Circuits
8501	Electric Motors and Generators (No Sets)
8507	Electric Storage Batteries, Including Separators, Parts
8508	Electromechanical Tools, Working In Hand, Parts
9838	General Warehousing and Storage
9837	Refrigerated Warehousing and Storage
9946	Hvac/Refrigeration Service and Repair
9841	Deep Sea Foreign Freight Transportation of Freight
9845	Marine Cargo Handling
9846	Towing and Tugboat Service
9852	Freight Transportation Arrangement, NVOCC, Customs Brokerage
8609	Containers for one or More Modes of Transport
8704	Motor vehicles for transport of goods
9870 and 9872	Commercial and Non-Commercial Physical Research
9953 and 9954	Education/Teaching & Training
9967	Marketing
9977, 9818, 9817, 2716, 9866	Forfeiting, Factoring & Other Int'l Finance Services, Heavy Construction, Water, Sewer, Pipeline, and Communications Construction, Electrical Energy, and Engineering Services
9910	Building Maintenance Services
9914	Employment Agencies
9922	Computer Maintenance & Repair
9936	Commercial Banks/Financing
9937	Foreign Trade & International Banks
9939	Legal Services
9938	Insurance Agents, Brokers, & Service

Source: Nathan Associates Inc., UN COMTRADE

A.I.5.3-6: List of Industries that are Linked to the “Assembly and Distribution Services of Gen Commodities, General & Refrigerated Warehousing and Storage, and MRO” industry

HS Code	Cluster Linkages for Assembly and Distribution Services of Gen Commodities, General & Refrigerated Warehousing and Storage, and MRO
3006 and 3004	Pharmaceutical Goods In Note 4 To Chapter 30, and Medicaments NESOI, Mixed Or Not, In Dosage Etc.
8708 and 8712 and 8711	Parts & Access For Motor Vehicles, and Motorcycles (INCL Mopeds) & Cycles With Aux Motor, and Bicycles & Other Cycles (INCL Del Tricycle) No Motor
8516 and 8528	Elec Water, Space & Soil Heaters; Hair Etc. Dry, Pt, and TV Receivers, INCL Video Monitors & Projectors
9018 and 9022	Medical, Surgical, Dental Or Vet Inst, No Elec, Pt and X-ray Etc. Apparatus; Tubes, Panels, Screen Etc., Pt
8415 and 8418	Air Conditioning Machines (temp & Hum Change), Pts, and Refrigerators, Freezers Etc.; Heat Pumps NESOI, Pts
4010	Conveyor or Transmission Belts of Vulcanized Rubber
8468	Machines, Solder Etc., Gas Surf Temper Machines, Pt
8479	Machines Etc. Having Individual Functions NESOI, Pt
8427	Fork-Lift Trucks, Other Works Trucks With Lifts Etc.
8428	Lifting, Handling, Loading & Unload Machines NESOI
8501	Electric Motors and Generators (No Sets)
8507	Electric Storage Batteries, Including Separators, Parts
8508	Electromechanical Tools, Working In Hand, Parts
9838	General Warehousing and Storage
9837	Refrigerated Warehousing and Storage
9946	Hvac/Refrigeration Service and Repair
9841	Deep Sea Foreign Freight Transportation of Freight
9845	Marine Cargo Handling
9846	Towing and Tugboat Service
9852	Freight Transportation Arrangement, NVOCC, Customs Brokerage
8704	Motor vehicles for transport of goods
9847	Air Transportation, Scheduled
9848	Air Courier Services
8805	Aircraft Launch Gear, Deck-Arrest, Grd. Flying Trainers, Pt
8609	Containers for one or More Modes of Transport
9870 and 9872	Commercial and Non-Commercial Physical Research
9953 and 9954	Education/Teaching & Training
9967	Marketing
9977, 9818, 9817, 2716, 9866	Forfeiting, Factoring & Other Int'l Finance Services, Heavy Construction, Water, Sewer, Pipeline, and Communications Construction, Electrical Energy, and Engineering Services
9910	Building Maintenance Services
9914	Employment Agencies
9922	Computer Maintenance & Repair
9936	Commercial Banks/Financing
9937	Foreign Trade & International Banks
9939	Legal Services
9938	Insurance Agents, Brokers, & Service

Source: Nathan Associates Inc., UN COMTRADE