Improving the logistical situation of Costa Rica

Researching strategies to gain additional economic advantages

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Preface

This report contains an elaborated analysis of the logistical situation of Costa Rica and defines an implementation plan to improve logistics in Costa Rica. This report is the outcome of collaboration between the Delft University of Technology, the Universidad Nacional de Costa Rica, the Dutch Embassy in Costa Rica and other Costa Rican parties.

We want to thank Randall Alvaro of the Universidad Nacional de Costa Rica for hosting and guiding us during our stay in Costa Rica. Further, we want to thank miss Ambassador Mette Gonggrijp and Priscilla Morera Gonzalez for hosting meetings and offering us workspace at the Embassy of the Kingdom of the Netherlands. Thirdly, special thanks to Susana Wong from the Universidad de Costa Rica for helping us arranging visits, providing workspace, and the delicious dinners. We also want to thank prof. Lorant Tavasszy and dr. Ron van Duin of the Delft University of Technology for guiding us and for giving useful feedback. At last, we want to thank every person who was willing to cooperate with our research.

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Executive summary

Summary

In 2014 Costa Rica was ranked 87th on the worldwide Logistics Performance Index (LPI) of the World Bank. The low ranking of Costa Rica is due to a bad customs and border clearance as well as a relatively poor transportation infrastructure. A new state-of-the-art container terminal is going to operate at the Caribbean coast to profit of the increasing containerisation and world trade. However, with the current logistical network the positive effects of the development in maritime transportation could be limited for Costa Rica. This description describes the core of the research, including the following research question: *'In what way can Costa Rica improve its logistical system to gain additional economic advantages, while matching future development in maritime transportation?'*.

The research is divided into two parts and as guideline for this research the 7-step project life cycle by Sage & Armstrong (2000) is used. This tool consists of three phases: the formulation phase, the analysis phase, and the interpretation phase. In this research the focus lies mainly on the first two phases, since the goal is to define strategies for Costa Rica and not very specific alternatives or a defined project to be executed. In the first part the current (logistical) situation of Costa Rica will be researched by means of literature study, interviews and sight visits. It deepens into Costa Rica's trade, its access to deep-sea transportation, current hinterland networks, climate and climate change and important stakeholders regarding this issue. Part I also gives insight in the developments of competing ports in the Caribbean/Central-American region. Part I concludes with a SWOT analysis and confrontation matrix in which all founded information is combined. The output of the confrontation matrix, four filled strengths-opportunities, weaknesses-opportunities, strengths-threats, and weaknesses-threats quadrants, will be used as input for Part II.

Part II delivers feasible strategies to improve Costa Rica's logistical system. First scenarios are developed under which strategies are tested. These scenarios vary from very optimistic futures to very pessimistic futures. The defined scenarios are: *Business as usual, Growing sky high, Storm is coming,* and *Booming business in the Caribbean*. Then, based on the confrontation matrix, existing literature about hinterland strategies, foreland strategies, and governance strategies is found. At last, the SWOT analysis, confrontation matrix, port strategies theory, and scenario are brought together to define feasible strategies for improving Costa Rica's logistical system to gain additional economic advantages, while it is matching with the future development in maritime transportation.

Conclusions

Out of Part I it can be concluded that in the current situation Costa Rica is heavily reliant on the agricultural sector, and mostly on the production of bananas and pineapples. In value, medical appliances are the most important export product. Costa Rica has a good usage of its geographical location with two main port complexes, both on the Pacific and Caribbean side. A state-of-the-art container terminal will replace the Moín/Limón container complex (Caribbean) in the beginning of 2018. However, one of the main issues is the hinterland connection of both ports with the Central Valley and the production areas, as well as the high logistical costs. Roads do not have sufficient capacity for the traffic, because almost all traffic from west to east has to go through the Central Valley which host most of Costa Rica's population and industry. Also, Costa Rica

deals with poor and inefficient border crossings. A summary of the strengths, weaknesses, opportunities, and treats of Costa Rica is presented in Table 1.

Table 1: Summary SWOT analysis

Strengths	**Weaknesses**
Geographical location	High logistical costs
Production of export goods	Relatively high labour costs
Gateway for Nicaragua	Low security logistical chain
Politically stable	Geographical location industries
Quality of education	Political power unions
Green image	Bureaucratic procedures
Free trade agreement with China	Political relationship with Nicaragua
Opportunities	**Threats**
Benefits of new TCM Moín	Stagnation/decline export goods
Transhipment terminal of AMEGA	Future development Panama ports
Near-sourcing	Other & current Caribbean hubs
Growth of global trade	Loss of manufacturing industries
Central American Customs Union (CACU)	Natural disasters
Expansion Panama Canal	Dependency multinationals

One of the main concerns for Costa Rica is the stagnation/decline of export goods due to natural causes (climate change, heavy weather, and fruit diseases) and competition from other (cheaper) countries. This threat becomes important, because it can be strengthened by the costly workforce, high logistical costs and Costa Rica's bureaucratic procedures. However, Costa Rica has also opportunities to improve their position. The biggest opportunities lie in exploiting the effects of the new terminal that will be operative in the near future. It will provide more security, a bigger container handling capacity and, the possibility for larger vessels to enter the port. Since Costa Rica has skilled workers and is improving its education facilities further, near-sourcing becomes an important opportunity as well. Near-sourcing can also be encouraged by Costa Rica's green image and its unique free trade agreement with China.

The developed strategies will deal with the threats and exploit the strengths and opportunities found in Part I. Two strategies are defined and evaluated by ease of implementation on the scenarios. The first strategy is called *Attractive investment climate*, meaning that the strategy focuses on creating a good investment environment. It is based on the near-sourcing and benefits of new TCM Moín opportunity strengthen by the production of export goods (& services). Attractive investment climate has four cornerstones: human resources, logistical situation, ease of doing business, and development of the northern region. Although Costa Rica has on average a skilled workforce, improvements are required to improve the amount of people who are educated for specific jobs. Language proficiency, and collaboration between free trade zones and educational institutions is necessary to improve the overall quality of the labour force. Matching businesses to right locations could bring demand and supply of workforce together. Another factor in need for improvement is the logistical situation. Different possible measures are identified that can fortify logistics in Costa Rica. Improve the bottleneck Route 32, and reinstating the railway are pure network measures that improve the connectivity between the GAM and Puerto Limón. Constructing an inland terminal with sufficient surrounding infrastructure in which all cargo will be collected should reduce the traffic in the Central Valley. A shift of locations from the

GAM to the port areas has the potential to reduce the heavy traffic in the centre of Costa Rica as well. Another measure to improve the logistical system could be to improve and speed up the border procedures. Forming a Central American Customs Union (CACU) with an integrated IT system will have a positive effect. The third factor to be improved is the ease of doing business. Costa Rica with its green image, free trade agreements and the political stable environment is already attractive for investing companies. However, bureaucratic procedures and complicated border crossing makes the business environment harder. To break through these problems, suggestions are to improve the border crossings with its neighbours by bringing together Central American countries to form a CACU. Also the earlier mentioned installation of an integrated IT system could be profitable. In the light of the near-sourcing trend and a possible transatlantic railway line through the northern regions of the country could greatly improve the investment climate. The northern area has potential to be developed as the location where foreign investors would like to relocate their activities to, and this railway would increase its accessibility and possibilities for export. A threshold could be the lack of skilled workforce in this part of the country, but with (re)training and the measures of *human resource* this could be rectified.

The second strategy focuses on making Costa Rica a *Regional hub*, a gateway to Central Europe. This strategy is based on two main principles, which are *Connecting the foreland* and *Serving the hinterland*. In the first principle, several possible measures are identified. For establishing a better connection between Costa Rica's ports and the foreland a hub-and-spoke network can be created. Further, establishing a competitive dry canal through Costa Rica is a measure to improve the connectivity with the foreland as well. With this measure Costa Rica suits more as a transhipment hub. A third measure could be to create a by-passing or tail cutting shipping configuration from TCM to the main shipping flow, because the TCM is one of the few ports which are able to receive New-Panamax vessels. The second principle, *Serving the hinterland,* could be ameliorated by different plans. Currently, the government took already two measures: it established a cargo ferry service between Puerto Caldera and La Unión (El Salvador), and it is constructing a new road in the northern region to reduce travel time between Nicaragua and Puerto Limón. Another way to improve the service to the hinterland is to construct a dry canal with an inland terminal in the north as mentioned in the first principle. However, in order for this measure to work, the current infrastructure needs to be improved. A sufficient road between Puerto Caldera and the northern region is required as well as regulating the traffic demand on Route 32. Secondly a railway from the inland terminal to Puerto Limón could improve efficiency of the inland terminal and thereby the use of hinterland. A third measure could be to create an environment to attract value-adding businesses near the inland terminal in the country. These logistical centres can house an array of activities relating to transport, logistics and the distribution of goods. Similar logistics centres could be developed in the area around the port providing services that preferably are located close to the port. At last, as mentioned in the *Attractive investment climate* strategy, improving the border crossings with clear arrangements and an integrated IT system could be a measure to improve the hinterland connections.

When evaluating the two strategies to the scenarios, it became clear that both strategies as viable in different situations. However, climate change remains an uncertain factor, especially for the *Regional hub* strategy, since this strategy is dependable on the agricultural sector. The agricultural sector could encounter serious damage from climate change, resulting in less export production. The strategy *Attractive business climate* is the most robust strategy since it encounters much less damage from climate change and

competition from other countries. It depends less on agriculture and more on service/specialised industries. However, the labour costs could cause difficulties, since it could grow higher with more economic growth.

Recommendations for implementation

For actual implementation of measures from the proposed strategy, it is important that all stakeholders are managed correctly and research into the measures is done in the right order. In order to do this the measures were ranked on the ease of implementation and an analysis of the stakeholders is made to determine how they should be handled in the process of possible implementation.
The advice is to start researching the methods that have the lowest cost of implementation and will need the fewest involvement of different stakeholders. Also, measures will likely be less opposed are advised to research first. After these considerations, for each of the different categories of the strategy; Ease of doing business, improving the logistical situation, and human resources, one ore multiple measures are proposed to start with. The following measures should be researched further from the start:

Human resources

- Improving the language proficiency

Logistical situation

- (re)Locating the industries
- Construction of an inland terminal
- Improving the border procedures or
- Better coordination of the demand

Ease of doing business

- Installation of IT systems
- Improving border processes

However, to develop an inland terminal it would be logical to first improve the infrastructural connection between the TCM and the GAM.

Recommendations for further research

There are three recommendations for possibilities to research in the future, the most important one being on the measures as proposed in the strategies and implementation plan. The effects and costs of these measures have to be tested before actual implementation can happen. The second one concerns the use of modern techniques in traffic management and new infrastructural projects. Models calculating and mapping the traffic flows can be essential in finding the major congestion points in the country that prevent efficient transport of goods. Also, cost benefit analysis can be a useful tool in the decision-making process for infrastructural projects, since it provides an objective view on the effects of a project. The last recommendation is to search for a solution to the problem of the bad cooperation between the different governmental ministries. Also, the non-profit organizations and universities could prove valuable in the process of coming to important decisions since they hold a lot of knowledge.

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1 Introduction

In 2014 Costa Rica was ranked in the Logistics Performance Index (LPI) on place 87 between number 86 Ecuador and number 88 Kazakhstan. Since logistics has many dimensions, comparing different countries on logistics is very challenging. Therefore, the World Bank invented the Logistics Performance Index, which measures five independent indicators and ranks 160 participating countries. The six components are: *efficiency of customs and border clearance (1), quality of trade and transport infrastructure (2), ease of arranging competitively priced shipment (3), competence and quality of logistics services (4), ability to track-and-trace consignments (5), and frequency with which shipments reach consignees within scheduled or expected delivery times (6)*. Costa Rica scores relatively high on the logistics quality and competence, however it scores relatively low on the customs and border clearance, and quality of transport infrastructure (World Bank, 2014).

In the coming decades global trade and maritime volumes are going to rise. Thanks to globalisation, global economic growth and a higher world population, the international; maritime transport is expected to increase to 250 tonne-km by 2050 (OECD/ITF, 2015a). An increase in maritime transport causes challenges for ports and port development. It is expected that tonnes of goods (un)loaded at ports will increase with a factor of approximately 3.8 in 2050 regarding to the level in 2010. Expansions of ports are needed and a broad development of hinterland connections is required as well, since large port projects have a significant impact on the land-use and local economy in the hinterland (OECD/ITF, 2015b).

Costa Rica has two main harbours at the moment: Puerto Caldera on the Pacific side, and Puerto Limón/Moín at the Caribbean side combined assured for a total of container movements of 1.3 million TEU in 2014 (ECLAC, 2015a). Currently, APM Terminals is constructing a new state-of-the-art container terminal in Moín with 7,056 reefer plugs to boost the Costa Rican fresh fruits and flowers export. The terminal will be operated from 2018 (APM Terminals, 2016).

Figure 1: Map with ports in Costa Rica (worldportsource.com, 2016)

Knowing that Costa Rica faces big logistical (hinterland) challenges and that Costa Rica is developing its maritime transport, this research tries to define a robust logistical strategy for Costa Rica with a focus on the ports of Limón/Moín and Caldera. The research focuses first on the current logistical system of Costa Rica and how it is performing in comparison to its neighbouring countries. Characteristics of the demand for logistics will be mapped, and all together result in a SWOT overview. Then, common logistical hub strategies are evaluated. Measures to improve the logistical system will be combined in a strategy and at last an implementation plan is given.

This chapter continues with a clear problem definition (§1.1), and is followed up by the definition of the main research question with its sub questions (§1.2). At last the used methodology is explained in paragraph 1.3.

1.1 Problem definition

Costa Rica has the highest economic welfare of the Caribbean region, but it performs worse on logistic issues, resulting in the 11th place out of 19 Latin American countries regarding logistics performance in 2013. Transportation of goods in the region is very costly in terms of money and time due to poor custom performance, bad secondary road quality, and high transportation service costs (World Bank, 2013a). For example, the price for pineapples transported for Costa Rica to Santa Lucia for Miami, suggest that the production costs counts for only 10% of the total costs, while the transportation is responsible for about 43% of the total costs (OECD, 2013).

Regarding the port sector, infrastructure facilities and service efficiency need significant improvement given the weak capacity, and the sector's importance for foreign trade and coastal shipping (Inter-American Development Bank, 2013).

To promote trade among countries, quality and costs of logistics are at least as important as distance between two trading partners. When the logistical situation improves, companies have a better accessibility to competitive import and export prices, resulting in a boost in trade (Mesquita-Moreira, Volpe Martincus, & Blyde, 2008). But, to gain full economic benefits from improved infrastructure three conditions has to be met; fine investment climate, stable economic growth, and a political agenda that supports investments in logistics (Banister & Berechman, 2011). With this information in mind, the main research question can be formulated.

1.2 Research questions

Now the problem has become clear in the previous paragraph the main research question with its sub questions can be defined. The research has the focus on the logistical system of Costa Rica. Regarding this research the logistical system is defined as a combination of infrastructure and business climate. With infrastructure is meant the main seaports, its hinterland and possibilities to expand its foreland. The main research question is as follows:

In what way can Costa Rica improve its logistical system to gain additional economic advantages, while matching future development in maritime transportation?

To achieve a clear answer on the main research question sub questions are made and categorised in two parts. The sub questions are:

Part I – current logistical situation Costa Rica

1. What type of goods is most important for Costa Rican trade and what are the origins and destinations?

2. How is the current logistical system of Costa Rica performing in comparison with neighbouring countries?
3. What opportunities and threats can influence Costa Rica's economic position in the international trade market?

Part II – possible futures and strategies

4. How can Costa Rica exploit its strengths and diminish its weaknesses by seizing identified opportunities in a robust way?
5. For what measures should Costa Rica start researching their effectiveness based on the ease of implementation?

First sub question has the focus on Costa Rica's (international) trade. It gives insight what important industry and production areas are as well as with whom Costa Rica trades most. The second sub question investigates Costa Rica's logistical systems and compares it with other countries in the region. By answering this question it can be determined if Costa Rica is a runner-up in logistics or lags behind on others. The third sub question should come with external factors that influences Costa Rica's logistical system and economy. After answering the first three sub question, the state of the Costa Rica became clear, so that the research could flow into a next phase; how to improve it? The fourth and fifth focuses on strategies that can influence Costa Rica's logistical system, found in Part I, positively. When all sub questions has been answered, the main research question can be answered.

1.3 Methodology

In this section the methodology used for the research for this report is presented. First the method used for conducting this research is explained. Secondly, and most importantly, a general approach is written as a tool to conduct similar research.

1.3.1 Costa Rica methodology

This methodology is based on an existing framework that can be applied to almost any project situation. This existing framework is provided by Sage and Armstrong (2000) and will be slightly adapted before applied on this research. The framework consists of three phases; each consisting of two or three steps, adding up to 7 steps in total. Therefore the name presented by Sage and Armstrong (2000) is the seven-step project lifecycle. The life cycle presents a general approach that can be followed when conducting a project, and is specifically designed for system engineering projects. The process is iterative, so results and analyses of earlier steps can be adapted based on information or results in a later step of the life cycle. Figure 2 shows the seven different steps. The authors of this report have experience with using this method and will use it as a tool for guidance throughout the project. The structure of the framework will be applied to the structure of this report as presented in the flow chart later in this section.

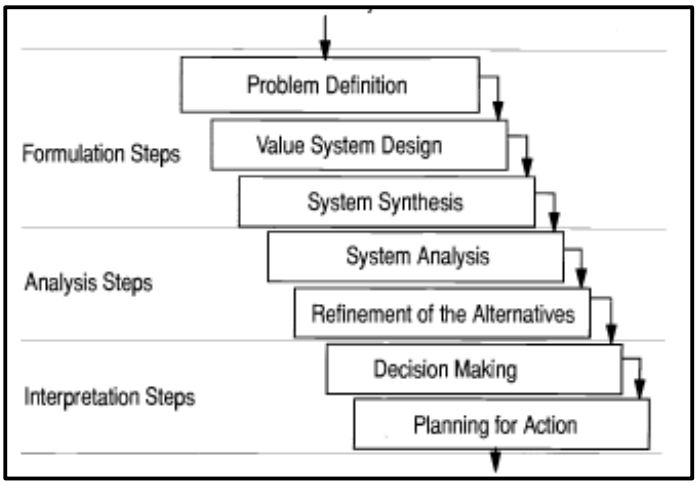

Figure 2: 7-step project life-cycle (Sage & Armstrong, 2000)

For this research the formulation and analysis steps will be the most important, since the goal of this report is to define strategies for Costa Rica and not very specific alternatives or defined project to be executed. Therefore the weight will be on the defining of alternatives and not on the process of selecting which alternatives will be the most suitable for Costa Rica. In order to do this, it is important to identify the current state of the Costa Rican logistical system along with its strengths and weaknesses. In the problem definition step, the problem will be identified along with scope of the problem. The value system design step normally provides criteria on which measures will be judged. In our case criteria will not be used, but the analyses will identify strengths, weaknesses, opportunities and threats on which the strategies will be based. The current state of the logistical system will be described in the system synthesis step, meaning that the value system design and system synthesis step are a lot alike for this research. The system analysis step will search for measures in there as well as possible future alternatives. The refinement of the alternatives step provides possible strategies applicable on the found current situation, based of the earlier identified theoretical measures. In the decision making step the strategies are reviewed and the most promising ones are chosen, based on their robustness in the different scenarios. The last step, planning for action, provides an implementation plan. In this implementation plan the involvement of the different actors will be addressed. Also, an advice on where to start future research will be given.

1.3.2 Generic approach

The approach chosen in this report can be, when slightly adapted to the specific situation, be used for other countries and other focuses of research. Therefore, the approached used for this research is also turned into a generic approach for research to improve the logistical and economical situation of a country. Figure %% shows this generic approach. Please note that the names of the chapters proposed chapters does not correspond precisely with the ones used for this specific report, since this figure applies to the generic approach and for this report case specific titles were chosen.

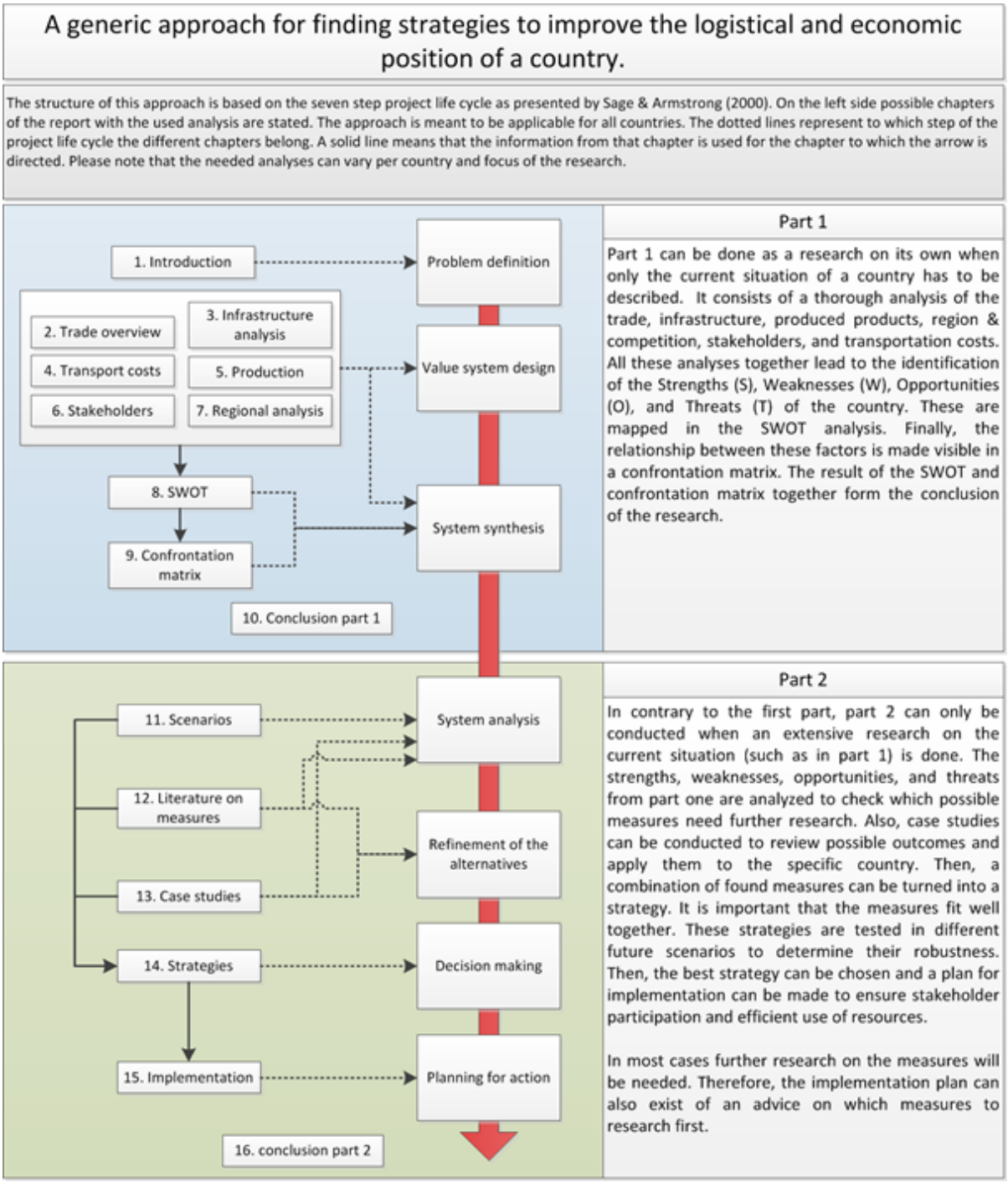

Figure 3: Generic approach for improving logistics and economical situation

PART I
-
CURRENT LOGISTICAL SYSTEM COSTA RICA

2 Costa Rican trade: statistics and transport of goods

This chapter interprets data and other information about the current trade of Costa Rica with foreign partners. First some general export and import statistics are given. After some general information, data about trade volumes, trade values and used transportation means of the markets are given. Most of this information is based on PROCOMER (2015). In §2.4 and §2.5 discussed respectively the flow of goods and the origins of the agricultural products.

2.1 Import / export statistics

Costa Rica is ranked 88th and 66th of the world trade for export regarding respectively merchandise and commercial services in 2014. For importing Costa Rica was ranked respectively for merchandise and commercial services 85th and 112th (WTO, 2015). Costa Rica exported for more than 11,304 billion USD. Unfortunately, it has a negative trade balance of 5,786 billion USD, because it imported goods with a value of 17,090 billion USD in 2014. The three most valuable export products are medical equipment (1), bananas (2) and pineapples (3) (PROCOMER, 2015).

Export goods are divided in three categories, which are livestock and fish, agricultural products and industry. The industry category is as broad as the word says; it includes among others clothing, ore products and electronic devices. 74% of the export value is earned with industry, followed by agricultural products (22.8%) and livestock and fish (3.2%). Each sector has mostly the same importers, but the distribution in values differs strongly.

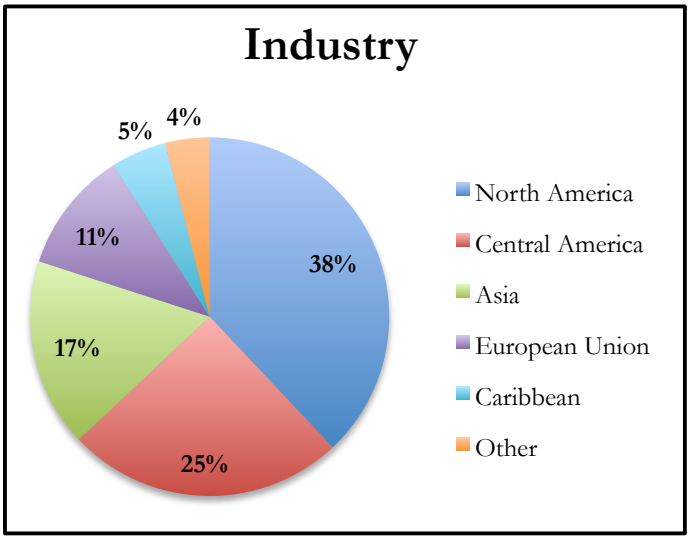

Figure 4: Export markets industrial sector 2014

As can be seen in Figure 4, the export market is mainly dominated by North American and the Central American region. Most important export products of the industry sector are electronics and medical equipment together responsible for more than 50% of the sector. The total amount of export value of the industrial sector has decreased with 2 per cent point relative to 2013. Because of high import values (16.149 million USD), the trade balance for the industrial sector is negative: -7.786 million USD. Costa Rica imports for approximately 1.8 billion USD fuels. (PROCOMER, 2015).

The agricultural sector on the other hand realised a growth of 5.2% of export. Its main customers are North America and the European Union together representing 90% of the export market (see Figure 5). The agricultural sector includes fresh products, coffee and tea, flowers and plants, and others.

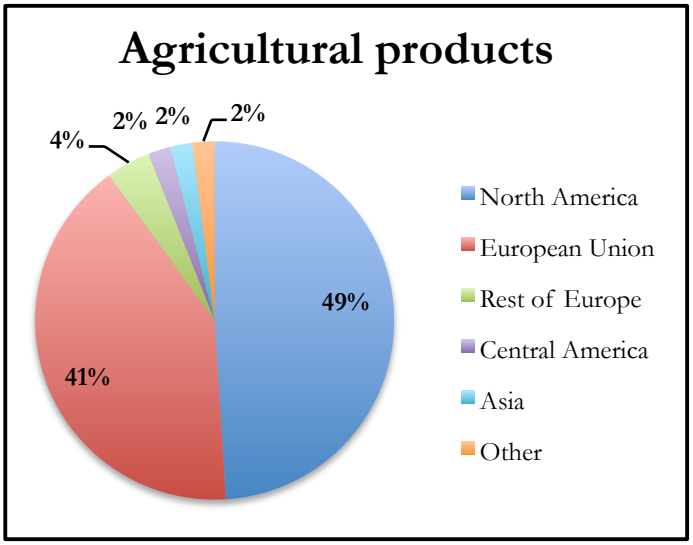

Figure 5: Export markets agricultural sector 2014

As can been seen in Figure 5, a significant part of the export of agricultural product is headed towards the European Union. Table 2 provides an overview of the distribution of the exported agricultural goods to the EU.

Table 2: Distribution exported agricultural goods to the EU 2014

European Union	
The Netherlands	23%
United Kingdom	19%
Belgium	18%
Italy	13%
Spain	8%
Germany	5%
Ireland	4%
Greece	3%
Sweden	2%
Other	5%

The overall trading balance with the EU regarding the agricultural sector is with 1.034 million USD positive for Costa Rica. The trade balance with the USA is a bit less, but still positive: +864 million USD. The top three exported products for this sector, together 80% of the export share, are bananas, pineapples and coffee.

The third and last export sector is the livestock and fish category. The livestock and fish resulted in an overall positive trade balance for Costa Rica, namely 366 million USD export value against 196 million USD import value. Figure 6 gives an overview of the most important export markets of livestock and fish. Again, North America has the biggest share, but the difference with the Central American region is not that big; one per cent point. Important export markers for the livestock and fish sector in Central America

are Guatemala, Nicaragua, El Salvador and Panama. The top three export products of this sector are beef, milk and concentrated cream, and fish filets and other fish products.

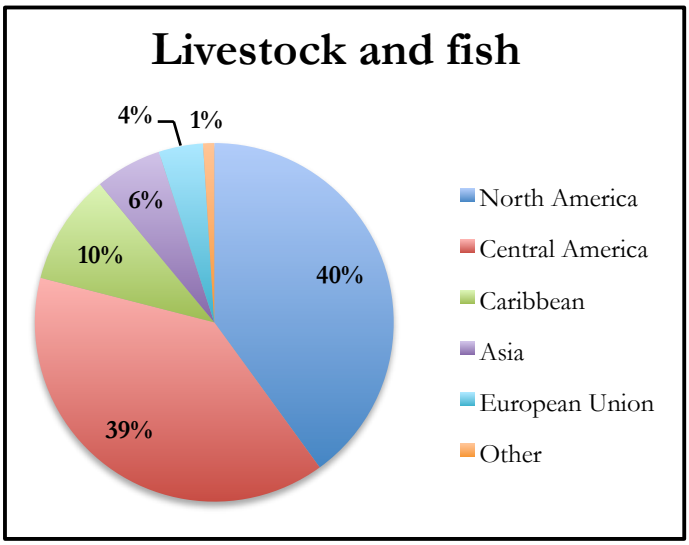

Figure 6: Export markets livestock and fish sector 2014

At last, the import and export of liquid bulk and dry bulk is very low in comparison to the containerised trade.

This paragraph gave a description of the trading for Costa Rica for three sectors: industry, agriculture, and livestock and fish. It became clear that despite Costa Rica is exporting many goods; it still has a negative trading balance. Further became clear that the USA and the EU are important trading partners. The next paragraph deepens in the trade per region.

2.2 Trade per region

Seven different regions are identified in the study of PROCOMER (2015) as trading regions for Costa Rica. These regions are North America, Central America, South America, Caribbean, European Union, Asia, and the so-called rest of Europe. The top five trading partners for Cost Rica regards the United States of America, the Netherlands, Panama, Nicaragua and Guatemala.

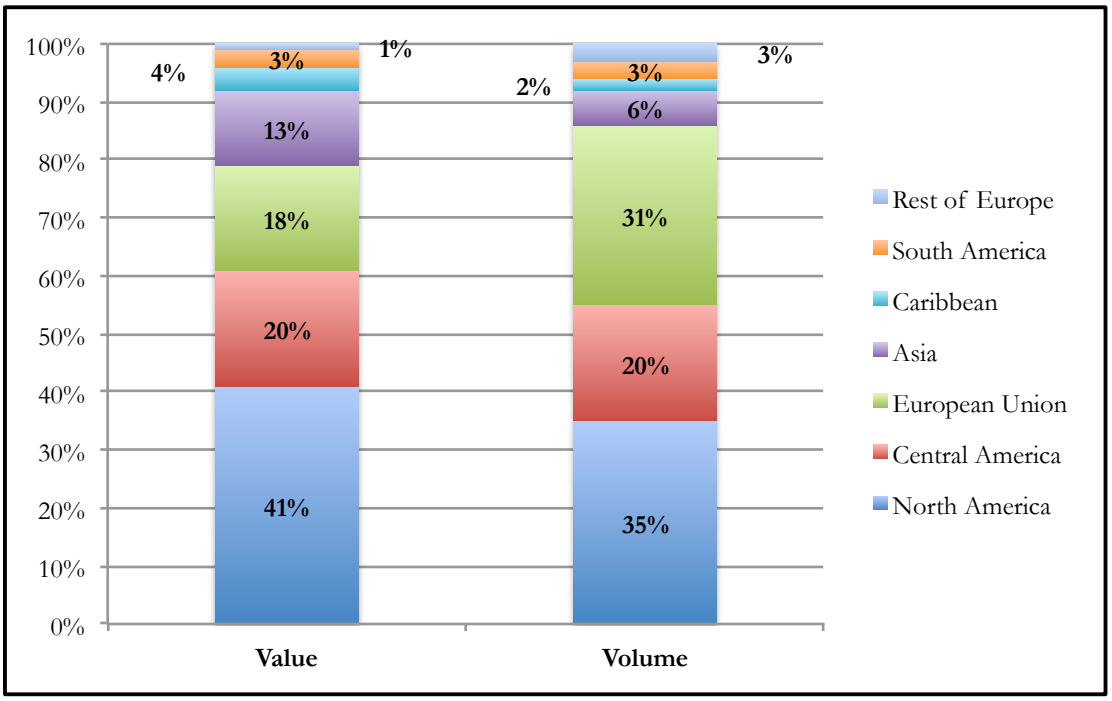

Figure 7: Values and volumes exported per region 2014

Figure 7 shows that both in total volume as in total value the North American region ranked on the first place. Making up the total balance of trade with North America is becomes clear that it is strongly negative for Costa Rica. Despite Costa Rica exports high value medical goods to this region it imports already for more than 1.7 billion dollar worth petroleum and diesel from North America. The last few years the import as well as the export with North America decreases.

The total trade with Central America has a positive result: one billion USD. The most important export partners are neighbouring countries Panama and Nicaragua, while Costa Rica is mostly importing from Guatemala and Panama. The main export product from Costa Rica is syrups and other concentrates for preparing of aerated beverages, mainly exported by the Coca Cola enterprise.

Regarding trading with the EU results in a positive trade of 553 million USD in 2014. The Netherlands (35%) and Belgium (19%) represent more than half of the demand for Costa Rican goods. However, Costa Rica imports mostly from Germany, Italy and Spain. The core export products to the EU are bananas, pineapples, and integrated circuits and micro electronic assemblies. Costa Rica imports mostly medicines and people transportation vehicles from the European Union.

Trading with the Asian continent gives a negative trading result for Costa Rica. Costa Rican main export partners are Hong Kong, Malaysia and China, together representing more than 75% of the export. The main countries from which Costa Rica imports are China (48%) and Japan (13%). Core export business with Asia is integrated circuits and micro electronic assemblies. Regarding import, passenger vehicles are mostly imported.

Because the Caribbean region is seen as a potential market, the report provides more information about the current trade with this region and where Costa Rica could expand its trade with this region. Figure 8 represents the current export destinations and import origins of the Caribbean region.

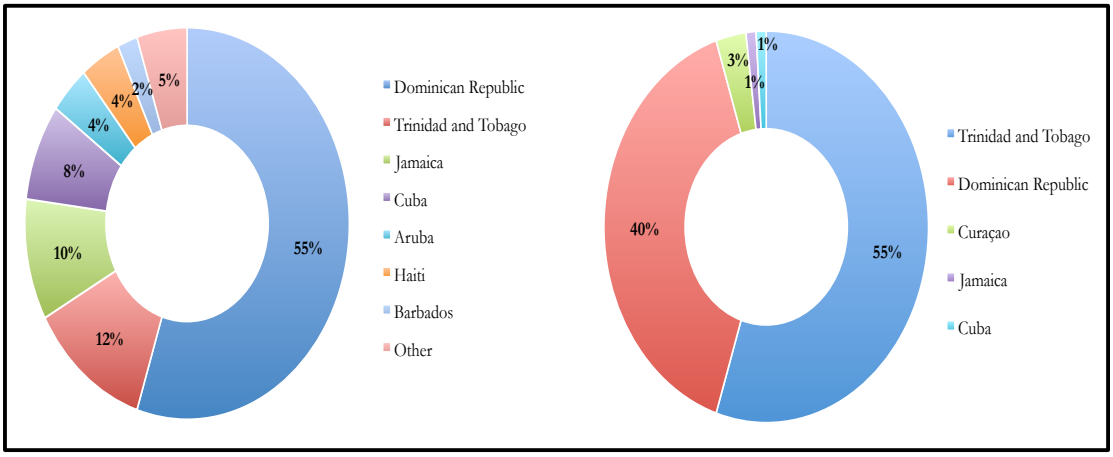

Figure 8: Export destinations (left) and import origins (right) in the Caribbean for Costa Rica 2014

In 2014 Costa exported for 490 million USD to the Caribbean and imported for 125 million USD resulting in a trade surplus of 366 million USD. Main export product to the Caribbean is antisera, followed by syrups and beverage concentration, and glass containers. The products Costa Rica mostly imports from the Caribbean region are half-fabricates of iron and steel, sheets and plastics, and iron wire.

The last region of importance for Costa Rica is the South America region. Its main export partners are Colombia, Ecuador and Venezuela, and the main import partners are again Colombia as well as Chile and Brazil. As result of only exporting 310 million USD to this region the trading surplus is more than 830 million USD negative. Costa Rica's core businesses for export are medicines, aluminium products, and syrups and beverage concentrates. Copper wire, medicines, and textile are the main import markets.

2.3 Export transportation

This paragraph is dedicated to the transport means for export. Regarding export volume 79% of the goods are transported by maritime transport, 20.5% is transported via road and the remaining 0.5% leaves Costa Rica via air. When looking at the value of the exported goods the distribution is quite different. Here the share of maritime transport has been reduced to 54.4%, while the share of air transportation rises to 22.9%. The share of exported goods regarding value is 22.7% for road transportation (PROCOMER, 2016b). It shows that air transportation carries almost 23% of the export value, while it only includes 5% of the volume. Typical characteristics for air cargo transportation are that is serves high value goods, low volume/low weight goods, and air transportation has a higher delivery speed than deep-sea transport (Long, 2003).

Table 3: Top three transported goods by maritime transport (tonnes and million USD) 2014

Maritime		
Type of good	*Volume*	*Value*
Bananas	2,146,245	894.3
Pineapples	2,054,923	861.8
Timber	203,293	39.6

Looking at volume most of the goods transported by sea are bananas, pineapples and timber. On the fourth and fifth place are respectively fruit juice and sugar. When

comparing Table 3 on value, the number three has to be the fruit juices and the timber goods drops.

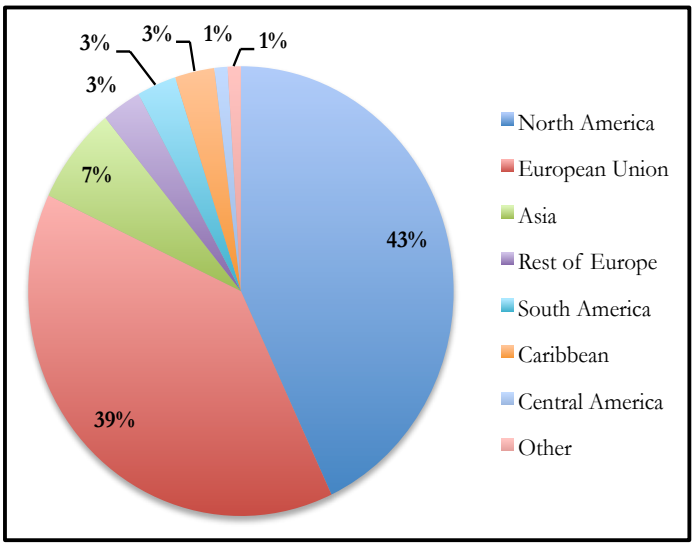

Figure 9: Volume of seaborne exports by region of destination 2014

Figure 9 gives an overview of the volume of seaborne exports by region of destination. It becomes clear that most of the maritime transport flows towards the European Union and North America.

Table 4: Top three transported goods by road transport (tonnes and million USD) 2014

Road		
Type of good	*Volume*	*Value*
Cement clinkers	200,221	21.5
Other Portland cements	121,429	14.5
Water and water products	74,558	26.6

Table 4 shows the top three regarding volume of products transported by truck. Both volume and value are much less than goods transported by maritime means. The number four regarding volume, sauces and preparations, would be the number one when looking at value.

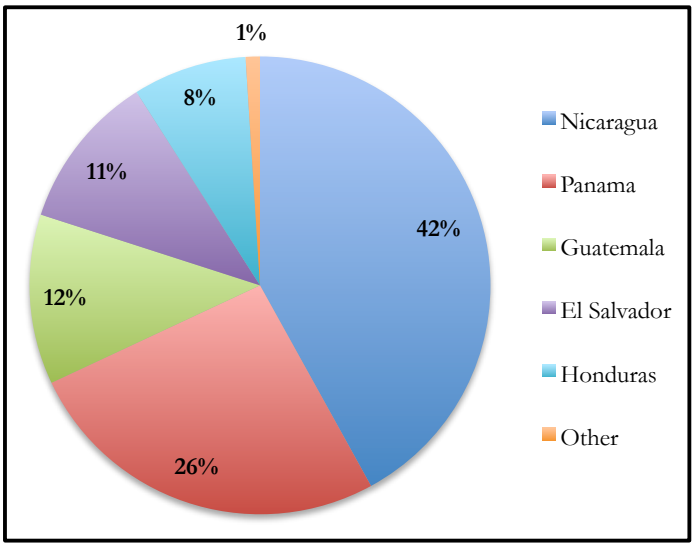

Figure 10: Volume of road exports by region of destination 2014

Most export traffic has the destination Nicaragua and Panama. 85% of the import and export traffic over land has to pass the border by Peñas Blancas by Nicaragua, because to reach Honduras, El Salvador and Guatemala by road you need to pass at least Nicaragua (Carvajal, Fernandez, & Salazar, 2008).

Table 5: Top three transported goods by air transport (tonnes and million USD) 2014

Air		
Type of good	*Volume*	*Value*
Fish fillets and other fish meat	6,716	49.1
Flowers and buds	5,746	33.4
Fresh, chilled or frozen fish	4,537	29.6

Table 5 contains the top three transported goods by air transport. It shows that most of these products are goods with a limited expiration date. This table makes it also clear that the air-transported goods are of high value compared to their volume.

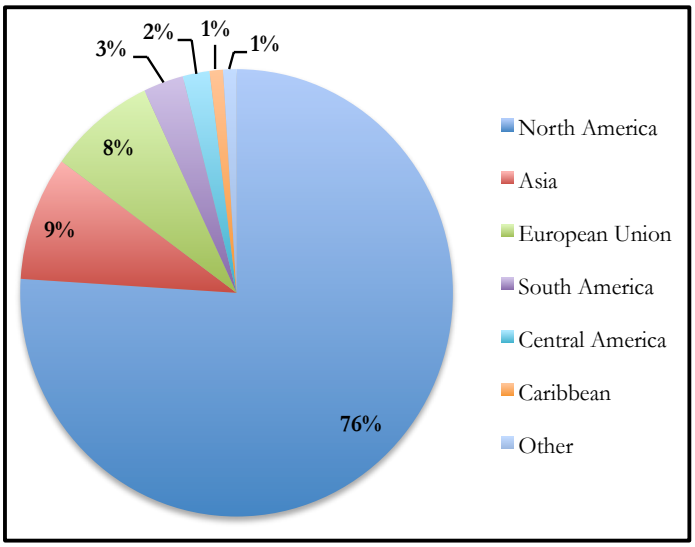

Figure 11: Volume of air exports by region of destination 2014

Figure 11 shows that 76% of the air cargo is heading to North America in 2014. Only a very small percentage of the exported goods go the other countries in Central America, because it is well accessible by road.

2.4 Flow of goods

The country of Costa Rica consists of six regions: the Northern Pacific, the Northern Plains, the Caribbean, the Central Valley, the Central Pacific and the Southern Pacific, see Figure 12.

Figure 12: Regions of Costa Rica

From the trade overview as described in the previous paragraphs it can be derived that the main export sectors of Costa Rica are generated in industry, agriculture and livestock and fish. In

Figure 13 the different areas that provide the several goods are distinguished. In can be noticed that most of the country's manufacturing industries (industria manufecturera) are positioned in the Central Valley region around the capital of San José (around 87 per cent of all companies). The materials for these businesses are mostly imported from the US and Asia and contain a large share of Costa Ricas imports (BID & CPCI, 2014). Many multinationals have opened branches in Costa Rica. The largest part of the companies are specialised in high-tech electronics. While other manufacturing sectors include medical equipment, nutricional preparates, chemical products and textiles. The multinationals use Costa Rica as a base to supply the Latin American markets. In 1981 the Costa Rican government introduced Free Trade Zones (Zonas Francas) to promote investments and trade exchange, and generate employment in the country. Domestic and foreign countries receive financial benefits for the development of their operations in these free trade zones (FTZs), exclusion from customs fees and duties (PROCOMER, n.d.). A main requisite for companies in a free trade zone is that a large percentage of the goods are meant for export and no goods are being produced here, only processed, handled or distributed. The free frade zones are located primarily in the Gran Area Metropolitana Ampliada (GAMA, Great Wide Metropolitan Region).
Figure 14 shows the distribution of FTZs over the country.

Figure 13: Origin of export goods (BID & CPCI, 2014)

Figure 14: Locations and number of free trade zones (BID & CPCI, 2014)

Currently, most companies in the FTZs are in the industrial sector, see Table 6. The companies producing most value are specialised in electronics and medical equipment (PROCOMER, 2016c). As most of these goods are transported by air, the proximity of most free trade zones near the Juan Santamaria Airport, in the Central Valley, is logicial.

Table 6: Export values 2014 per sector in USD (PROCOMER, 2015)

Sector	Outside Free Trade Zones	Free Trade Zones	Total
Fish	284.9	81.5	366.5
Agriculture	2,515.3	58.1	2,574.4
Industry	2,712.6	5,651.0	8,363.6

The amount of companies in the Central Valley employ many people, which causes congestion in the Central Valley by transportation of persons and goods. Furthermore, a new airport is being planned south-west of San José to handle freight and passenger transportation in the future (from 2025), as the curent airport is reaching its limits (CentralAmericaData.com, 2015b). There are opportunities for Costa Rica to attract companies in FTZs near the terminals of Caldera and Limón/Moín to perform distribution and handling services on maritime imported products. Costa Rica can benefit from the value-adding processes on products that are transhiped in the nearby ports. Furtermore, if more companies will be located in the Cariben and Central Pacific regions, this will increase employment availability in these poorer regions. Another possibility for the free trade zones is to invest in distribution centres for SMEs. Often it is difficult to arrange export certificates for SMEs, so therefore many are being bought by large multinationals (Dole, Del Monte, Chiquita) (Buhrs, 2016). Livestock products

(ganaderia) are scattered over all regions with fish (farming) (pesca y acuicultura) solely centered on the Pacific Coast.

In volume agriculture provides the largest export share of the three before mentioned categories. The main export products include bananas, pineapples and coffee. These products are transported by ship to primarily Northern American and European markets. The growning locations of the agricultural products are predominantly located in the Caribbean and the connecting area of the Northern Pacific, Northern Plains, Central Pacific and Central Valley. Smaller patches of argiculture are found in the northern part of the Northern Plains, in the Central Valley near Alajuela, right on the coast near Puerto Quepos in the Central Pacific and the largest of the four in the Southern Pacific.

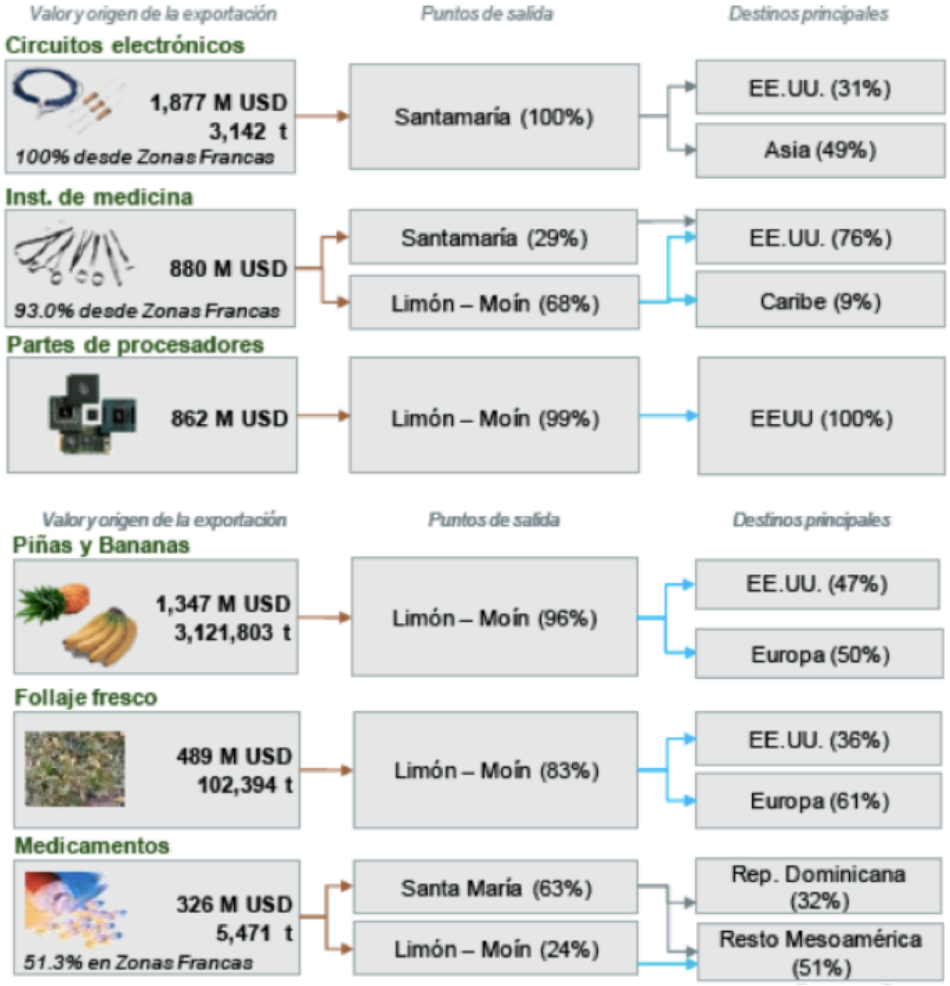

Figure 15: Origin, destination and transport mode of goods (BID & CPCI, 2014)

Figure 15 shows the origin, destination and transport mode used for the most important export goods. Electronical devices, part of the medical equipment and supplies are transported by air via Juan Santamaría International Airport. Fruits (like bananas and pineapples), processed parts and fresh foliage is tranported mainly by ship from the Limón/Moín port. The argicultural products have the largest share in maritime transportation and as this research has a primarily focus on maritime transportation, the exact origins of argricultural products are looked into in more detail.

2.5 Origins of argicultural products

From Figure 16 it can be derived that all bananas are produced in the Caribbean region. While pineapples are more divided over the Northern Plains, Caribbean and Southern Pacific. Coffee is produced in the mountainous Central Valley region. It must be mentioned that althoug cane suger is produced in the highest numbers, this is mostly for national use, as can be seen in Table 7.

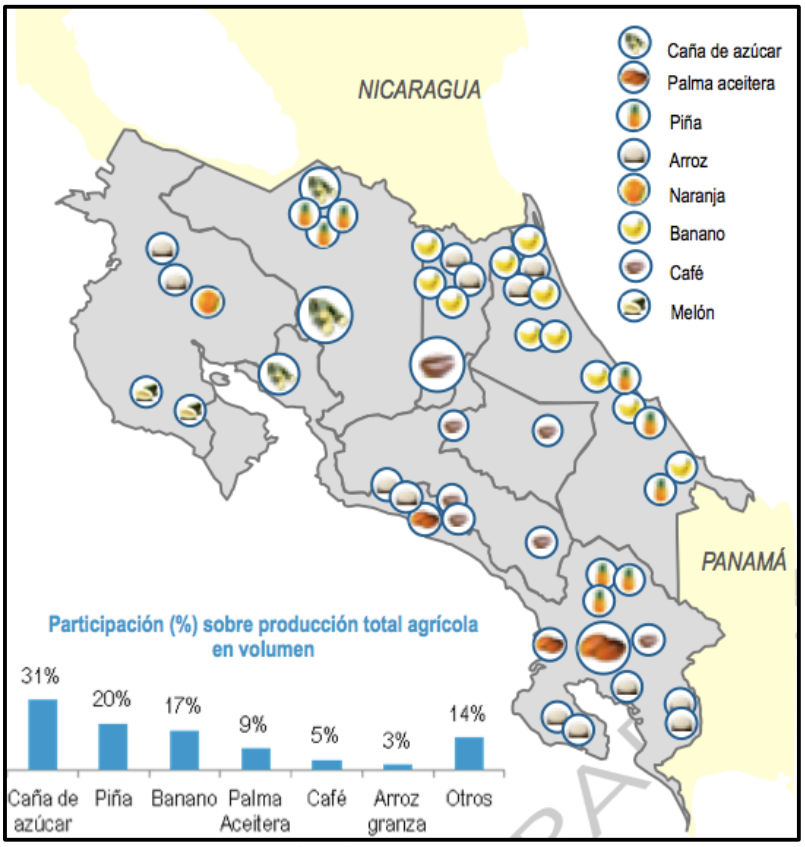

Figure 16: Origin of agricultural goods (BID & CPCI, 2014)

Since 96% of all pineapples and bananas are shipped from the Limón/Moín port, as was shown in Figure 15, all the fruit needs to be transported to the shipping docks over land. In chapter 4 the layout, use and quality of the Costa Rican road and rail network will be discussed. Pineapples have a travel time of six to ten hours, for which the ten hours is encountered with picking up pineapples in the Southern Pacific region. Mangos from the Northern Pacific region generally take up twelve to fourteen hours by truck, which is equivalent to the transportation times of melons in this region (Hartog, 2016).

Table 7: Production and export numbers 2010/2011 (BID & CPCI, 2014)

Main product	Production 2010 (ton)	Export weight 2011 (ton)	Main destination
Cain and sugar	3,734,732	111,383	North America
Pineapple	1,976,755	1,587,736	North America European Union
Banana	1,803,941	1,523,394	North America European Union
Palm oil	985,800	174,874	Central America
Coffee	512,123	75,112	Central America

2.6 Concluding Costa Rican trade

The first part of this chapter made clear that the top three export products by value are medical equipment, bananas, and pineapples. Most of the export value is earned by the industrial sector followed up by the agricultural sector, and the livestock and fish sector. However, in trading volume agricultural products are very important, especially bananas and pineapples. Approximately 80% of export value and volume is send to North America, Central America and the European Union. The mode of transport for exporting products in volume is mainly maritime transport (79%), followed by road (20.5%) and air (0.5%). When looking at export value shares are differently distributed: 54.5% maritime transportation, 22.9% air transportation, and 22.7% road transportation. This can be explained by the cost/speed ratio of the different modes.

The second part of this chapter gave insight in the flow of goods and the origins of the agricultural products. It became clear that most industry in situated in the GAM, while most agricultural products are cultured in at the Caribbean side, the northern region, and in the south. Further, most free trade zones are in San José and its surrounding cities. Almost no FTZs are close to the Caldera port and Moín/Limón port making it no surprise that mostly the industrial sector makes use of these special economic zones.

3 Costa Rican ports: then, now and present

This chapter focuses on the two major ports in Costa Rica: Puerto Limón/Moín and Puerto Caldera. These ports are respectively situated at the Caribbean and Pacific coasts of the country. For each port the history, accessibility, productivity and future plans are discussed. §3.1 and §3.2 discusses the above-mentioned aspects for the Moín/Limón port complex, and §3.3 for the Caldera port. Furthermore, the AMEGA Holding Company is currently reviewing plans to build a container terminal in Moín. The development of the project 'AMEGA transhipment terminal' will be discussed in paragraph 3.4. This part is separated from the Moín/Limón port complex paragraphs, because this plan is still very uncertain and is not involved in further port operations.

Table 8 and Table 9 show statistics for the import and export volumes per transport mode for respectively 2011 and 2015. As the most recent data on the division of import goods over transport modes is from 2011 these figures are used. Furthermore, to provide insight in the ratio import/export the total import number for 2015 are also included. It can be noticed that the largest percentage of goods (both in value and volume) is transported via its ports. Figure 17 visualises the ratios maritime, air and land transport.

Table 8: Import statistics 2011 (BID & CPCI, 2014); (PROCOMER, 2016c)

2011	Import value (x 1000 US$)	Percentage	Import volume (tons)	Percentage
Maritime	9,405,245.6	58%	7,841,057.4	92%
Air	4,216,144.6	26%	85,228.9	0%
Land	2,594,550.5	16%	596,602.2	7%
Total	16,215,940.7	100%	8,522,888.5	100%
Total 2015	*15,504,470.7*	*100%*	*9,792,878.4*	*100%*

Table 9: Export statistics 2015 (PROCOMER, 2016c)

2015	Export value (x 1000 US$)	Percentage	Export volume (tons)	Percentage
Maritime	5,211,337.0	54.0%	6,031,306.5	78.8%
Air	2,194,786.6	22.7%	34,840.8	0.5%
Land	2,162,493.5	22.4%	1,564,239.5	20.4%
Undefined	81,049.1	0.8%	20,041.3	0.3%
Total	*9,649,666.3*	*100%*	*7,650,428.1*	*100%*

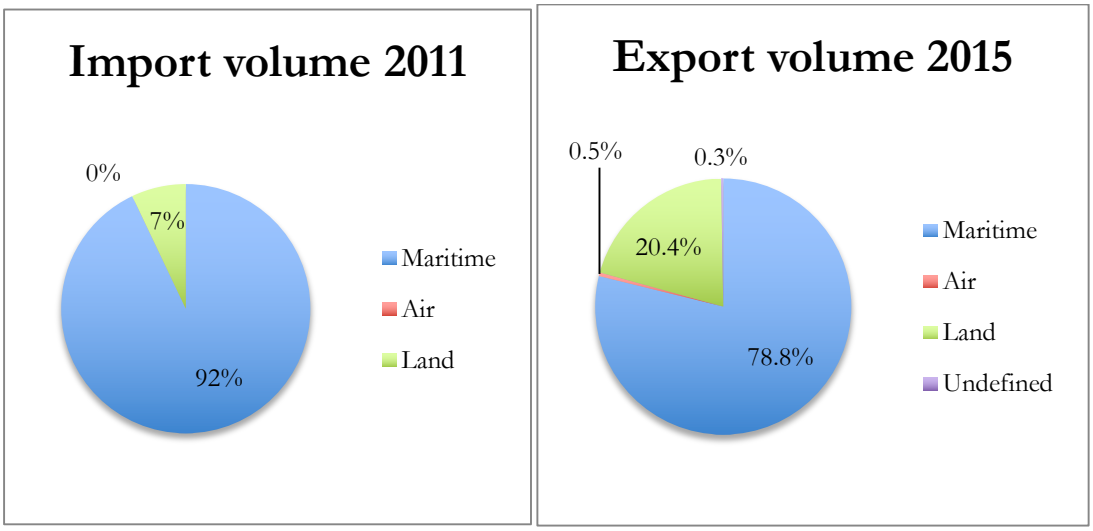

Figure 17: Import and export volumes per mode 2011/2015

Most maritime transportation is handled in the ports of Limón and Moín on the Caribbean side of the country, and the port of Caldera on the Pacific sea, see Figure 18.

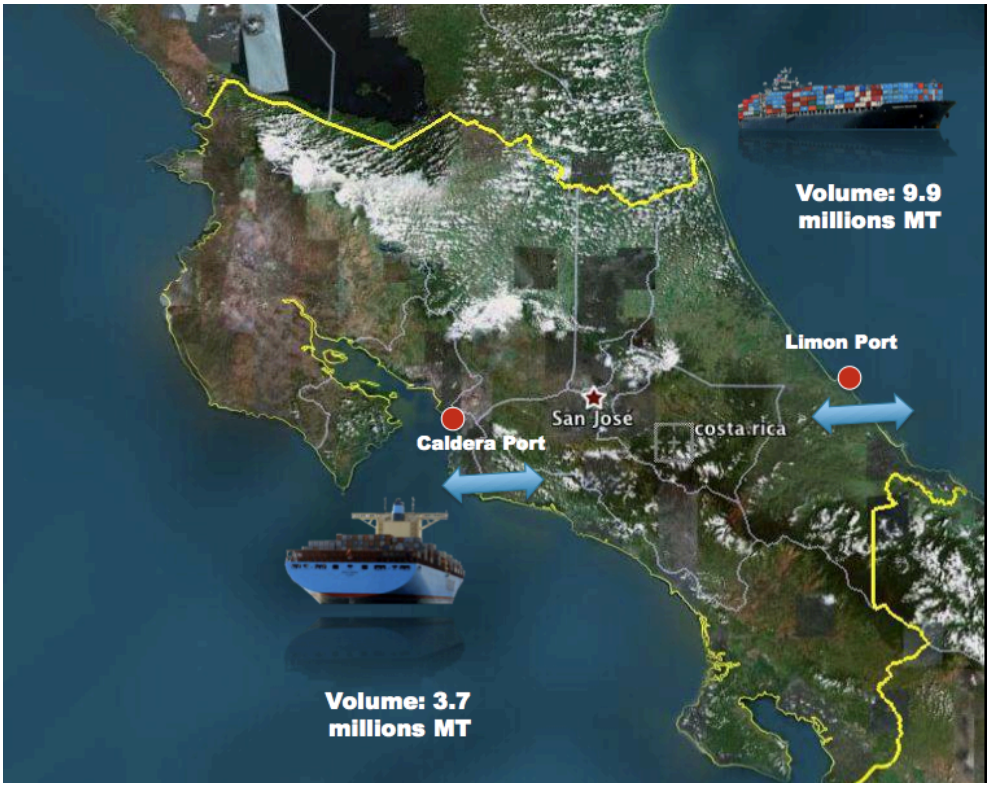

Figure 18: Geographical locations of Costa Rica's main ports (JAPDEVA, 2008)

3.1 Moín/Limón port complex

This paragraph explains the current situation in the Caribbean port region. It gives information about the history of the ports, the accessibility, and the productivity of both ports.

3.1.1 History

Junta de Administración Portuaria y de Desarrollo Económico de la Vertiente Atlántica (JAPDEVA) is the current exploiter of both maritime terminals in the Puerto Limón region. JAPDEVA is a state owned company erected in 1963 to build and operate freight

connections from Tortuguero to Colorado. From 1966 JAPDEVA started in the port business by transition of the Limón port from the Ministry of Public Works and Transportation (MOPT) to JAPDEVA. At this moment JAPDEVA is both port authority and operator of the Limón/Moín terminal complex. The Limón port was originally constructed to export bananas in 1904 (MOPT, 2002). In 1976 the Costa Rican oil company Refinadora Costarricense de Petroleo (RECOPE) started the construction of a new terminal. Even though the terminal was primarily designed as an oil terminal, the Plan Nacional de Desarrollo Portuario (national plan on port development) pointed out multiple opportunities for the new terminal leading to an adjustment of the terminal purpose. The Moín terminal was opened to handle transport of a variety of goods like fruits, fertilisers, combustibles, orange juice and others (JAPDEVA, 2014a). With a focus on the growing tourism in the area, the port authority decided to open a cruise dock in the Limon terminal. Currently, the Limón and Moín terminals are known as the combined Complejo Portuario Limón-Moín. The complex handles 80% of the country's maritime commerce and with the 1.09 million TEU handled in 2014 it ranks 13th in Latin America and 4th in Central America based on volume (van Oord, 2013) & (AJOT, 2015)

3.1.2 Accessibility

The port consists of two terminals: Terminal Hernán Garrón Salazar (Limón) and the Terminal Gastón Kogan Kogan (Moín). The location of the terminals on the Caribbean Coast provides a strategic location on the transportation routes towards North America, South America, the Caribbean and Europe. Furthermore, the port is situated in close proximity (about 190 nautical miles) of the Panama Canal, providing a good location for ships originating from the Pacific Sea (JAPDEVA, 2014b). Figure 19 shows the locations of the terminals, being approximately six kilometres apart.

Figure 19: Location of the terminals operated by JAPDEVA (JAPDEVA, 2014c)

From its strategic location the port complex mainly provides services to shipping lines operating on long distances. In 2014 the composition of trafficked export cargo was composed of Central American Countries, the United States, Great Britain and the Netherlands (respectively 27, 23, 11 and 3 per cent). Imported cargo was mainly derived from the United States and Central American Countries (respectively 46 and 22 per cent) (JAPDEVA, 2015).

After the destruction of a large part of the railway system in 1991 by an earthquake the railway was never properly restored. Although the railway system worked very well for the transportation of bananas, the rise of trucks made it unbeneficial to restore the railway. As such freight transport in Costa Rica is still mainly transported by road. To reach the Limón province all traffic has to use Route 32 (Figure 20). The current road and rail network are more detailed explained in chapter 4. Furthermore, Nicaragua does not have a port on the Caribbean side and thus sends goods by road to Moín to be transported to Europe and the USEC. Currently a new border pass was constructed in the border with Nicaragua at Los Chilles, however due to lack of investment on the Costa Rican side of the border it is not expected to be operational for freight until 2018 (Roman, 2016).

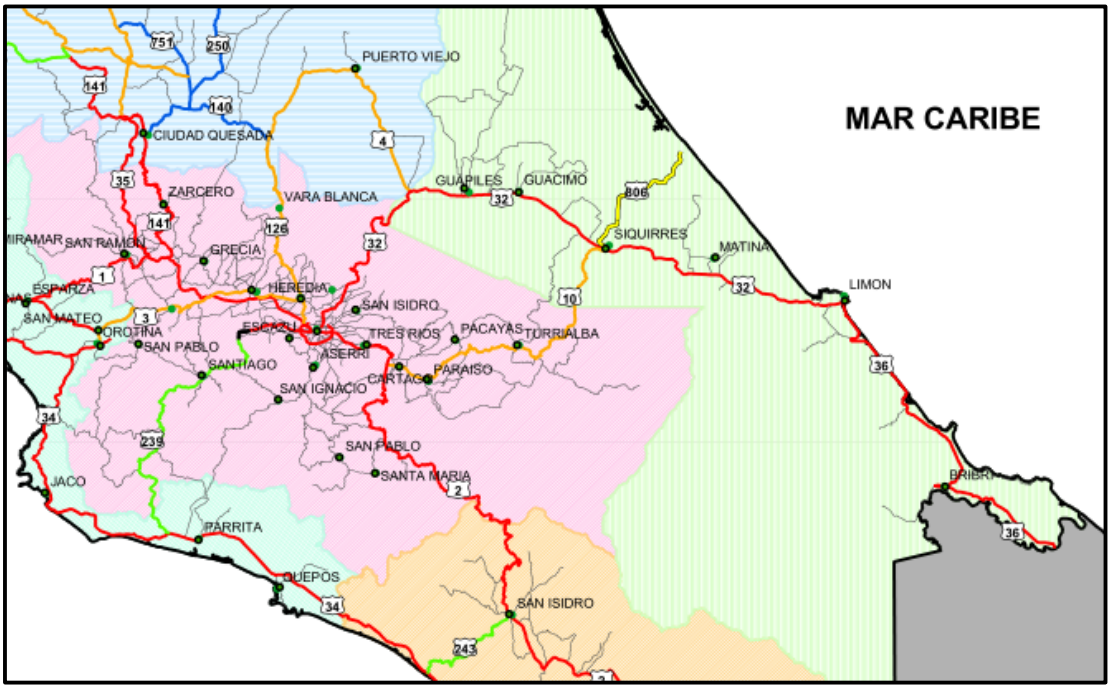

Figure 20: Route 32 to Limón/Moín (CONAVI, 2010)

3.1.3 Productivity

The Terminal Hernán Garrón Salazar (Limón) consists of two docks for cruise ships (3-1/3-2 and 3-3) and two container docks (4-1/4-2 and 4-3) on 3.26 hectare. Locations 3-1/3-2 and 4-1/ 4-2 can be used for Roll on-Roll off (RoRo) transportation. The depth of the port is 11.5 meters. Therefore, technically the port should be able to receive Panamax vessels (IDB, 2013). In Limon the available equipment consists of one rubber tired gantry crane (45 tons capacity), three straddle carriers (40 tons capacity), six tractors (40 tons capacity), seven loading carts (60 tons capacity), four reach stackers with a capacity of 15, 10, and two times 6 tons.

Terminal Gastón Kogan Kogan (Moín) consists of six docks in total: petrol dock (5-1), general cargo (5-2), three docks for banana export (5-3, 5-4, 5-5) and one container dock (5-6) on 5 hectares. The depth of the terminal is 14 meters. At the Moín terminal there are currently no cranes present. As such only ships with own cranes can be served in Moín. Based on recent feasibility studies the terminal should be equipped with 2.6 cranes. A new crane is expected to arrive in 14 months (Pecou Johnson, 2016). Ship idle times are high as even though three vessels can be berthed simultaneously but only one can be serviced (Morreira & Godinez, 2016). The Moín terminals primary function is to handle cargo, unlike Limón's. This can be noticed in the cargo ratio of both terminals. In 2014

Moín handled 8,420,196 tons versus 2,392,696 tons in Limón (JAPDEVA, 2015). Maps of both Puerto Limón and Puerto Moín are shown in Figure 21.

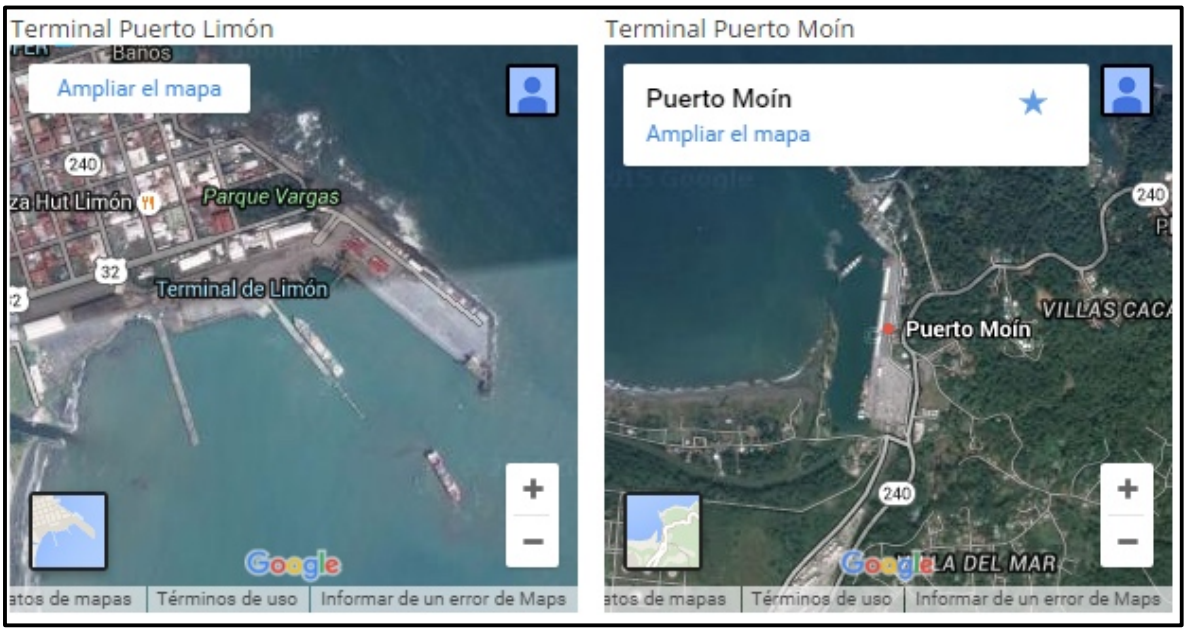

Figure 21: Terminal layout Limón and Moín (JAPDEVA, 2014d)

Both terminals are in operation for 364 days per year and 24 hours a day (with the exception of May 1st, Labour Day or presidential elections). Figure 21 shows the layout of both terminals (JAPDEVA, 2014b). The port complex offers around 2,000 jobs on site and also offers approximately 2,700 jobs in the storage of containers at external depots (Pecou Johnson, 2016).

Currently, vessels with a capacity of up to 2,500 TEU can be handled at the port complex. The depth of the current channel and terminals, and the type of crane(s) causes this vessel limit. However the average vessel size handled at the port is 1,250 TEU (IDB, 2013). JAPDEVA uses a first come-first serve policy for ships in the terminals. This leads to high waiting times for ships before handling. Furthermore, the terminals do not have storage space for containers on site. As a result, all shipping lines own their own storage spaces and need to instruct trucks to take containers to the terminals for transhipment as soon as their ships arrive. This construction leads to increased loading and unloading times at the terminals. It takes approximately 60 minutes to pickup or drop-off a container.

The Limón/Moín port complex offers its services to 20 shipping lines and handles four vessels per day on average (IDB, 2013). Vessels that are destined for North-West Europe generally arrive at the port at the beginning of the week. The sailing time of a standard vessel to its destination is 14 days, which means that many ships will leave on Saturday, Sunday and Monday. Since most ships prefer departing at the same days, this leads to congestion in the port and a high risk of delay. For the US East Coast (USEC) destination the same problem occurs on Wednesday till Friday. The transit time to the USEC is around 5 days. In the busy period ships lose approximately six hours waiting for other ships to release the berths (Hartog, 2016). Furthermore, at the Moín terminal no crane is available for loading and unloading of containers (Pecou Johnson, 2016), even though ships can be berthed at three docks (Morreira & Godinez, 2016). The dock productivity of the terminal only reaches 15 containers per hour (BID & CPCI, 2014),

due to lack of cranes and the labour sphere. The average vessel turnaround time at the port is 25.9 hours of which only 48 per cent of the time spend at the berth is productive. Furthermore, ships spend around 8.8 hours at anchor waiting around the port (IDB, 2013).

Import/export statistics

In Puerto Limón/Moín five types of cargo are handled: general cargo, containers, RoRo, solid bulk and liquid bulk. The top two cargo types are containers, and fluid bulk; see Figure 22. In 2011 both terminals combined handled 901.309 TEUs (BID & CPCI, 2014). The division container embarkation - disembarkation is 55 versus 45 per cent.

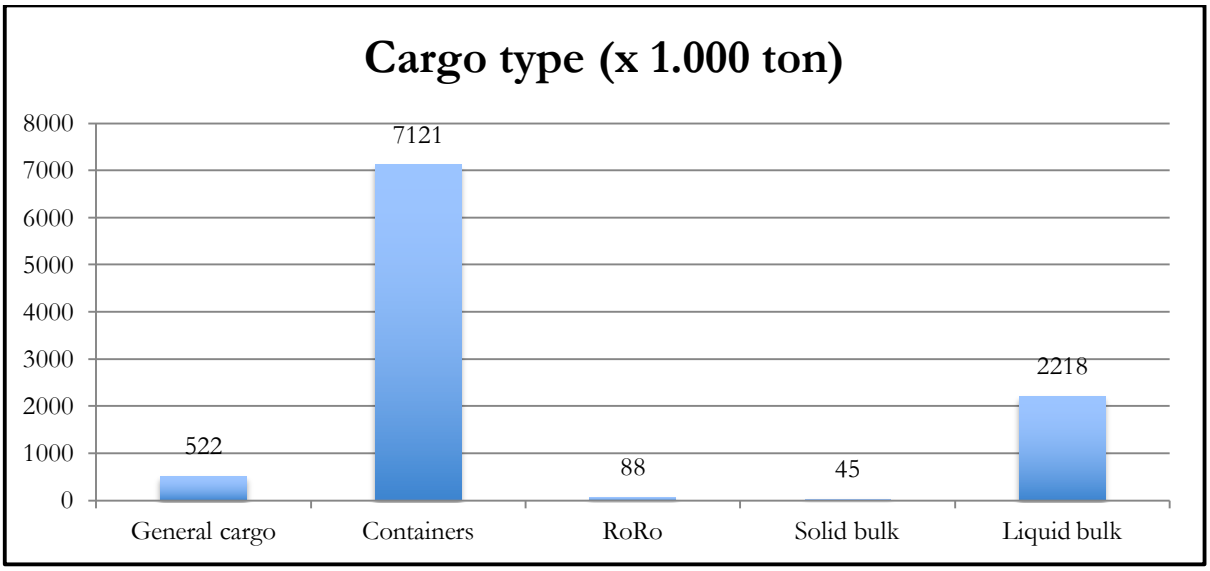

Figure 22: Cargo handled at Limón/Moín port 2011 (BID & CPCI, 2014)

The number of TEUs handled at the port complex increased over the past few years; slowly reaching its capacity of 1,120,000 TEU, see Table 10. The division container embarkation - disembarkation was approximately 50.7 versus 49.3 per cent in 2014. However, it can be noted that significantly more metric tonnes are exported than imported, respectively 70.5 and 29.5 per cent, see Table 11.

Table 10: Number of TEUs handled at Puerto Limón/Moín (JAPDEVA, 2015)

Containers	**2010**	**2011**	**2012**	**2013**	**2014**
Import TEUs	425,168	446,085	493,091	517,699	537,475
Export TEUs	432,145	454,205	507,219	535,572	552,024
Total TEUs handled	858,175	901,309	1,00,541	1,053,484	1,089,499

Table 11: Metric tonnes handled at Puerto Limón/Moín (JAPDEVA, 2015)

	2010	2011	2012	2013	2014
Total tons handled	9,943,072	9,995,519	10,325,529	10,669,236	10,812,892

In 2014 the largest export numbers of the port complex were bananas, other fresh fruits and vegetables, respectively 2,454,000 tons, 2,146,000 tons and 257,000 tons. On the import side petrol and derivatives, paper and carton and chemical products hold the highest numbers, with respectively 2,283,000 tons, 489,000 tons and 236,000 tons. (JAPDEVA, 2015).

Although medical equipment currently provides the highest value in the export market, most of the products were small in size and high in value leading producers to prefer air transportation over maritime transportation. However, recently a change in medical product types led to the production of larger medical equipment that needs to be sent by sea. Especially Moín benefits from this development as most medical equipment is destined for the European market via the US (Roman, 2016).

Safety and Security

In Costa Rica the port authorities have full responsibility for the safety and security at the ports. JAPDEVA has realised efforts to meet the international commercial demands. The focus of the Oficial de Protección de la Instalación Portuaria (OPIP) is on possible threats and vulnerability of the terminal equipment, the vessels, the goods and the persons present at the port. Personnel and equipment is dedicated to the mitigation of possible risks and vulnerabilities. Examples of measures include the restriction of certain areas, using closed circuits for communication, placing more illumination on site, introducing strict safety procedures with emergency plans and maintaining a good relation with national police authorities (JAPDEVA, 2014e).

Although the efforts of JAPDEVA, the port lost its ISPS (International Ship and Port facility Security Code) status in 2015 after it was determined that the port operations did not fulfil the necessary safety requirements. In October US border officials advised JAPDEVA to make the required adjustments to be able to continue transhipment to the USA. JAPDEVA decided to replace the current border control guards by the Policia Nacional. Currently a 100% check policy is in place, so loading and unloading times of vessels has increased tremendously (CentralAmericaData.com, 2015a).

The importance of security and safety checks links to the geographical location of the country in the drug trafficking route from South America to the US. Drugs are moved both over land using the not always well guarded border passes and by sea in (reefer) containers (CentralAmericaData.com, 2014a), see Figure 23. As reefer containers are generally easy to open and are often shipped fast to preserve the quality of the perishable goods, these make good vessels for drugs (AGF, 2015).

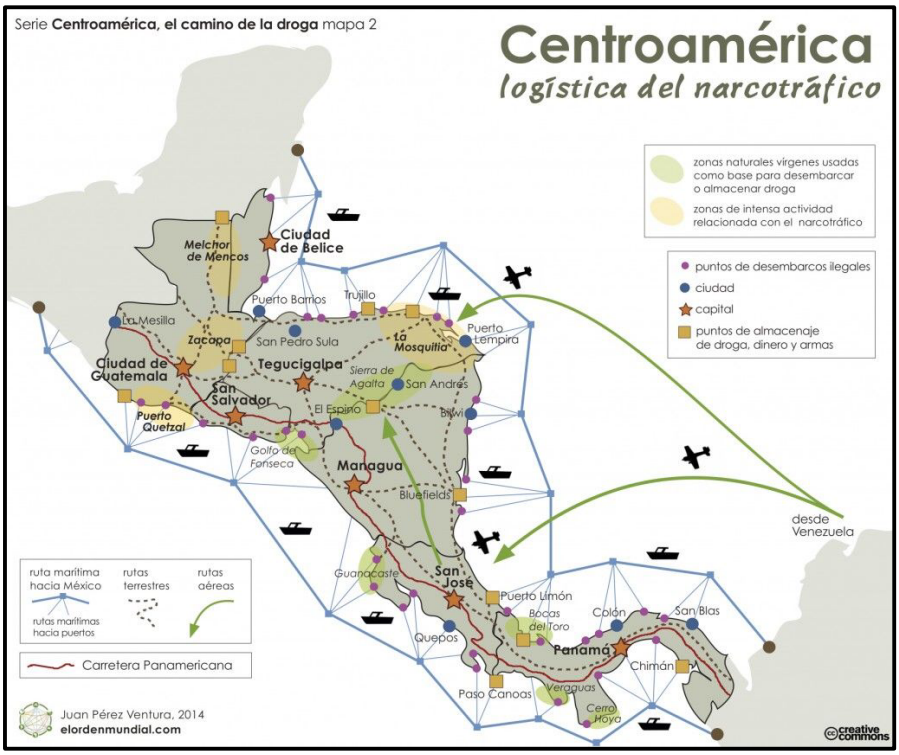

Figure 23: Drug trafficking routes in Central America (Ventura, 2014)

Over the past years the number of drugs activities in the country has risen and besides the bridge function of the country to pass on drugs from mostly Columbian to Mexican drug traffickers, processing and warehousing sites of drugs are increasingly suspected to be present. Although the previous president Chinchilla had tried to fight the war on drugs, the results were minimal. As drug cartels tend to hide in the mountainous areas of the country it is difficult to make arrests (Woodbury, 2013).

Currently, Costa Rica has a reputation as a politically stable country as well as a sustainable country. All electricity generation is done on a sustainable way with wind, sun, and waterpower. The reputation of Costa Rica as a political stable and sustainable energy country is slowly being influenced by the increasing drug problems in the country. Companies fear that investors, exporters and shipping liners might focus on other countries if the government does not take proper actions (Briceno, 2016).

3.2 Current port development: Construction of the new Moín terminal by APMT

This part contains information about the construction of the new Moín terminal. First some general information is given followed up by information about the target productivity, how to reach the new terminal, and the future expectations.

3.2.1 General information

JAPDEVA is next to being port authority responsible for the economic development of the region. A research conducted by Royal Haskoning commissioned by JAPDEVA in 2008 envisioned a master plan to modernize the port complex in the Caribbean region (Royal Haskoning, 2008). This plan included the construction of a new terminal in Moín, the expansion of the RECOPE petroleum complex and the transformation of the Limón terminal with a solely cruise ship and tourist purpose. Currently the existing petroleum terminal operated by RECOPE is being expanded. Furthermore, APM Terminals (APMT) was awarded a concession by the Costa Rican State and JAPDEVA in March

2011 to design, finance, construct, operate and maintain a new container terminal in Moín for a period of 33 years. To construct the new Terminal de Contenedores de Moín (TCM), 80 hectares of land is constructed in two phases just 500 meters of the coast of Moín. The State of Costa Rica will own the terminal itself, while the exploitation will be in hands of APMT. During the exploitation phase APMT will pay 7% of the annual profit to JAPDEVA. After the concession period the whole complex is handed over to the Costa Rican Government (World Maritime News, 2014a).

A large part of the employees of JAPDEVA is gathered in El Sindicato de Trabajadores de JAPDEVA (SINTRAJAP). SINTRAJAP is the union of JAPDEVA and has proven to be a powerful organization in the past. However, all SINTRAJAP's opposition to the development of a new Moín terminal has been in vain. Although SINTRAJAP states the new port will reduce the number of jobs for Costa Ricans in the region instead of increasing them and organised several demonstrations, the court has decided in favour of the new terminal on all occasions. Furthermore, during the start of the concession period many environmental issues were opposed to stop the development of the new terminal. However, as result of an environmental study the Moín terminal would not have a negative impact on the environment, so the counterarguments were also refuted.

The expansion of the Moín terminal will result in a throughput capacity of the port complex of 1.3 million TEU per year and possibility to increase this number to 2.7 million with finalisation of the second phase of the project, resulting in an increase of annual throughput of respectively 23.8 and 157.1 per cent (World Maritime News, 2014b). Furthermore, TCM will offer possibilities to receive new-Panamax size ships, whereas the current port is limited to vessels with a maximum capacity of 2,500 TEU (Seatrade Maritime News, 2014).

3.2.2 Accessibility

At the seaside the terminal is located at the same strategic location as the present Moín terminal, giving it good access to the Panama Canal and shipping routes to North America (East Coast) and Europe. With the expansion of the Panama Canal vessel sizes increase from the current 4,400 TEU maximum to 12,500 TEU. As mentioned before, the current vessel maximum capacity is 2,500 TEU. Located only 60 nautical miles from the Panama Canal, Moín will provide a good base for large container vessels (AJOT, 2015). Another possibility for TCM is to be used as a hub for the Caribbean region. In the current situation many goods transported to the Caribbean from Latin America are transhipped in Miami (USA) before reaching their destination in the Caribbean. At this moment it is hard for Costa Rican exporters to ship their goods cost efficient to the Caribbean as there is insufficient load from Costa Rica to fill enough containers and as the islands in the Caribbean have no export products, the containers will return empty. Both will lead to high transportation costs and as such no shipping lines are currently operating the route. Whether TCM will be used for this purpose depends foremost on the shipping lines. As for APMT the transhipment gains are generally lower than import/export gains it might be hard to compete with other transhipment terminals in the Caribbean. The shipping lines do see possibilities to start short-sea shipping in the Caribbean region to add to their current practices as USA and Europe long distance transportation. Another development that could be expected is Maersk redirecting a part of the current business located in Panama to their new central location in Costa Rica.
As mentioned before, the main access route to the Moín/Limón port is Route 32, see Figure 20. This road is constructed as a two-lane undivided road that facilitates all traffic from San José to the Limón province (both freight and passengers). Moreover, most

transport from fruit plantations in the Northern provinces first passes by the Central Valley (through San José, pink section on the map) before heading to the Limón province. A new road in the north to create a new passage is currently under construction (to the east of Puerto Viejo) and is thought to decrease travel times from the north to Limón, as freight trucks can then make use of the new northern route that functions more or less as a ring road.

The government is planning to widen Route 32 to a four-lane road in order to improve the accessibility of the terminals in Limón/Moín. However the agreement with a Chinese company to construct the expansion is not yet settled. If the road is not expanded before TCM opens at the end of 2016, more congestion and delays are inevitable.

In order to guarantee accessibly to the port on the landside a new road (Route 257) needs to be constructed to connect the terminal to the Route 32, the current main road from the Central Valley to the Limón Province, see Figure 24. The project is included in the concession between the Government and APMT. A road is currently built in an unpaved manner to supply construction materials to the building site (MOPT, 2015b).

The government is obliged to finish Route 257 at 30 September 2017. The specific plans for the road are not yet made up at the time of writing. However, the road should also be wide enough, connect to the terminal entrance at 5 meters height, and proper connections with flyovers need to be build on the Route 32 side to prevent a bottleneck causing long traffic jams. Moreover, TCM will store export containers but will not host border control facilities for import containers, so external container storage will still be necessary around Route 32. Furthermore, as APMT will only conduct small reparations on containers (approximately up to $150) and given the current knowledge in Limón on the reparation of reefers new companies are likely to settle around Route 32 to provide the necessary repairs. Shipping lines expect that TCM will provide a good transhipment location where broken containers can be repaired in the area with guaranteed quality. Both developments will lead to an increase in traffic on Route 257 and Route 32.

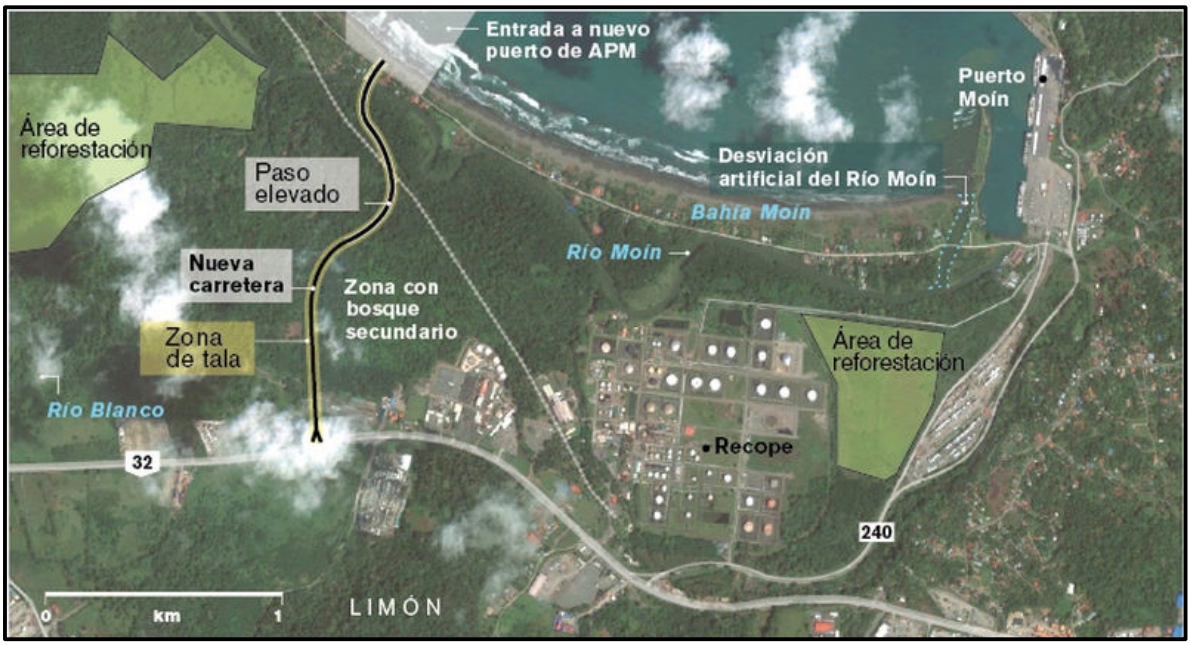

Figure 24: Location of new road 257 to Moín terminals (La Nación, 2014b)

An opportunity would be to reconstruct the railway system to connect TCM with the northern region of Costa Rica and Nicaragua. The construction of a train station has not been included in the current terminal design. However, sufficient land would be available might a train connection be set in place.

3.2.3 Productivity

With the concession of the TCM it was decided that all containers being handled at the Moín/Limón terminal complex should be handled by APMT at the new terminal complex. By means of maximum charges APMT may use the ´monopoly´ of TCM is regulated in the concession. The other two terminals will focus on bulk, mixed cargo and cruise ships. The proposed cruise terminal in Limón is currently not being constructed and if constructed will most likely be awarded in a concession to finance the project (Pecou Johnson, 2016).

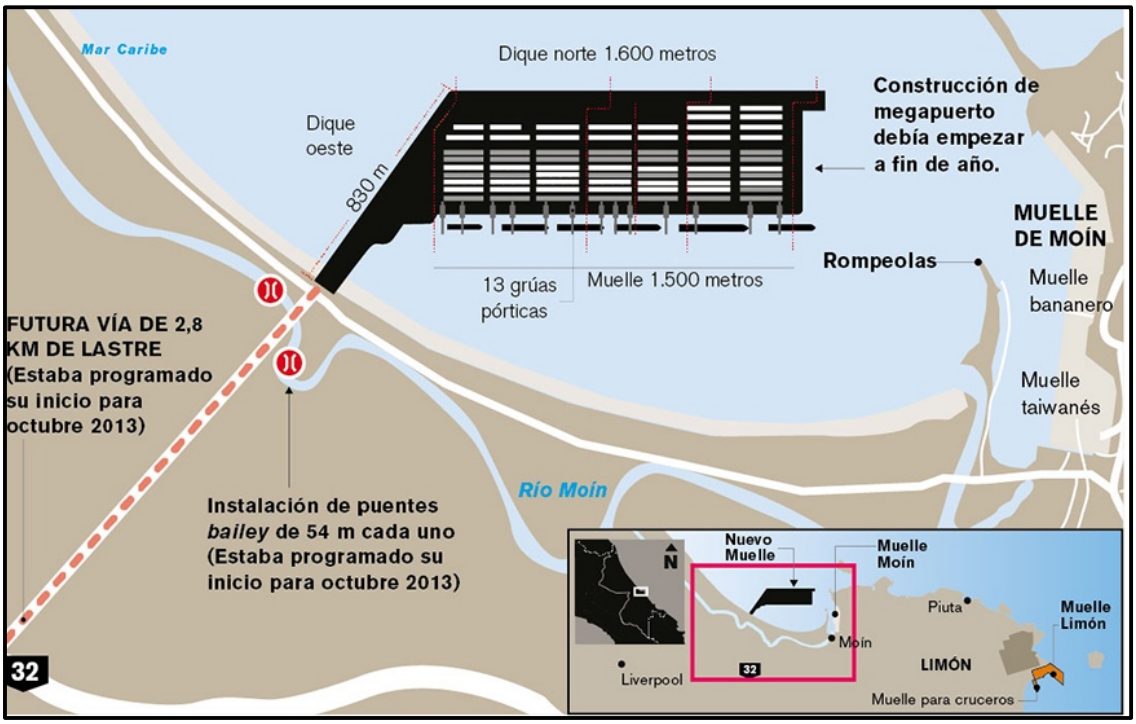

Figure 25: New Moín Terminal (La Nación, 2014a)

Figure 25 shows the layout of the new terminal. From January 2015 the first preparation works for construction started. The terminal will be completely situated on artificial land, and will be constructed in two phases. The first phase includes dredging the access canal and turning-basin to a depth of 16 meters, constructing a new breakwater and realising reclaimed land for 40 hectares of container yard, 650 meters of quay and two berths equipped with six new-Panamax cranes. The eventual depth of 18 meters will provide opportunity to facilitate the handling of goods from 12,000 TEU vessels. The first phase is scheduled to complete at the beginning of 2018. For construction to the terminal APMT signed a contract with the Dutch Van Oord-BAM consortium (APM Terminals, 2013). Based on the importance of fresh fruit exportation APMT assigns 60 to 70 per cent of the capacity to refrigerated storage facilities (AJOT, 2015).

The TCM will be equipped with six STS cranes on two berths (8,000-9,000 TEU) with a total quay of 600 meters in the first phase. The terminal can be extended to nine cranes, four berths on a total of 900 meters and eventually will consist of thirteen cranes, five berths (of which two berths up to 15,000 TEU) and a quay surface of 1500 meters (APM Terminals, 2015) & (Rodrigue J. , n.d.). Furthermore, APMT recently concluded a contract for 29 electric-powered Rubber Tire Gantry Cranes (eRTGs) to ensure quick handling of the expected 1.3 million TEU in the terminal (AJOT, 2015). The equipment that will be used at the new terminal is new for Costa Rica; as such the majority of employees from the Limón region will need additional trainings in order to be able to operate the equipment. APMT made an agreement with the Instituto Nacional de Aprendizaje (INA) that INA will offer schooling for the new terminal employees.

The new terminal will be ISPS certified to guarantee safety and security on site. Using all modern high tech facilities, extensive checks on containers are to be conducted in a more efficient manner than currently done in the Limón/Moín port. Therefore high standards on safety and security can be guarantee while maintaining a fast loading and unloading process.

3.2.4 Future expectations

The export numbers for bananas and pineapples are expected to reach a maximum in the next five to ten years due to limited production capacity of around 1 million TEU (Hartog, 2016). Furthermore, as bananas are delicate fruits they are highly vulnerable for diseases. As bananas will reach their maximum production and are vulnerable goods it will be important for APMT to focus on other goods to export in order to keep the terminal growing. Examples of other goods can be medical equipment (currently transported by air). The development of the terminal will lead to more employment in the Limón region. A small part will be at the terminal itself (±800 FTE), but a large part will be derived from secondary and tertiary effects of the terminal. The possibility of a higher flow of import/export goods will allow for more fruit plantations and especially new businesses as well. A not yet released study by APMT on social economic impacts in the region confirms that ten thousand new jobs can be created with the operation of TCM.

Some recent developments were looked into in order to determine the effects on the APMT terminal, the expansion of the Panama Canal, the construction of a canal in Nicaragua and the ambition of Cuba to develop to a hub in the Caribbean. The expansion of the Panama Canal will allow new Panamax ships to find their way to TCM and will therefore only have positive effects on TCM. There are doubts whether the Chinese company will manage to construct a canal in Nicaragua; although it will have great benefit for Nicaragua it is rather questionable whether the investment will pay itself back. Due to the high uncertainty the effects of the Nicaragua Canal are not considered relevant for APMT. Cuba could be a competitor for TCM and Costa Rica by means of production of export goods; however the country is currently not developed enough to become a threat for TCM. The higher change on natural disasters compared to other regions does proof to be a threat for terminal operations in TCM.

3.3 Caldera port

In this paragraph the history, accessibility, productivity, and possible future developments of the Caldera port are discussed.

3.3.1 History

Since the colonial period the port of Caldera has played an important role in transportation on the Pacific Coast. In 1910 the first contours of a dock were built from wood. In the late sixties the population around the port grew and the transport numbers increased. To facilitate these developments and increase foreign trade, a new port was needed on the Pacific Coast. Due to the strategic location of Caldera, it was decided to build the port there. In December 1981 the current port with the name Puerto Caldera was initiated and by January 1982 was exploited by the Instituto Costarricense de Puertos del Pacífico (INCOP). The INCOP was initiated in 1972 to handle port authority functions in collaboration with the railway company Instituto Autónomo del Ferrocarril Eléctrico al Pacífico. In 1977 INCOP was separated in INCOP and JAPDEVA (which exploits terminals on the Caribbean Coast). INCOP is responsible for operating and improving facilities and port operations in the Pacific region. (INCOP, 2010) In 2001 the government decided on the privatisation of port activities to improve results. The concession was granted to the Sociedad Portuaria Regional de Buenaventura, Corporación Brisbas de Pacifico, Logistica de Granos and Comercializadora RYS, working together under the consortium of Consorcio Portuario de Caldera II. (SPCaldera, 2016)

3.3.2 Accessibility

Caldera is located on the Pacific Coast of Costa Rica near the port city of Puntarenas. From this location many ports on the United States West Coast (USWC), Latin America and Asia are easily accessible. Figure 26 shows the lay out of the terminal.

Figure 26: Port layout Caldera (INCOP, 2015)

Based on its geographical location Caldera provides good connections with the US West Coast and Asia. Furthermore, there are opportunities to start short-sea shipping lines with neighbouring ports to decrease travel times of import/export cargo in Central America. However, Caldera cannot receive large vessels, because the offered berth depth is 11 meters making it suitable for Panamax vessels and smaller (IDB, 2013).

The port is well connected to the hinterland of Costa Rica and neighbouring countries. Route 27 provides a direct connection to the Capital in about 75 minutes. In this area multiple roads can be used to transport cargo, making the port less vulnerable to road blockages or congestion. Furthermore, the port is located close to the Inter-American Highway giving it good access to Nicaragua and Panama. From the end of March 2016 a two-weekly ferry service is scheduled to El Salvador. It will be able to transport 150 containers per load in either direction (Roman, 2016).

3.3.3 Productivity

The Caldera port offered a berth depth of 11 meters making it suitable for Panamax size vessels (IDB, 2013). In 2013 on average only one ship was handled per day at Caldera. The vessel turn around time was 28 hours and of this the productive time at the berth was only 43 per cent. Furthermore, ships were at anchor for around 14 hours on average as well. The Caldera terminal consists of 4.2 hectares and in contradiction to Puerto Limón/Moín it does offer storage for export containers. The pickup and drop-off time of containers takes 30 minutes on average (IDB, 2013).

3.3.4 Recent port development: new dock and new operational system

In the last three years Caldera port invested in a new dock and a new operational system to improve its operational status. The changes considerably lowered the waiting times for ships in the bay of Caldera. The previous waiting times for ships of around five days led to high costs for transporters and consumers. In three years' time the port managed to decrease the waiting times by 50 per cent. Previously containers that were unloaded were picked up directly by transport companies to be stored externally. In the current situation, containers can be stored in the dock, lowering the unloading times from almost 13 hours to 8.5 hours. This can help lower the transportation costs for freight vessels and as such to their companies and costumers (INCOP, 2016). Furthermore, the berth has been deepened to 13 meters making it the deepest port on the Pacific coast in the region. The advantage lies in that shipping lines can now use larger and less ships to transport cargo to Caldera. Especially with the expansion of the Panama Canal SPCaldera expects to receive more large vessels (Mora Perez, 2016).

At Caldera there is one dock available for loading and unloading of containers at which 45 containers can be handled per hour. On average the Caldera port can handle containers three times as fast as the current Limón/Moín port complex (BID & CPCI, 2014).

At Puerto Caldera five types of cargo are handled: general cargo, containers, RoRo, solid bulk and liquid bulk. The top two cargo types are solid bulk and containers. Puerto Caldera handles 95% of the countries bulk cargo (Mora Perez, 2016). In 2011 the port handled 168,043 TEUs. This amount is only 18.6% of the amount handled at the Limón/Moín port (BID & CPCI, 2014). The division container embarkation - disembarkation is 16 versus 84 per cent.

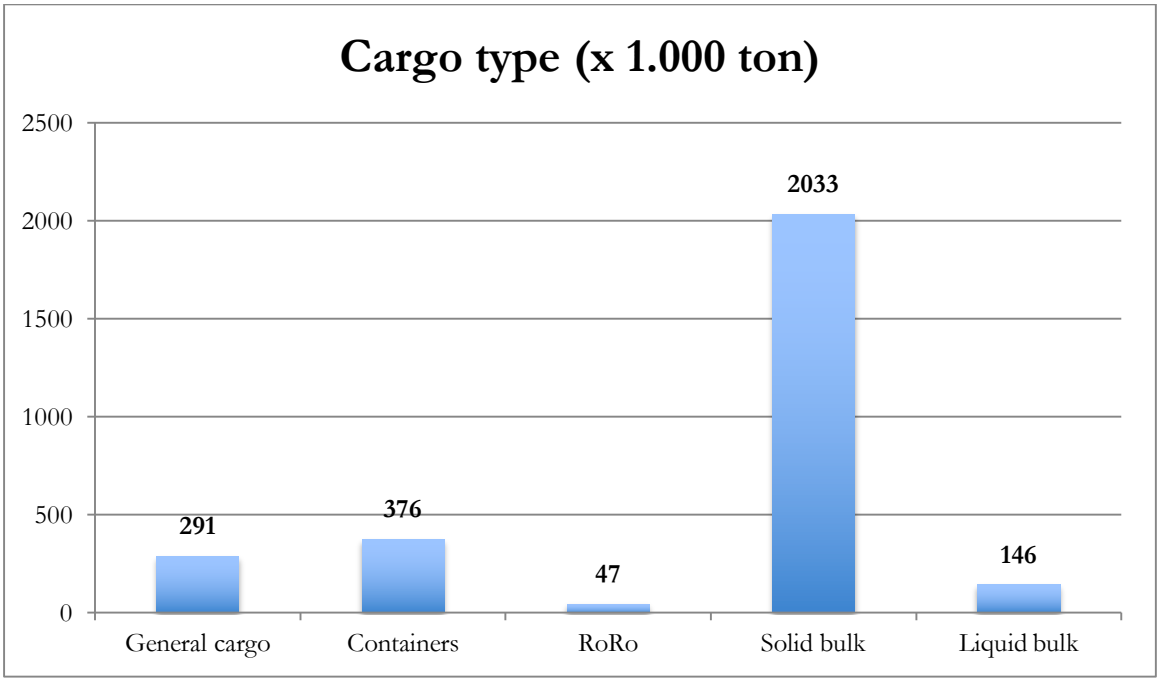

Figure 27: Cargo handled at Caldera port 2011 (BID & CPCI, 2014)

Even though the number of TEUs handled at Puerto Caldera increased over the past few years, see Table 12; the port is not even close to reaching its capacity of 450,000 TEU (IDB, 2013). The division container embarkation - disembarkation was approximately 48.3 versus 51.7 per cent in 2013. Furthermore, from INCOP data it was found that over

2010-2014 on average 5.9 per cent of import containers was empty. However a staggering 50.9 per cent of all export containers from Puerto Caldera were shipped empty (INCOP, 2014). From Table 13 it can be derived that unlike Puerto Limón/Moín, more is imported than exported at Caldera. In 2014 only 19.3 per cent of all tons handled at the port were export versus 80.7 per cent imported goods.

Table 12: Number of TEUs handled at Puerto Caldera (INCOP, 2014)

Containers	2010	2011	2012	2013	2014
Import TEUs	50,212	53,849	58,007	60,020	N.A.
Export TEUs	44,446	48,444	51,296	56,164	N.A.
Total TEUs handled	94,658	102,293	109,303	116,184	N.A.

Table 13: Metric tonnes handled at Puerto Caldera (INCOP, 2014)

Containers	2010	2011	2012	2013	2014
Import tons	2,752,748	3,263,790	3,240,982	3,279,435	3,503,730
Export tons	560,944	628,869	700,255	699,051	782,283
Total tons handled	3,313,692	3,892,659	3,941,237	3,978,485	4,286,013

Caldera mainly functions as an import port for several types of grain and flower, containers (mostly cars) and iron and similar products. In 2014 these products were imported in amounts of 2,125,649 tons, 1,00,861 tons, and 261,423 tons. The main export products leaving Costa Rica from this port include containers (mostly empty returns), packaged fruit and general merchandise. There export number for 2014 are respectively 743,164 tons, 38,891 tons and 1,132 tons (INCOP, 2014). Puerto Calderas main export products are timber and scrap goods (Mora Perez, 2016).

Unlike Moín, Puerto Caldera does not have a large market for fresh fruits like pineapples and bananas. The long travel time from the port to Asia and the USWC makes it difficult to ship perishable goods. However with only 77 kilometres, it is closer to the Central Valley than Puerto Limón, which drives shipping lines to disembark their cars, half fabricates and grains here. Cars are mostly sold in the Central Valley where most people live, half fabricates and raw materials are transported to the Free Trade Zones that are primarily located in the Central Valley as well, and grains are transported throughout Costa Rica of which a large share is used as food for cattle (Mora Perez, 2016).

Del Monte and Dole use Puerto Caldera as a gateway of a dry canal towards Moín. These fruit companies import its fresh fruit from Ecuador and transport this by road to the Caribbean coast. From here the fruit is exported to the USEC and Europe. Although this route is less expensive than going through the Panama Canal it does bring some risks. The poor condition of Route 32 makes it vulnerable to landslides during the rainy season. In such cases the only road to Moín will be closed and cargo will have to leave Puerto Caldera again by ship leading to unnecessary delays (Mora Perez, 2016). Currently, other companies do not use this dry canal and shipping lines as the Costa

Rican customs paperwork provides a lot of hassle. It is more convenient for those companies to make use of the Panama Canal or the cheaper alternative of the Panama Railroad as a dry canal (Madrigal, 2016).

Safety and Security
A new electronic customs system (Tica 1.0) will be implemented in the port of Caldera to reduce the paper load for cargo. However, in the processes of designing the system the port and other users were not involved.

The port charges at Puerto Caldera are lower than those in Limón, respectively $120 versus $140 per TEU. Recent port developments have increased the efficiency of the port, and as the tariffs remained the same the port provides more value for the money (Mora Perez, 2016). Port tariffs in Moín and the new APMT terminal are also higher than in Caldera, respectively $170 and $230 per TEU (Pecou Johnson, 2016).

Future developments
From the end of March 2016 a ferry is planned to be operational between La Unión in El Salvador and Caldera to decrease the travel times of cargo from over two days to 24 hours. At the moment a lot of time is lost waiting at border crossings. Currently no trade is done with Mexico as the transportation costs are to high due to the long travel times. The introduction of the ferry could open up possibilities to set up a new market for Mexico (Mora Perez, 2016).

Opportunities for Puerto Caldera can be found in relation to the Free Trade Agreements that are in place with China and in negotiation with South Korea and the United Arab Emirates (UAE). The strength in these agreements is that Costa Rica is almost the only Latin American country to have these agreements and their accompanying benefits. In combination with the FTZs the Chinese half fabricates could be finished in Costa Rica and exported to the US and Europe. This will lead to higher import and export numbers and more employment possibilities (Roman, 2016). Chinese and Korean companies are interested to put production companies in Puntarenas, San Carlos and Guapiles to increase the export potential in the Central American region (Mora Perez, 2016).

The opening of the new Moín terminal will provide advantages for Caldera, especially if Moín will focus on being a hub for the region. There are plans to develop a road through the northern region of Costa Rica to develop a dry canal between the two ports. Currently, the travel time is around ten hours while the new road would offer the possibility to cross the distance in only four hours (Mora Perez, 2016).

Development of the terminal itself is very hard, as the port is still publicly owned. This means that any change has to be agreed on and financed by the government (Mora Perez, 2016). Possibilities to improve the position of the port include, deepening of all berths, installing pumping materials to be able to handle liquid bulk in five days instead of ten, creating additional space for the storage of special products (e.g. Windmill parts).

3.4 AMEGA terminal plans

AMEGA Holding was founded in 2007 to provide plans for investment opportunities. Based on the report of the International Development Bank (IDB, 2013) AMEGA identified the opportunity to construct a new terminal next to the APMT terminal in Moín. This new terminal would focus on the transhipment of containers rather than import/export services. By focusing solely on transhipment, primarily from ship to ship,

AMEGA believes to be able to penetrate a new niche market in the Caribbean. Even though the Panama Canal will be expanded the 18,000+ TEU vessels will still not be able to pass. Here AMEGA intends to offer services for transhipment to smaller vessels and in the long term offer a competitive alternative of a dry canal connecting the Pacific to the Caribbean. As AMEGA started negotiating about the MTA back in 2006 the clause of the concession of TCM stating the monopoly on container handling is not on affect for AMEGA. It even states that APMT should focus on import/export on containers and that AMEGA will handle transhipment (Pecou Johnson, 2016).

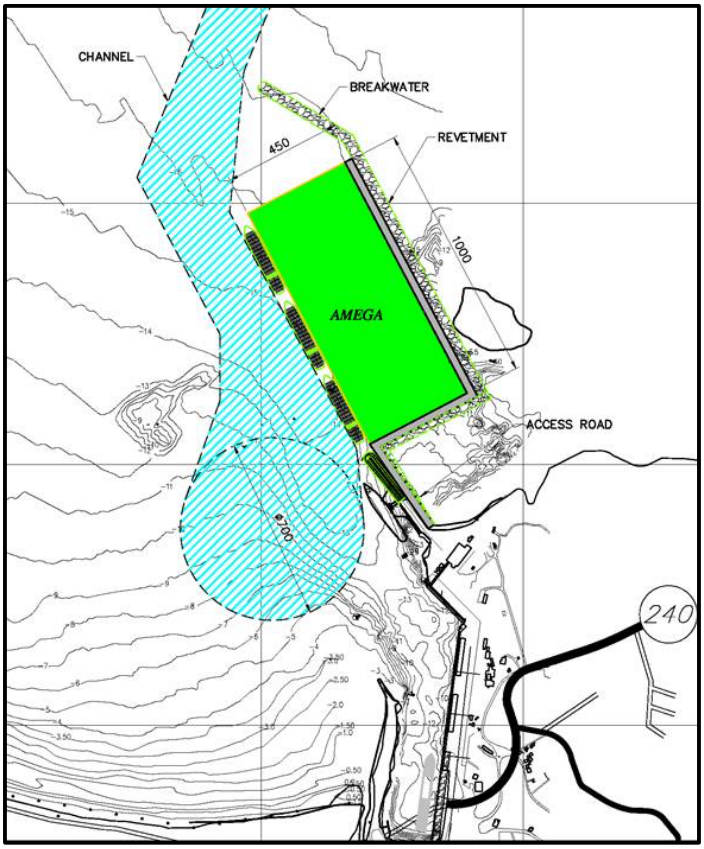

Figure 28: Phase 1 construction of MTA

The project will be completed in three phases. First the construction of the Mega Terminal of the Atlantic (MTA) has to be constructed north of the current Moín Terminal (see Figure 28). The construction of the terminal will be on a floating island rather than reclaimed land (Pecou Johnson, 2016). The construction proofs thus to be less expensive than the APMT terminal. The terminal will be completely self-sufficient and would be able to handle 2 million TEU yearly at full capacity, with the possibility to expand. The second phase entails the construction of a railroad connection between the Pacific and Caribbean coasts. The railway will be constructed through the northern region of Costa Rica given the geographical advantages of the least elevation in Central America (see Figure 29). To complete the project, a Pacific Mega Terminal is constructed. The development of the second and third phase will happen simultaneously to immediately offer dry canal services after completion. In the search for a location for the MTA and dry canal AMEGA compared several Central American countries. Based on the good political and social stability of Costa Rica and the fairly manageable terrain to construct a railroad, AMEGAs decision fell on Costa Rica.

Figure 29: Phase 2 and 3 dry canal and proposed port Pacific side

AMEGA stresses that the project will provide opportunities for the development of Costa Rica even though the primary focus is on transhipment services (90 per cent of operations). The terminal will provide about 1,000 jobs in operation, and will generate extra income for the country by penetrating a whole new market. In a second order effect the region of Limón will experience the effects of more welfare in the region by an increased number of businesses and tourism (Brooke & Dengo, 2016). Furthermore, as is agreed on with APMT the MTA will be publicly owned at the end of the concession period.

Currently, the government has already approved initial plans for the project. AMEGA is working on the proposition of the MTA plan to investigate the feasibility of the project. Most likely the MTA terminal will be offered in a concession just like the new Moín terminal and Puerto Caldera. AMEGA prefers to construct and operate the terminal itself, however if another party will win the concession or the government decides to cancel the project AMEGA will be reimbursed for the research work done by either the third party or the government (Brooke & Dengo, 2016).

The construction of the TCM by APMT influences the sea currents in a negative manner for the MTA (Pecou Johnson, 2016). However, AMEGA expects that construction of the MTA will start in the next two years and the first phase of the project to be completed and operational around 2020-2021. After this it can be decided to expand the project with the dry canal based on operational volume (Brooke & Dengo, 2016).

3.5 Concluding Costa Rican ports

So, this chapter discussed the current Moín/Limón port complex and Caldera port as well as the future plans of the AMEGA MTA. APM Terminals will largely expand the container capacity of the Moín, which will be in operation beginning 2018. The Caldera Port is not very large, but is performing well. It tries to benefit from the trading agreements with Asia and opens a new shipping service with El Salvador. At last, the plans of AMEGA are still only on paper and it is still unknown if and when AMEGA is going to construct the MTA.

4 Infrastructure and transportation costs

This chapter will give a concise overview of the current freight transportation network in Costa Rica, with the goal of defining bottlenecks. First an extensive analysis of the national road network will be given. This is done by an overview of the national highways, the quality of the roads and the strategically important routes. Secondly, a short overview of the current situation regarding the (lack of) national railway system is given. Paragraph 4.3 gives a short overview of the airfreight transportation. The last paragraph, §4.4, gives an overview of the average transportation costs of road, air and deep-sea transport.

4.1 Road network

Due to the lack of a functional national railway system or any other significant transport mode, road-based transportation is by far the most used transportation mode for transporting people and goods within Costa Rica. Because of the geographic characteristics of the country as well as the economic importance of the capital city, the greater metropolitan area of San José located in the central valley acts hereby as the centre of gravity for the road network. Figure 30 gives an overview of the highways in Costa Rica.

Figure 30: Overview of highways in Costa Rica (Google Maps, 2016)

As can be seen in Figure 30, a major part of all highways lead either to or through the greater metropolitan area of San José. The through traffic combined with the regular commuter traffic is leading a huge amount of congestion in the San José area every morning and afternoon.

4.1.1 Road quality

Highways in Costa Rica tend to have great variation in quality, safety and average speeds. It varies from multiple lane motorways of high quality where speeds of 100 km/h be reached without a problem, to gravel road highways requiring four-wheel drive cars. Most of the recently built highways have a high-quality surface, including reflectors and appropriate shoulders. Highways that have been improved in the last couple of years usually have high quality asphalt as well as appropriate shoulders, however they might be lacking lineage and reflectors. The most common highways, mostly located outside the greater metropolitan area, are narrow paved highways lacking shoulders. Although the surface of these roads is typically fine, due to their twistiness and windiness maximum speed upon which these roads can be travelled safely does not exceed 60 kilometres per hour (CR Highways, ND).

Appendix 1: Overview of road surface of the national highways (CONAVI, 2009) shows an overview of the national road network distinguished by road surface and priority of the road, as it was in 2009. Roads are divided in primary roads, secondary roads or tertiary roads, and in entirely asphalted, partly asphalted and partly unpaved (macadam) or entire macadam roads. In 2014 the national road network amounted to 7,771 kilometres, of which 5,269 kilometres were paved. According to the International Roughness Index, 62% of the national roads scores as deficient or lower, while less than 5% scores a good or higher (Villalobos, Bogantes, Cañas, & Quesada, 2014).

4.1.2 Major routes

Being part of the Pan American Highway, highway 1 (Peñas Blancas – San José) and highway 2 (San José – Paso Canoas) have been important roads connecting Costa Rica (San José) to its neighbouring countries Nicaragua and Panama. Another important destination with relation to the transportation of people and goods are the ports in Limón and to a lesser extent the port of Caldera. Figure 31 gives a small overview of the national highways distinguished by their strategic relevance. The same overview has been given on a full page in Appendix 2: Overview of roads distinguished by their strategic relevance

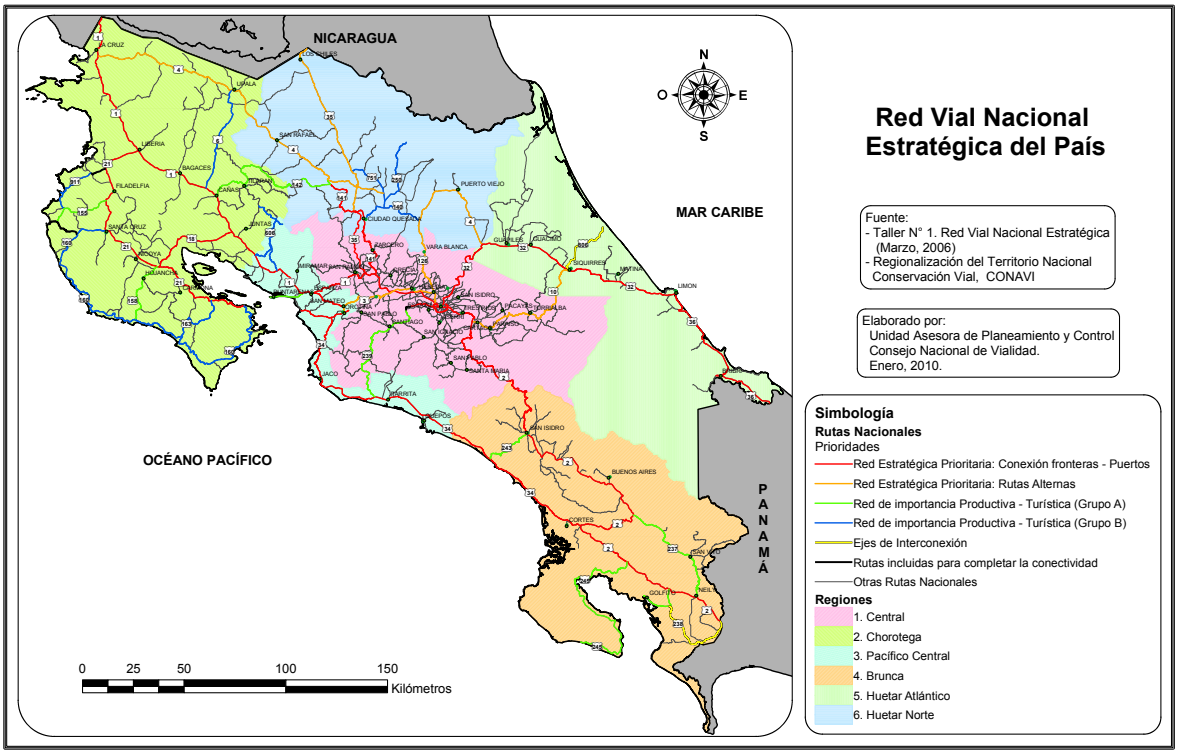

Figure 31: Overview of roads distinguished by their strategic relevance (CONAVI, 2010)

As can be seen, the primary strategic roads run from the borders with Nicaragua & Panama to San José and the ports of Moín, Limón and Caldera. Highway 1 is particularly important since it is the primary link between the border crossing of Peñas Blancas and San José. It is furthermore used as a primary link connecting Nicaragua with the ports of Moín and Limón on the Caribbean side. Since there are no significant ports on the Caribbean side of Nicaragua, the ports of Moín and Limón are often used. It is estimated that the border crossing at Peñas Blancas handled 89% of export and 66% of import in terms of weight by land in 2014 (Villalobos, Bogantes, Cañas, & Quesada, 2014). Highway 1 is a two-lane undivided highway, with speed limits ranging from 70 to 75 kilometres per hour. Close to the border, a lot of freight is being transported using

vehicles classified as heavy vehicles (tractor semi-trailers with five or more axles). Over 20% of all vehicles are classified as heavy vehicles in the border region, while on the southern part only 9% is classified as heavy vehicle. On the southern part of highway 1 it is the road geometry that is posing challenges in overtaking slower vehicles, leading to congestion (MacAngus, Montufar, & Chaverri, 2012).

Besides highway 1, running from Peñas Blancas to San José, highway 32 between San José and Limón is a crucial road for the transportation of goods in Costa Rica, since it is the main road to the ports of Limón and Moín. The highway has speed limits ranging from 55 to 80 km/h, with the presence of school zones and pedestrians. It suffers from heavy rainfall causing frequent closure of the road during the rain season, by which the traffic has to be diverted over highway 10. This poses problems for large trucks due to its mountainous geometry (MacAngus, Montufar, & Chaverri, 2012).

Route 32 has a fairly mountainous part at first followed by a fairly flat part closer to the shore. With a high share of heavy vehicles, it is estimated that 800,000 TEUs are moved by truck per year, which is causing congestion in the port areas as well as up to 20 kilometres outside of Limón (MacAngus, Montufar, & Chaverri, 2012), where many container depots are currently located since no storage facilities are available at the current ports. Containers are only moved to the ports when the vessel has physically arrived. It is expected that with the opening of the new container terminal, containers have to be present at the port at least 24 hours before arrival of the vessel. This will probably diminish the function of the container depots, since containers can be brought to the port of Moín directly instead (Hartog, 2016).

The high share of heavy vehicles in combination with the mountainous part poses difficulties with overtaking slower vehicles causing operational deficiencies of the road. Figure 32 shows typical difficulties that were being encountered during fieldwork of this research. The first picture shows the problems being caused by slower vehicles, while the second picture shows problems for heavy trucks in the mountainous area.

There are plans to expand highway 32 between Limón and Pococi (107 kilometres), to the junction of highway 4, to an entirely four-lane wide road, including 36 bridges with recent seismic parameters (BN Americas, 2015). However, at the moment of writing, troubles have come up between the MOPT and the Chinese contractor CHEC, regarding additional terms and its payment. Therefore, it is not yet known when the expansion of Route 32 takes place (Arias, 2015). But even still if the Pococi – Limón section is to be expanded, there still remains the San José – Pococi section. This part of the road runs through the Braulio Carrillo national park, and is known for its frequent closures due to heavy rainfall during the rainy season. Running through the mountains as well as a national park makes it hard from an engineer perspective as well as from legislative perspective to expand the current Route 32, but if not it is expected to remain a bottleneck, even if the Pococi – Limón section of Route 32 is expanded (Hartog, 2016).

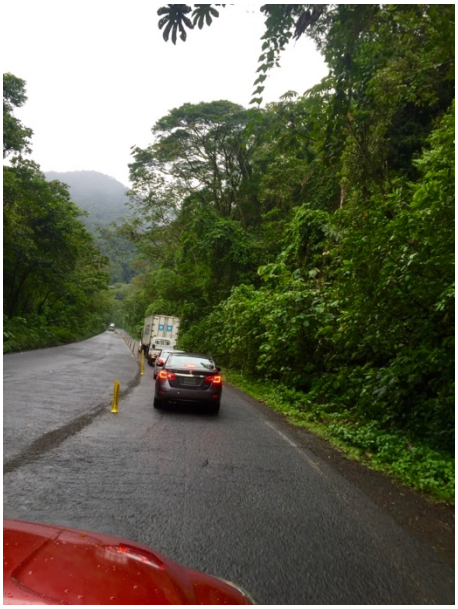

Figure 32: Typical difficulties encountered on route 32

Up until May 2015, the Peñas Blancas border crossing was the only one border crossing between Costa Rica and Nicaragua. Located north of Guanacaste and along the highway between San Jose (CR) and Managua (NI), it has been a bottleneck for transporting goods between Costa Rica and Nicaragua, causing huge delays and thus higher costs (MacAngus, Montufar, & Chaverri, 2012). In order to relieve pressure on the Peñas Blancas border crossing, a new border crossing has been opened last, located west of the Nicaraguan Lake and about 120 kilometres closer to the Caribbean coast. The new border crossing at Las Tablillas, close to Los Chiles, can reduce the distance from the Caribbean ports of Moín and Limón in Costa Rica to Nicaragua tremendously. It is expected by the Costa Rican government that in 10 years 40% of the people and goods that are now using the Peñas Blancas border crossing will shift to the new border crossing (Isenberg, 2015). However, even though the border crossing has been opened, it is not yet used for the export and import of goods that was expected. Due to a lack of completion of proper customs facilities, only a handful companies use this border crossing for transporting goods between Nicaragua and Costa Rica (Hartog, 2016).

Along with the new border crossing a new road is being constructed, "Tapón de Chilamate". This road can reduce the distance between Vuelta de Kopper and Bajos de Chilamate to 27.9 kilometres (MOPT, 2015a). This new road improves the accessibility of the whole northern region of Alajuela, which is known for growing and cultivating many pineapples, bananas, mangos, potatoes and cassava, by making the ports of Limón better accessible (Castillo, 2014). It also provides opportunities for the ports in Limón by making Nicaragua better accessible, by providing a new major route that does not run through the greater metropolitan area of San José. It can reduce transportation times with 2 hours compared to the current route via Aguas Zarcas and San Miguel (Hartog, 2016).

Figure 33 shows the locations of the border crossing Peñas Blancas (1), the new border crossing at Los Chiles (2) and the location of the new road "Tapón de Chilamate" (3). Looking at Figure 31 and Appendix 1: Overview of road surface of the national highways, it is expected that the new "Tapón de Chilamate" can make the road from the border crossing at Las Tablillas to Limón via Puerto Viejo part of the strategic national road network, connecting the borders to the ports.

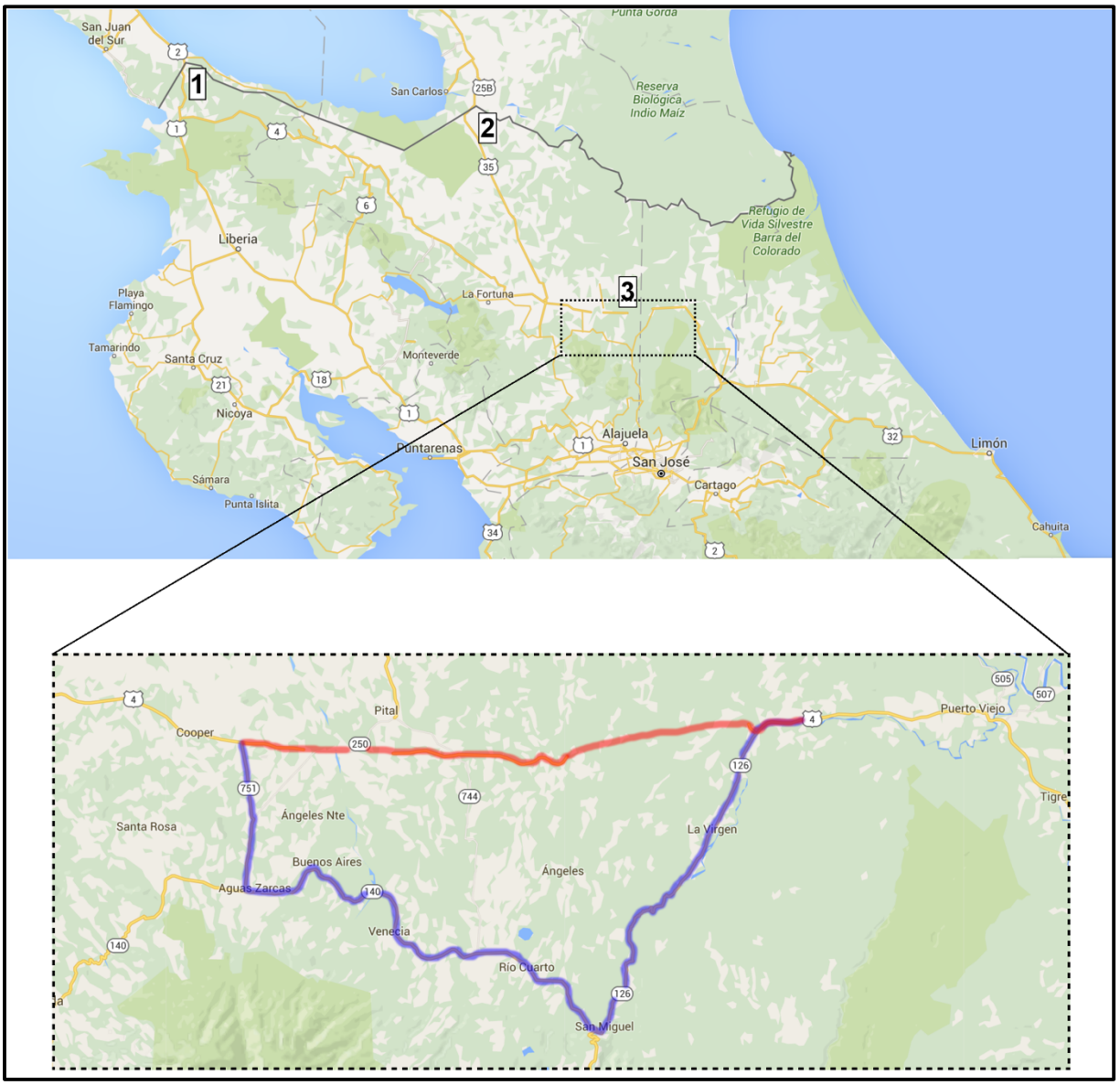

Figure 33: Border crossing of Peñas Blancas [1], new border crossing at Los Chiles [2] and location of "Tapón de Chilamate" [3]. The blue road depicts the current route, while the red one depicts the new "Tapón de Chilimate"

Costa Rica has two border crossings with Panama, one located at the Caribbean side (Sixaola) and one located at the Pacific side (Paso Canoas). Highway 36 runs from Limón to Sixaola. The area surrounding highway 36 is occupied with the production sites of bananas, which are to be exported via the ports of Limón and Moín. However, there is no significant amount of freight being transported to or from Panama via this border crossing in 2014 (Villalobos, Bogantes, Cañas, & Quesada, 2014). This is probably due to the remote area that lies beyond the border crossing in Panama. The border crossing at Paso Canoas is therefore the only border crossing between Costa Rica and Panama where a significant amount of freight is being transported. 33% of the total export over land and 11% of total import over land in terms of weight is transported via this border crossing (Villalobos, Bogantes, Cañas, & Quesada, 2014). The border crossing has always been connected to the central valley by highway 2, but due to its mountainous geometry it has recently been connected by highway 34 as well, which follows the Pacific coast. Due to its relatively good accessibility, the route from the central valley to Paso Canoas does not pose any significant problems.

4.1.3 Bottlenecks road network

- *Route 32*

A combination of two-lane undivided highways, mountainous areas and heavy rainfalls poses serious problems for the road network performance. Route 32 is the major link connecting San José as well as Nicaragua to the new container terminal at Moín. It is facing problems from a capacity perspective as well as a reliability perspective due to heavy rainfall during the rainy season. There is no real alternative for the heavy trucks transporting goods to the port of Limón. Plans exist to expand Route 32 from Limón to the intersection with Route 4 (Pococi), but these are still not confirmed and it is not known when expansion is expected to begin. Even then, the section San José – Pococi is expected to still remains problematic.

- *San José Metropolitan Area (Gran Area Metropolitana de San José)*

The GAM is known for its severe congestion problems, especially during the morning and afternoon rush hours. The greater metropolitan area of San José houses half of the population on just a fraction of the total area (OECD, 2016). Over the last decade, the total number of vehicles in Costa Rica has increased with 78% (Villalobos, Bogantes, Cañas, & Quesada, 2014), leading to congestion in the main artery of the national road network. San José can hardly be avoided for trucks going to the ports of Limón/Moín, originating in Guanacaste, Nicaragua or southwest Costa Rica. Besides that, San José is also the industrial and economic centre of gravity, producing freight trips for export and attracting trips for import. The road network in and surrounding San José have been lacking behind to the economic development of the area and is out-dated (Hartog, 2016).

- *Peñas Blancas border crossing (Nicaragua)*

As mentioned before, the current border crossing at Peñas Blancas is the busiest border crossing regarding freight transportation over land in terms of weight. Current border infrastructure is not suited in an efficient manner to handle trucks crossing the border, causing delays experienced by the transportation companies and rising the logistic costs (BID & CPCI, 2014).

- *Puerto Limón*

For the current ports in Limón and Moín, goods are stored at container depots located around the ports prior to departure to the vessel and after arrival of the vessel. Since there is only one major road running through Limón to the ports, upon which the majority of the container depots are located, it is causing congestion combined with the regular traffic going to or coming from the centre of Limón. However, it is expected that the opening of the TCM will reduce these problems, since containers have to be delivered at the container terminal prior to arrival of the vessel and the role of container depots will be diminished (Hartog, 2016).

- *Route 27*

Designed in the 70's, this road was to be the solution for the relatively difficult route from San José to the Pacific coast (Puntarenas / Caldera). Before opening of Route 27 in 2012, there were two main routes running from San José to the Pacific coast, which are highway 1 and highway 3. Both these routes tend to have a lot of narrow curves and were not capable handling the amount of traffic. However, since the new Route 27 was built on the design originating from the 70's, the new highway 27 is not suited to handle all the traffic from Puntarenas / Caldera / Guanacaste to San José either (Hartog, 2016). The highway mostly only has two lanes, which makes overtaking difficult. It also suffers from landslides during the rainy season, which causes the highway to be closed down.

The general opinion about this new road is not positive, since it is a private road with fairly expensive toll tariffs (toll tariffs are up to 25x higher than usual) and still a lot of congestion exists, even though it is still a quicker route than the highway 1 and highway 3.

4.2 Rail network

Up until the earthquake in 1991, Costa Rica used to have a well-functioning, electrified narrow-gauge railway network. Built in the end of the 19th century, it started on the Caribbean side transporting coffee and later bananas from the plantations to the port of Limón, since there were no roads or trucks. Later on, it was extended to San José via Cartago, while on the Pacific side a railway track was constructed from Puntarenas via Caldera to San José. The earthquake of 1991 damaged the railway network severely. Due to economic as well as political reasons, it was decided not to restore the railway network but to transport all the goods by truck.

At this moment, a total of 212 kilometres of railway track is available. However, only a small part of it is actually being used. Around San José, the lines San José – Empalme (3 kilometres) and the line Heredia – Curridabat (14 kilometres) are being used during rush hour as commuter lines (Villalobos, Bogantes, Cañas, & Quesada, 2014), operated by INCOFER.

As for the transportation of cargo by train, the Pacific railway line between San José and Caldera (97 kilometres) is not being used actively for the transportation of cargo since 2007, just as the railway line of Limón – Valle la Estrella (54 kilometres) on the Atlantic side. Only the line of Limón – Leesville – La Rita (31 kilometres) is still being used for the transportation of cargo, amounting to 143,320 metric tons in 2014. In comparison, the total amount of cargo handled by the ports of Moín and Limón cumulatively was over 10 million metric tons (JAPDEVA, 2015). The cargo transported over rail was divided in bananas (38.8%) and iron (61.2%) (Villalobos, Bogantes, Cañas, & Quesada, 2014). Figure 34 shows an overview of the active cargo rail network in Costa Rica.

Figure 34: Active cargo rail network in Costa Rica. (BID & CPCI, 2014)

INCOFER, the public rail authority responsible for maintaining, operating and developing the rail network, and the Ministry for Public Works and Transportation have the ambition to extend the current network. In its vision for 2035, an extension of the current cargo rail network is envisioned to the north, all the way up to the Pacific side of the country. Besides that, the railway between San José and Caldera is to be reinstated (MOPT, 2011). It is unknown if this is to be dedicated to cargo only, or for passengers as well.

Figure 35 shows the envisioned railway network in 2035.

Figure 35: Envisioned railway network in 2035 (MOPT, 2011)

4.3 Air transportation network

San José's main airport Juan Santamaría is besides transporting people also used for the transportation of cargo. In 2011, it handled around 75.000 tons of air cargo, mainly for the electronic sector, specialised medical equipment and medicines. In value, the airport exports over 30% of Costa Rica's total export. Due to its relatively short runway surrounded by urbanisation and a taxiway in the vicinity of the runway, the airport is restricted in terms of aircraft classes it can host. Unfortunately, expansion is not possible. There are plans building a new airport which can host all modern aircraft and with a higher capacity in the vicinity of Orotina. Further, almost no barge or coastal feeders are used.

4.4 Transportation costs

This paragraph gives insight in the average costs of transporting goods over land, through air or by sea. The costs are averages based on several sources found on the Internet, and on interviews with professionals. First information is given about road transport, subsequently about air cargo and at last about deep-sea transportation.

4.4.1.1 Road transport

Trucking costs are determined by the following formula: *transportation costs = vehicle operation costs + total costs to transport provides + profit mark up*. Vehicle operation costs include maintenance, tires, fuel, labour and capital costs, and can be seen as direct operational costs (Teravaninthorn & Raballand, 2008). The indirect costs, the total costs

to transport provides, include license, insurance, road toll and roadblock payments. The profit mark up is logically the profit margin, which depends on the competition (Hansen & Annovazzi-Jakab, 2008). The total transportation costs are in Costa Rica, as well as whole Central America, very high in comparison to for example the United States. These high costs are caused by high fuel prices, high security costs, transfer of empty containers, excessive travel times, and scarce investment and poor accessibility to credit to maintain or renew the vehicle fleet (World Bank, 2013b). Figure 36 shows that adistribution of the costs for one road transportation vehicle. It makes clear that in 2012 a share of almost 60% of the costs is dedicated to fuel expenditures (LCSSD Economics Unit, 2012b).

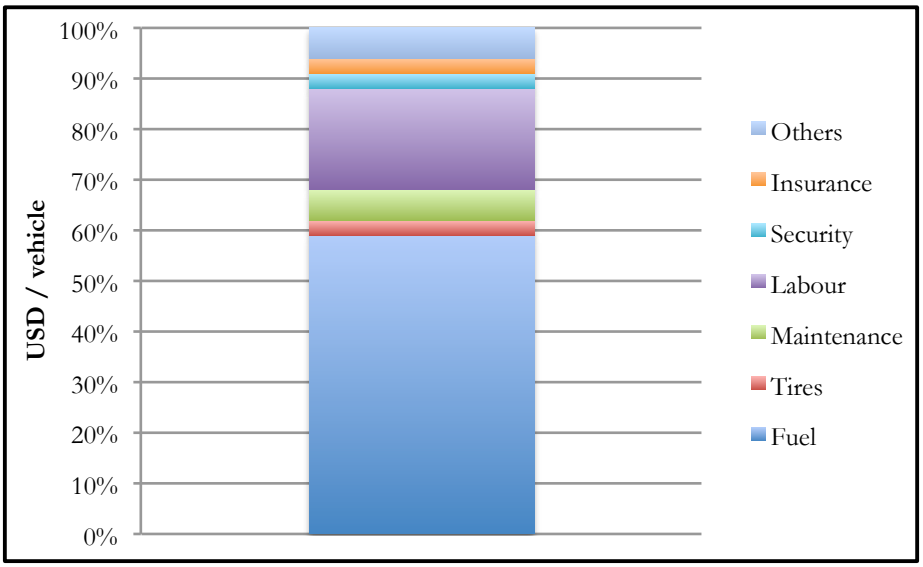

Figure 36: Distribution cost per vehicle (LCSSD Economics Unit, 2012b)

Despite the high fuel costs only 39% of the trucking companies in Costa Rica admit that they are taking measures for driving fuel-efficient (World bank, 2012). LCSSD Economics Unit (2012b) mentions also the big waiting times at the borders, and that customs costs are big obstacles. This has been confirmed when looking at an example of a big tomato exporter from Costa Rica to Nicaragua. It is estimated that 10% of the total costs are customs costs at the border. In the case of the tomato export from Costa Rica to Nicaragua logistics costs vary from 22% of the final price for large producers to up to 41% for small producers (Fernandez, Gomez , Souza, & Vega, 2011).

Another aspect of the relative high transportation costs is the trips with empty payload. For short-haul trips (<150 km), 70.6% of the trips have an empty backhaul. For the long haul the percentage is reduced to 44.3% (Osborne, Pachon, & Araya, 2013). When looking at the domestic and international road transportation Costa Rica is on average slightly more expensive than other countries in the region. For transporting a FEU (forty-feet equivalent unit) the costs for the first 180 km are on average $3.30 per km. For distances further than 180 km, the costs are on average $1.60 per km. Table 14 shows the average road freight prices in Central America (Guerro, 2012). Some countries have different tariffs due to different distances; this is called tariff one and tariff two.

Table 14: Road freight prices in Central America (firm means by country in USD/km for 1 forty feet container) (Guerro, 2012)

Country	Tariff one	Tariff two
Belize	2.5-2.75	
Colombia	2.99	
Costa Rica	**3.30 (<180 km)**	**1.60 (>180 km)**
El Salvador	3.50 (<90 km)	1.30 (>90 km)
Guatemala	1.80 (<300 km)	1.50 (>300 km)
Honduras	3.30 (<60 km)	1.24 (>60 km)
Mexico	1.42	
Nicaragua	3.70 (Caribbean zone)	1.21
Panama	2.95 (<300 km)	1.85 (>300 km)
Dominican Rep.	3.60-5.90	

Coming together, it costs around $550-600 for transporting a container via Route 32 from San José to the Limón/Moín harbour area, and it costs around $400 for bringing a container from San José to the Caldera harbour, When it is not possible to drive over Route 32 due to heavy rainfall, trucks have to take an alternative route via Turribalda. This route costs an additional $250 per container (Morreira & Godinez, 2016). Transporting a container from the northern region to Limón/Moín costs for a small/medium company $900/$1,000. When being a large company scale advantages can be reached resulting in slightly reduced road transport costs, resulting in ±$650 for transporting a reefer from the north to Limón/Moín (Cordero Noriega, 2016).

Concluding, road transport is very expensive in the Central America region and has to be reduced. Improving the fuel efficiency, less border/customs costs, less empty backhaul and improved road quality, is able to reduce this problem.

Air transport

Air transportation of cargo is almost only used for valuable goods like medical equipment. Charging air cargo differs per transportation company, some only charged kilogrammes, others kilogrammes and diameter, or a kilo price different per destination. Two kinds of air cargo services are provided, a business air cargo services used by large exporters and business, and a provider for private use. Rates between these two types of air transportation differ strongly; business transport and private transport. Secondly, differences occur also between the distances between origin and destination. It is logically more expensive to fly cargo for San José International Airport to the United States than to Europe. Most big air cargo companies (UPS, FedEx) use charges per zone. At last delivery time is a main cost component. The bigger transportation companies offer different transportation packages, which mostly differ in delivery time: from one day to seven days. This part of air cargo is only about business (import/export) transportation.

Table 15 shows the tariffs of two big air transport companies: FedEx and UPS. Both companies use different zone scales, FedEx uses an eight-zone system and UPS uses a seven-zone system. Examples of countries in a zone are:

A. Nicaragua
B. Only Miami (USA)
C. United States / Mexico
D. Brazil
E. Curacao (Caribbean)
F. the Netherlands
G. Malaysia
H. Rest of the world e.g. Cambodia)

1. Nicaragua
2. USA / Mexico
3. Brazil
4. Curacao (Caribbean and some smaller South-American countries)
5. the Netherlands
6. Malaysia
7. Australia/China

The list above shows that zones are comparable to each other. Comparable zones are: A-1, C-2, D-3, E-4, F-5, G-6/7, and H-7. Some regions of zone 7 are at FedEx mentioned in zone G and as 'rest of the world'. The table shows the tariffs of the cheapest transportation packages of both FedEx and UPS. Rates of both companies are including documentation, customs and other services.

Table 15: Air cargo tariffs FedEx and UPS 2016. Source: (FedEx, 2015), (UPS, 2015)

								FedEx
Kg	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
0.5-5	$108.50	$110.35	$129.40	$132.95	$140.35	$158.85	$156.85	$180.25
5.5-10	$177.00	$189.35	$227.10	$218.50	$233.35	$289.25	$265.20	$323.60
10.5-15	$234.90	$256.80	$292.35	$281.45	$302.75	$382.40	$354.20	$445.80
15.5-21	$281.59	$309.46	$339.33	$330.08	$353.32	$450.00	$417.76	$545.24
								FedEx high-weight tariffs (USD / kg)
21-44	$13.90	$15.10	$17.10	$16.30	$17.20	$22.00	$20.10	$26.80
45-70	$13.30	$11.80	$12.00	$12.70	$13.60	$18.00	$17.30	$24.70
>71	$10.10	$9.90	$11.40	$11.40	$12.30	$15.40	$15.90	$20.40
								UPS
	1	**2**	**3**	**4**	**5**	**6**	**7**	
0.5-5	$72.73	$140.53	$151.28	$151.66	$176.55	$207.40	$214.52	
5.5-10	$113.53	$200.24	$211.72	$229.25	$281.62	$305.60	$338.11	
10.5-15	$138.07	$225.17	$235.89	$273.12	$304.24	$345.82	$419.62	
15.5-21	$155.35	$239.72	$255.30	$309.25	$338.56	$385.48	$467.40	
21-31.5	$200.75	$291.61	$312.23	$345.35	$417.55	$471.85	$615.23	
								UPS high-weight tariffs (USD / kg)
>31.5	$7.50	$9.70	$11.40	$11.65	$15.00	$16.95	$22.50	
								Average
	A-1	**C-2**	**D-3**	**E-4**	**F-5**	**G-6/7**	**H-7**	
0.5-5	$90.62	$134.97	$142.12	$146.01	$167.70	$192.92	$197.39	
5.5-10	$145.27	$213.67	$215.11	$231.30	$285.44	$302.97	$330.86	
10.5-15	$186.49	$258.76	$258.67	$287.94	$343.32	$373.21	$432.71	
15.5-21	$218.47	$289.52	$292.70	$331.28	$394.28	$423.55	$506.32	

It can be concluded that on average air transportation is very expensive, and it is obviously only used for expensive goods or products with a close expiry date. Air transportation is further out of the scope of this report.

(Deep)-sea transport

The last part of the transportation costs is about the cost for shipping containers from Costa Rica to other countries. Ocean carriers maintain a very complicated structure to determine their tariff for the shipping service. Shipping lines wield basic fixed charges for containers, which is mostly negotiable for big consumers. The average rate for a container shipped on various important routes has an order of magnitude of approximately $2,000 per forty-feet equivalent unit (40 ft. container). Further, additional fees are charged per container. These are for special services, currency adjustment factor, war risks, ISPS surcharges, winter surcharges, piracy risk, dangerous goods and refrigerated goods special treatment charges and document costs. Security charges are around $10-20, BAF/CAFs are usually few hundred USD per TEU. Summing all the surcharges: it could give an additional $1000 or more to the freight (Lee & Meng, 2014). For larger companies shipping a reefer container filled with pineapples from the Limón port to Europe costs around $3,200 (Cordero Noriega, 2016).

4.5 Concluding infrastructure and transportation

The first three paragraphs discussed the transportation network of Costa Rica. The national road network in Costa Rica certainly longs for improvement. Both road quality as well as the amount of roads can be improved and/or expanded. Centres of freight movement activities are the northern border crossing at Peñas Blancas, the central valley (San José area) and the ports of Limón and Moín. With the opening of the border crossing at Los Chiles and the construction of "Tapon de Chilamate", an alternative road connecting the ports of Limón and Moín to the north of Costa Rica and Nicaragua is given, going around the central valley. However, current operations at the border crossing are not as expected.

Besides that, Route 32 still remains an issue since it is the major link between San José and Limón/Moín, as well as the metropolitan area of San José, where through traffic, local traffic and regional traffic is mixed and causing congestion. Currently, 212 km of rail is available in Costa Rica. However, only a little bit of the train network is used. In the San José tracks are used for public transport, and close to the Moín/Limón port complex some rails are used for cargo transport. Regarding air transportation, all cargo flows via Juan Santamaría International Airport in San José.

Further, it became clear that transporting through, to, and from Costa Rica is relatively expensive. Especially, road transport is expansive in comparison to other Central American countries. This is mainly due to high fuel prices, high security costs, transfer of empty containers, excessive travel times, and scarce investment and poor accessibility to credit to maintain or renew the vehicle fleet.

5 Dependency agricultural sector

This chapter provides information of Costa Rica's climate and it changes, and gives insight in value adding businesses as well as the maximum cultivation threat. Paragraph 5.4 deepens into the current trend of near-sourcing in the bigger economies.

5.1 Climate and seasonality

According to the Köppen-Geiger Climate Classification Costa Rica has a tropical-mesothermal climate, see Figure 37 (Kottek, Beck, Rudolf, & Rubel, 2006). Due to the mountainous lay out of the country the amount of rainfall depends of the location and altitude. Costa Rica has more or less two seasons: a dry and a wet season. The dry season affects the Western part of the country (up to Central Valley) from December to May. The Caribbean side of the country has more rainfall all year round. While the rainy season for the Western part of the country runs from May up to December.

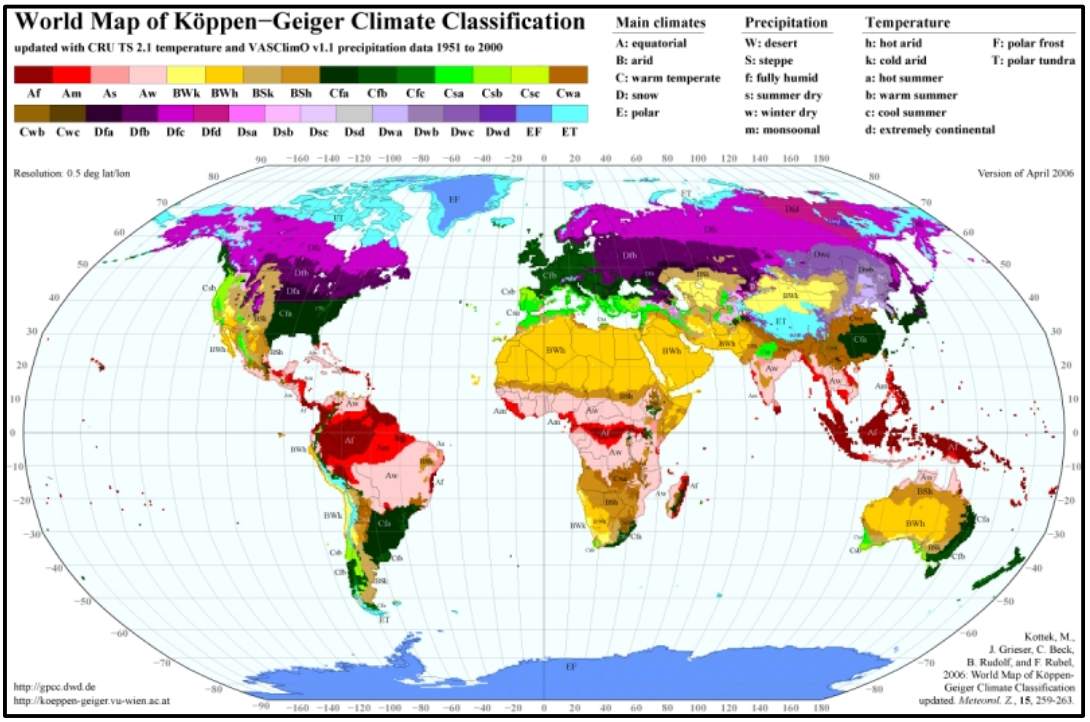

Figure 37: World Map of Köppen-Geiger Climate Classification

Banana trees prefer the wet climate on the eastern side of the mountains, confirming their location in the Caribbean region.

5.2 Climate change effects on agriculture

Normally, Costa Rica is less exposed to droughts and extreme weather then its neighbouring countries. Costa Rican plantations are able to harvest all year long by planning harvests smartly. More or less only its northern Pacific region lies in the Central American Dry Corridor. This corridor stretches from Belize to Costa Rica and includes regions that are most exposed to drought, see Figure 38.

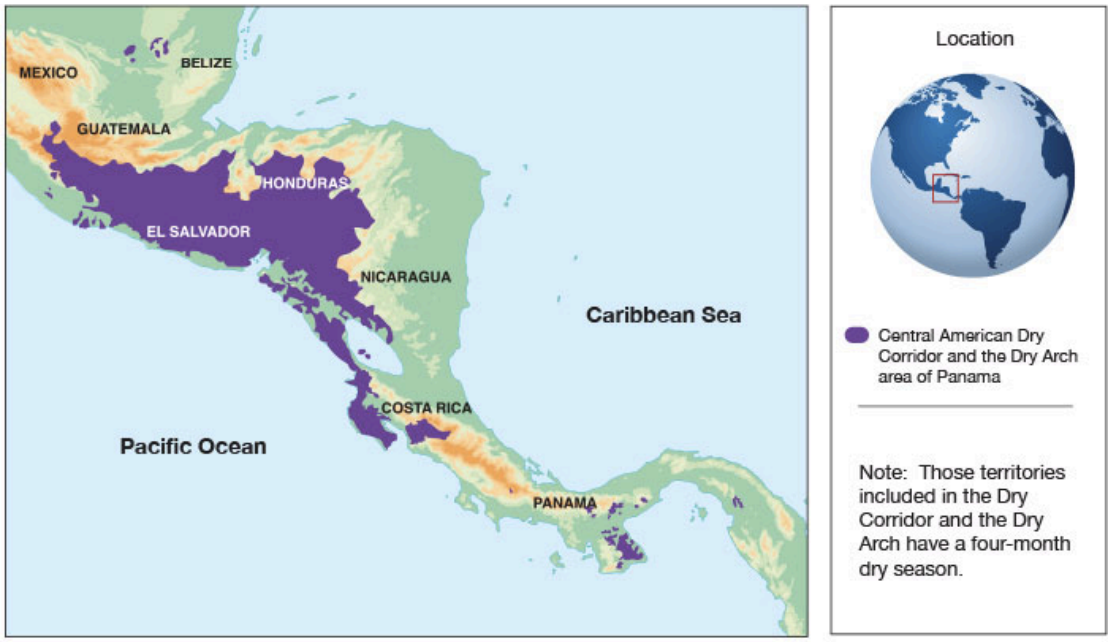

Figure 38: Location of the Central American Dry Corridor (FAO, 2015)

Furthermore, Costa Rica is situated just south of the hurricane belt. However, the country is still affected by the effects of climate change. The temperatures in the whole country are expected to rise by approximately 1.2 degrees Celsius and the western parts of the country are projected to receive less annual rainfall, see Figure 39 (World Bank; CIAT; CATIE, 2014). Additionally, Figure 40 shows clearly that as the western parts get drier the eastern areas are expected to receive slightly more rainfall. This is explained by the intensification of the 'Alisios' winds in the Caribbean region. These winds bring humidity to the Talamanca (Caribbean) and Central Valley regions from the north-northeast from June till August. However, from November to February climate change leads to a decrease of cold fronts leading to decreased precipitation in the Caribbean region (MINAET, 2012).

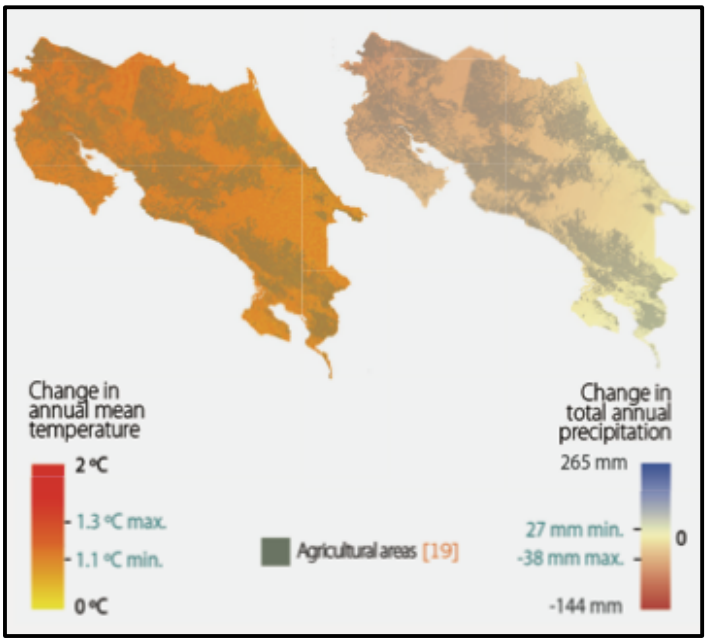

Figure 39: Projected change in precipitation and temperature in Costa Rica by 2030 (World Bank; CIAT; CATIE, 2014)

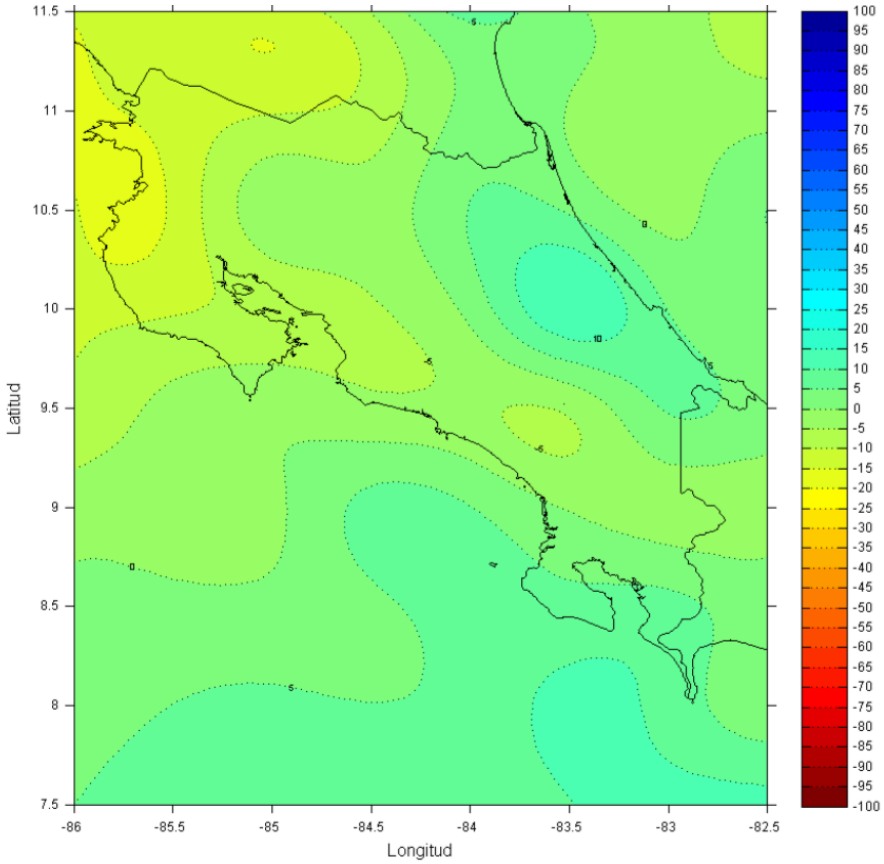

Figure 40: Expected average change in precipitation per year (%) for the period 2011-2040 (Alvarado, Contreras, & Jiménez, 2011)

Higher temperatures cause declining yields of plantations and the presence of pests and diseases to increase (America Economica, 2014). The effects are seen as the Black Sigatoka and coffee rust diseases have seriously impacted the Costa Rican bananas and

coffee plantations (MAG; CCAFS, 2014). Furthermore, weather patterns are expected to change and the frequency of extreme weather will increase (World Bank; CIAT; CATIE, 2014). Especially unpredictable seasonal rainfall patterns will have a large influence on the agricultural business, as this results in abnormal periods of drought and flood occurrence. The agricultural industry is extremely vulnerable as insurance mechanisms are mostly absent. Furthermore, programs to create irrigation and drainage systems to allow for sufficient watering lack investments (IICA, 2010).

5.3 Value adding businesses and maximum cultivation

An identified opportunity for Costa Rica to increase the value of its export products and to provide more employment is to invest in value added businesses. According to PROCOMER Costa Rica has a large strength in shipping 450,000 products to 40 countries (Roman, 2016).

A large risk that Costa Rica faces is a decrease or stagnation in the amount of export products available. Especially agricultural products are vulnerable to the effects of climate change, but even if measures can be taken to reduce negative effects of less and irregular rainfall and higher temperatures the land faces a danger of maximum cultivation (Hartog, 2016). It is important for Costa Rica to look beyond the products of pineapples and bananas in any form. It was noticeable that many involved parties did not look at possibilities for other export products on middle and long term for when such a scenario would occur in Costa Rica.

5.4 Near-sourcing

A survey conducted in 2014 under 134 U.S. senior manufacturing and distribution executives showed a preference for having near-sourcing manufacturing industries rather than based in China, as congested ports on the U.S. West Coast pose significant disruptions in their supply chains. It was found that 86% of the involved companies have plans to invest in locating the manufacturing industries closer to the U.S. Market in the next two or three years. The companies expect to reach lower import costs, lower freight costs, improved speed to market and improved customer service from the change (Journal of Commerce, 2015).

Furthermore, the labour costs in the Chinese coast area are increasing over the past years urging manufacturing companies to look for other locations. Even though the labour costs are lower in inland China, sufficient infrastructure and skilled workforce are lacking. Mexico focuses on the Consumer Electronics sector, mainly the manufacturing of audio and video devices, telecommunications and computer equipment and its parts. With its export potential the sector is rapidly increasing and back in 2011 already representing the second largest exporter to the U.S. (Marca Pais, 2011).

Currently the country focuses on the receiving more manufacturing countries by providing several advantages. The geographical location of Mexico provides opportunities for trucking and rail connections that are more reliable than the congested U.S. West Coast ports. Furthermore, the government works with logistics companies in identifying areas with infrastructure that suits the needs of companies (road and rail connections, and sufficient skilled labourers). In Mexico 114,000 engineering and technology graduates enter the job market each year (Marca Pais, 2011). Finally, Mexico has eased the customs procedure for the import of half fabricates and raw materials by using a single electronic system. Mexico poses to be a competitor by also increasing the level of education and its workforce focused on the electronics market. Furthermore,

China and other Asian countries were though competitions with expertise and lower labour fees. However, the increasing labour costs in China and the Free Trade Agreement closed with China in 2011 provides opportunities for Costa Rica to collaborate with China on expanding the possibilities of the electronics and medical appliances markets in Costa Rica.

5.5 Concluding dependency agricultural sector

This chapter first discussed Costa Rica's climate, and the possible effects of the climate change. Costa Rica has various landscapes, so it deals with different climates. It faces wet and rainy seasons, but dry and sunny seasons as well. Due to climate change, the average temperature in the country rises, which affects the harvest negatively. Also weather patterns and the frequency of extreme weather are expected to change. More rain in at the Atlantic side, and less rain is expected at the Pacific side. At last, the risk of maximum cultivation and the opportunity of value adding business have been discussed. Partly because the maximum cultivation rate will be reached in the coming years, Costa Rica has to search for other moneymaking businesses; promoting value-adding businesses could be a good opportunity for the country. By attracting (new) businesses and industries, Costa Rica could hitch on the near-sourcing trend of the bigger economies.

6 Costa Rica's logistical system: who is involved?

This chapter will address all actors involved in the Costa Rican logistical system. The first paragraph is about the identification of the actors. This identification will show the role and goals of the different actors. When the actors are identified, they are placed in a power-interest grid, which is used to determine how actors should be handled during the projects to be conducted (§6.2). After placement in the grid, for each of the actors their power and interest will be shortly reviewed. The complete stakeholder analysis is a useful tool for the further research and will be mainly used for the implementation plan. This plan deals with how the proposed strategy can be actually implemented.

6.1 Involved actors

Table 16 shows the identified actors for this research, along with their subgroup, role, influence and goal.

Table 16: Identified actors

Actor	Sub group	Role	Influence	Goal
COMEX	Government	Client	Approval / blocking	Promote, facilitate and consolidate the inclusion of Costa Rica in the international economy, in order to promote the growth of the economy and thus improve the living conditions of all Costa Ricans.
MOPT	Government	Client	Approval / blocking	Build and maintain the infrastructure in the country, assure safety of its users
JAPDEVA	Port authority	Authority for Caribbean region	Blocking	Facilitating foreign trade, promoting the socioeconomic development of the Costa Rican Caribbean.
INCOP	Port authority	Pacific port authority	Blocking	Provide efficient port services and give out concessions to the private sector to benefit importers, exporters and the general public with the aim of promoting economic and social development the country in harmony with the environment.
SINTRAJAP	Union	Union for JAPDEVA	Political power	Present itself for the interest of the employees of the Limón/Moín terminals.
APMT	Port operator	New Moín terminal operator	Partner / blocking	Increasing market share and thereby profit in a sustainable manner
SP Caldera	Port operator	Caldera operator	Partner / blocking	Promote the provision of modern, safe and efficient port services
AMEGA	Port/rail operator	AMEGA terminal, rail, Pacific terminal	Partner	Gain market share in the transhipment sector, and development of the region
INCOFER	Rail authority	Builder, maintainer, operator	Partner / blocking	Providing modern, sustainable and efficient rail transportation in an integrated network
CONAVI	Road authority	Builder, maintainer, operator	Blocking power	Ensure the welfare and development of Costa Rica, by the sustainability of the national road network, in harmony with the environment.
ZEEZN	Regional authority	Special economic zone programme	Possible partner	To build a development vision oriented to stimulate the productive sector and generate quality jobs
PROCOMER	Public entity	Supporting international trade	Partner	Promoting Costa Rican exports of goods and services in the world. Simplify and facilitate export procedures, generate linkages for export statistics recorded

				exports of goods and conducting market research
CINDE	Non-profit	Costa Rican investment promotion agency	Partner	Promote the attraction of Foreign Direct Investment (FDI) in Costa Rica
CANATRAC	Union	Truck drivers union	Political power	Support land freight carriers, actively cooperate in strengthening and exercise a dignified, safe and efficient defence of their interests before public and private entities inside and outside the country.
CANACAR	Union	National chamber of trucking	Political power	To represent the interests of the domestic industry trucking, projecting and promoting their integration and professional development.
SME	Enterprises	All small/medium enterprises <250 employees	Potential beneficial	Get a change to be included in the shipping to more countries in the region, thereby increasing their market share and profit
Large producers	Enterprises	Large companies with > 250 employees		Increasing market share and thereby profit in a sustainable manner
Foreign investors	Enterprises	Companies investing in Costa Rica	Potential beneficial	Increasing market share and thereby profit in a sustainable manner
SETENA	Environmental organisation	Decentralised body of the Ministry of Environment and Energy	Political power	To harmonize the environmental impact with production processes and to analyse the environmental impact assessments and resolve within the limits laid down by the General Law of Public Administration, and any other activities necessary to fulfil its purposes
WTO	Global organisation	World trade organisation	Blocking power	To ensure that trade flows as smoothly, predictably and freely as possible.
Shippers	Enterprises	Shipping companies	Possible beneficial	Increasing market share and thereby profit

The influence column provides the different influences actors can have on the implementation of the strategies provided later in this research. One of the most important influences is the blocking power. If an actor has blocking power this means that his influence is big enough to block (some of) the plans that can be derived from the future strategies. For some of the stakeholder is not likely that they will execute this power (MOPT, COMEX etc.) due to their goals of a better logistical situation in Costa Rica. Others, such as some of the unions might use their political power to influence the actors with blocking power to take a negative stance against some of the proposed plans. Possible partners are actors that might or can support some of the measures taken and can be a help in supporting the measures with both resources or public support, leading to more support in the local, regional or even national community. Approval means that the involved party has to improve measures before even a start can be made with implementing them. Beneficial means the actors have possibilities to reach (part of) their goals if proposed strategies are implemented.

6.2 Power-interest grid

The power versus interest grid with its four categories is a tool used for this research as applied by Murray-Webster & Simon (2006). It places all stakeholders in one of the four groups according to their power and interest in the subject. The definition of power and interest to be used for this analysis is:

- *Power:* Their potential to influence derived from their positional or resource power, or may be their actual influence derived from their credibility as a leader or expert.
- *Interest:* Their interest in the project as measured by the extent to which they will be active or passive.

The four categories on the grid are: keep satisfied, monitor, manage closely, and keep informed. Figure 41 shows how the actors are placed in the grid according to the assumed amount of power and interest they have regarding the outcome of the research and their role in the actual realization. The top right corner means a lot of power and high interest, whereas the lower left corner means no power and no interest.

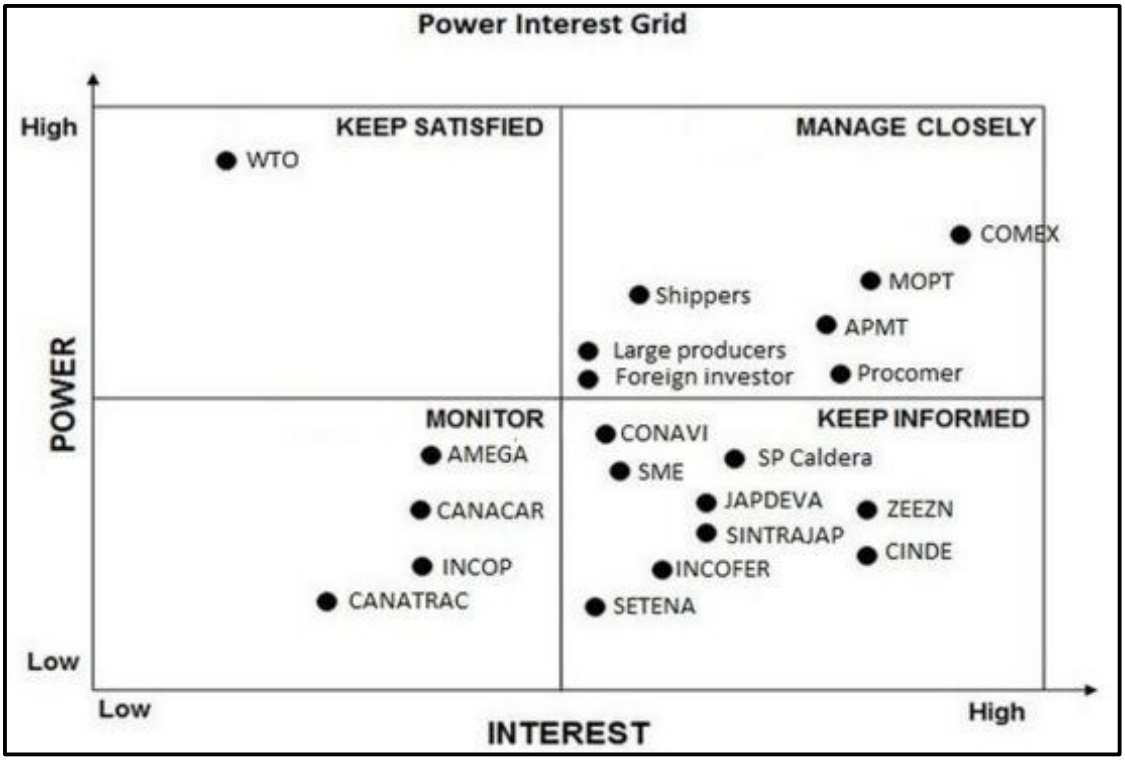

Figure 41: Power versus interest grid Costa Rica's logistical situation

The category an actor is in on the power-interest grid determines how the actors are involved during the project, but mostly how they have to be handled when implementing the alternatives provided. The left upper grid; keep satisfied deals with actors with high power but low interest, if they are kept satisfied they will not use their power to block the projects or certain part of the projects, with the WTO this basically means that all trade agreements should be respected and international rules cannot be violated. The lower left category is the monitor category; these actors should be monitored during the projects but only in extreme situations might form a threat for the continuity of the project. The upper right category is the category that includes the actors that have relatively high power and interest and therefore is the hardest and most important one to manage. The actors in this category should be informed and included in important decisions during the process of coming to alternatives and in the decision which alternative is best. This should be done to secure early support and to deal with resistance against the alternatives before they are actually implemented. These categories will be addressed in the implementation plan at the end of this report.

Table 17 shows for each of the four categories of the power-interest grid why the actors are placed in that category by explaining their power and interest position.

Table 17: Explanation power and interest per identified actor

Actor	Description
Keep satisfied	**High power, Low interest**
WTO	Has a large influence on global trade and has the ability to use its power if certain projects are not to their liking. However, the WTO will only use this power if needed and has no specific interest in the strategies to be proposed. Therefore, high power, low interest.
Monitor	**Low power, Low interest**
AMEGA	The AMEGA project is a project on itself that will not use most of the current infrastructure or export products from Costa Rica. So even though it is a large project, the power and interest in the strategy will be relatively low
CANACAR	As national chamber they have some influence, but only on the truckers. Therefore only a small portion of the strategy will interest them
CANATRAC	As a union they have some influence, but only on the truckers. Therefore only a small portion of the strategy will interest them
INCOP	They do not have influence in Caldera anymore, only in some very small ports with low import/export
Manage closely	**High power, High interest**
MOPT	Has the power to allow/block a project. Direct responsibility for transportation, so high interest and power.
COMEX	Ministry of trade will have high interest in strategies for improving trade and logistics. Also, COMEX has the ability to deal with foreign investors making the powerful in the strategy
Shippers	Without the shippers there can be almost no growth, they will have to come to the terminals. Their interest is high because they can possibly earn money by including Costa Rica in their shipping lines.
APM Terminals	APMT has the monopoly in the largest port. Even though they have a strict contract, they can determine which shippers can use the terminal and what can and will be imported/exported. Without them real growth is almost impossible
Large producers	The large producers. Mostly in agriculture, can influence the export market since they are responsible for a large share of the export. Also, better logistics will be quite important to them since they can benefit from it.
PROCOMER	PROCOMER has high interest in the strategy since they try to improve costa Rican trade and relatively high power due to the status of their organization and the companies involved with them.
Foreign investors	Need to be convinced to come to Costa Rica, which

	when the strategy is applied right is also in their interest. Collectively they have some power since the strategy will not work if foreign investors will not come to Costa Rica.
Keep informed	**Low power, High interest**
CONAVI	CONAVI is responsible for building and maintaining the roads, which are likely to be an important part of the strategy. Their interest will be high on the parts of the strategy concerning roads.
SP Caldera	Private company that can benefit from the strategy. They also have some power since they control the import and export in Caldera, the only large port on the pacific side of Costa Rica.
SME	Collectively they have some power and can influence the export market. Also, the strategy can be beneficial for them if it is focussed on protecting of beneficial for SME's.
JAPDEVA	As port authority they will have large influence on the existing Moín and Limón ports. However, their power will become smaller since APMT will operate the new terminal. Their interest in the strategy will be for the plans for what should happen to the current Moín and Limón ports.
ZEEZN	Does not have direct power. However, as they work together with many companies and institutions that trust their opinion, in a region that produces a lot of export products, they are able to influence other actors. A good logistical plan will benefit the companies and producers in the region and therefor is in the interest of ZEEZN.
SINTRAJAP	As a Union they had a lot of political power. However, with the new terminal this power goes away. Their interest will be in what will happen with the current port workers.
INCOFER	Small organization that when rails will be build will be in charge. However, their only power lies within the railways. The interest in the strategy will be high if it contains the construction of new railways.
CINDE	If they decide to work with the strategy they have to power to talk to companies to try and get them to invest in Costa Rica. However, they only have this power if other measures are also taken to make Costa Rica more attractive. Their interest will be high since their work will become ore important if attracting foreign customers is part of the strategy.
SETENA	Only has the power to influence people to go against (parts of) the strategy. Will only have interest if the environment is harmed.

6.3 Concluding stakeholders Costa Rica's logistical system

This chapter analysed all stakeholders involved in the current logistical problem. Some actors have more abilities to undertake action than others, and some actors have a bigger interest in this problem than others. It became clear that the involved parties that are in the high power-high interest quadrant need to be managed closely. Important stakeholders in this quadrant are COMEX, MOPT, shippers, APM Terminals, large producers, PROCOMER, and foreign investors. Another actor that has high power, but less interest is the WTO, since it checks if trade agreements are honoured.

7 Developments in the Caribbean/Central-American region

In this section an analysis is conducted about other countries in the Caribbean and Central American region. It will mainly discuss other port regions/countries that perform better than Costa Rica on logistical indicators such as the earlier mentioned Logistics Performance Indicator. Further promising projects and, if available, their results will be reviewed to find possible measures for Costa Rica. This paragraph identifies also threats for Costa Rica in the form of competition.

As earlier mentioned in this report, Costa Rica is ranked 87th on the Logistic Performance Index. Of the two neighbouring countries, Panama (45) is placed significantly higher than Costa Rica and Nicaragua slightly lower (95). When reviewing the larger area, more countries can be found performing better than Costa Rica, such as: El Salvador (64), the Bahamas (66) Dominican Republic (69), Jamaica (70), and Guatemala (77) (World Bank, 2014). If these countries are ranked higher, there are possibilities for Costa Rica to learn from these countries and review which measures they took to improve their logistical position. Hence, this report has the focus mainly on ports; only countries ranked higher with significant ports are enlightened. It deepens mostly on the bigger (transhipment) ports in the so-called Caribbean Transhipment Triangle (CTT) seen in Figure 42.

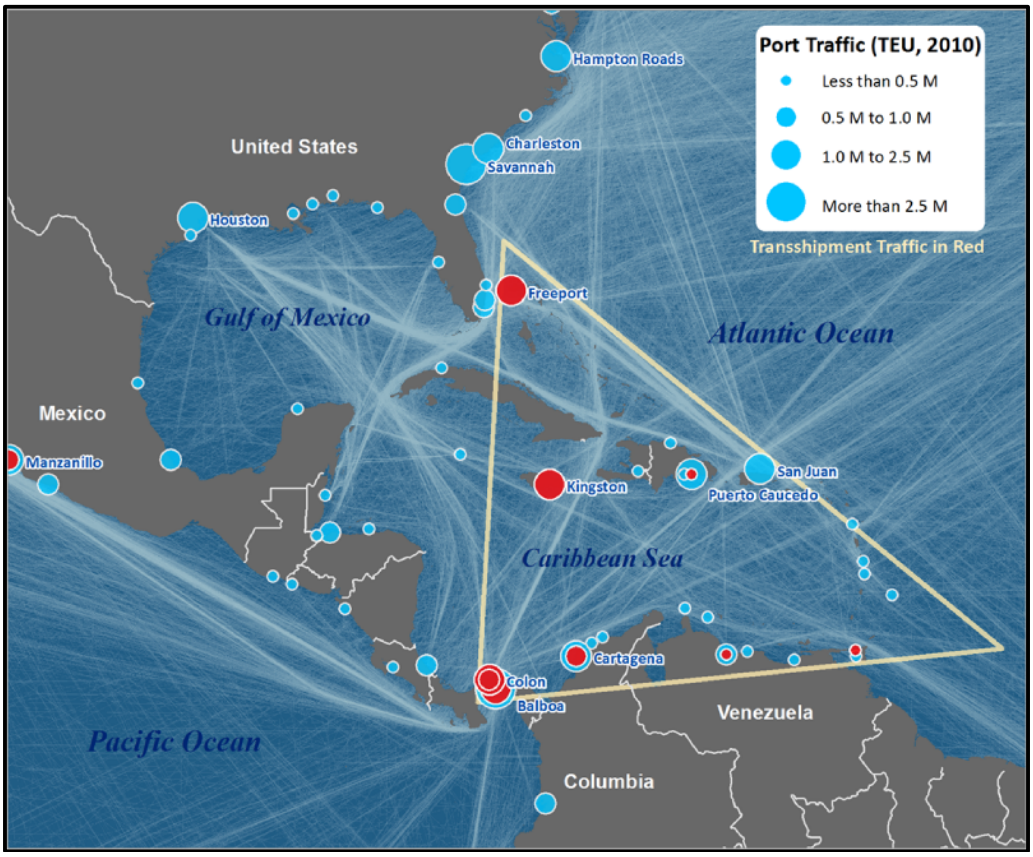

Figure 42: Caribbean Transhipment Triangle Source: American Association of Port Authorities

Paragraph 7.1 gives an analysis of Panama followed up by Nicaragua in §7.2. Paragraph 7.3, 7.4, and 7.5 gives insight in the port performances and developments of respectively Kingston (Jamaica), Miami (USA), and Freeport (Bahamas). The last paragraph, §7.6, provides information about the idea of a Central American Customs Union (CACU).

7.1 Panama

The logical country to start with is Panama; they are ranked the highest and are a neighbour of Costa Rica. Geographically Panama has the advantage that the biggest city of the country lays next to the sea, making it much easier to get the goods from the biggest port in the country to the most densely populated areas. Panama's main ports lie relatively close together, on the pacific end of the Panama Canal near the capital and on the Caribbean end of the canal near the city of Colon (World Port Source, n.d.). Most industry in settled close to one of these two harbours. Panama handles about four times as many containers as Costa Rica and is the largest container shipping country in the region (World Bank, n.d.). Panama's large asset is the Panama Canal, which lies strategically close to their harbours and makes it easy for the passing container vessels to make a stop at one of their harbours. The ports at the Pacific Ocean, Balboa and the TSA terminal, had a combined handling capacity of 3.43 million TEU in 2014. Of these two, the Balboa harbour is by far the most important with 3.2 million TEU. At the Atlantic side, the three harbours handled a total of 3.21 million TEU in 2014 (Netherlands Embassy in Panama, 2015). Manzanillo is the most important harbour on the Atlantic side, handling 2.0 million TEU. In comparison, all Costa Rican harbours combined handled 1.88 million TEUs in 2013 (World Bank, n.d.).

When comparing the roads of both countries the Panamanian roads have improved more than the Costa Rican roads since the start of the 21st century, with an average expansion of the road network of 2.59% per year, where in Costa Rica this growth is only averaged 1.56% per year (World Bank, 2015a). The roads manufactured in Panama are also of a higher quality and have a larger capacity than the roads designed in Costa Rica. For example the road connecting the main ports is a four-lane expressway, whereas the road to the most important harbour in Costa Rica is a poorly maintained two-lane road. Figure 43 shows the density of the road network in Costa Rica and other countries in the region. It shows that The Costa Rican road network is by far the densest. However, a survey by the World Economic Forum (2013) shows that the Costa Ricans rate the quality of their roads very low, resulting in a 129th place worldwide, where other countries in the region perform much better: Panama (49), El Salvador (52), Nicaragua (75), and Honduras (91). This means that the roads of Costa Rica do not fit the economic situation of the country.

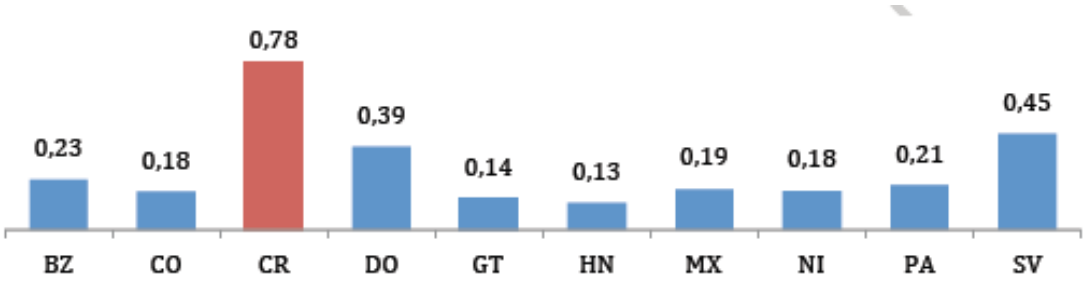

Figure 43: Comparison of road density (km/km²) (BID & CPCI, 2014)

When comparing the export products of Panama, Costa Rica and Nicaragua, a similarity can be found between Panama and Costa Rica, They both export a lot of bananas. There are almost none similarities between Nicaragua and Costa Rica, and the export of Nicaragua is very small compared to the export of Panama and Costa Rica.

Figure 44 shows the exported goods with percentages representing the amount they contribute to the total exported value for Costa Rica and Panama.

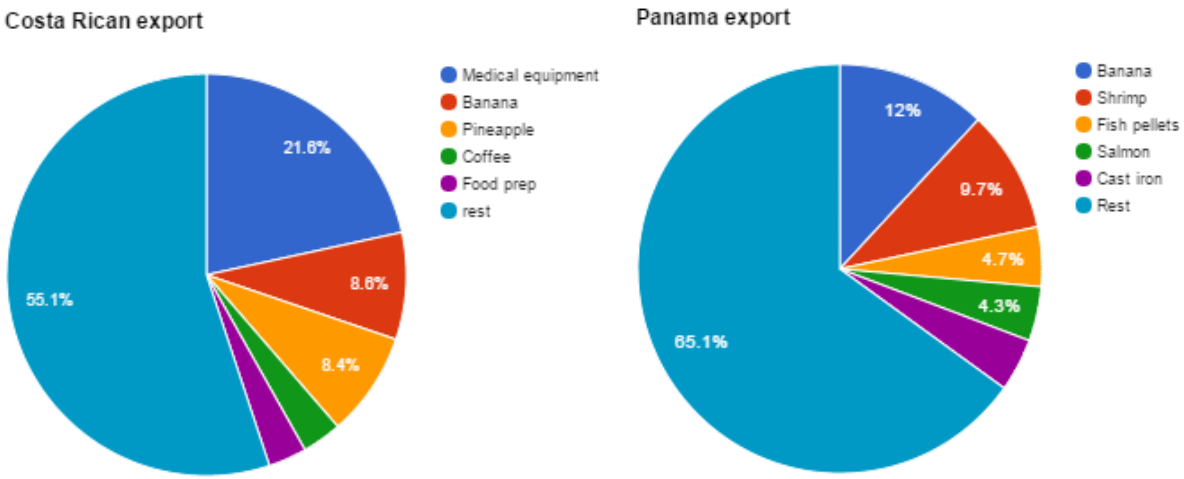

Figure 44: Comparison of largest export products (PROCOMER, 2015) & (WITS, 2015)

When looking at the countries to which most of their products are shipped, some similarities are visible. Both Panama and Costa Rica export most of their goods to the United States. After that for Panama follow Germany, China, Costa Rica and the Netherlands (WITS, 2015). For Costa Rica after the United States the countries most exported to are Panama, Nicaragua, Guatemala and the Netherlands (PROCOMER, 2015). However, because of the difference in exported goods, it is hard to say if Panama is a big competitor for Costa Rica. The only product they really have in common is bananas, and it is unlikely that one of the two countries can produce enough bananas to take over the export from the other country. Also, bananas are a perishable good, so it is desirable that they are shipped as soon as possible. This makes moving them to the closest port the best option.

Panama wants to be an international hub for the Americas (Netherlands Embassy in Panama, 2015). If Costa Rica wants to achieve something familiar in the near of far future with the new to be constructed terminal in Moín, Panama will form a competitor. The capacity of the Panamanian harbours combined with the advantages the Panama Canal brings, the country will make it very hard for the port in Costa Rica to compete. There will have to be commitment from large shipping companies to do some transhipment in Costa Rica, and the infrastructure in the country will have to change to facilitate this. The overall conclusion from the comparison with Panama is that they perform better on most logistical aspects. The most important advantage they have is the Panama Canal, which leads to high revenues and a natural way to attract large container ships, leading to easy import and export possibilities.

Promising projects in the region

In this sub paragraph promising projects in other countries will be reviewed in order to identify if they are useful to be adapted to a possible measure for Costa Rica to implement to improve their logistical situation. The projects can be already implemented, in which case the results will be used or can be still in the development phase, in which case their advantages and disadvantages will be reviewed.

Panama Canal Railway
The Panama railway is a railway meant for both passenger- and freight transport from the Pacific coast to the Caribbean coast in Panama. The rail is constructed alongside the Panama Canal and its goal is not to be a competitor of the Canal but a complementation to it. Shippers can use it to maximise their operations in Panama and find the most cost effective way to get their containers from the Caribbean to the Pacific coast and vice versa. The service provided is in-bond, meaning that for example a container loaded onto the train at the Caribbean port can be moved by rail duty free to the Pacific port. The maximum capacity of the railway will be two million TEU, which is a higher number than the total movement of TEU in 2015 (PCRC, n.d.). So, what can this project mean for Costa Rica? The idea of a railway between the two most important harbours can be profitable for Costa Rica. However, the harbours in Panama are way bigger than the one in Caldera so the question can be raised if such a network would be as profitable for Costa Rica as it is for Panama. For Costa Rica it might be profitable if the railway would go through the Central Valley, so the freight road traffic from the metropolitan area in the Central Valley can be reduced, leading to less congestion on the roads. The Panama Canal railway proves that capacity wise it is possible to realise a railway that can move almost all cargo to be exported from Costa Rica. The geographical production locations however require several different railways to be connected on one large railway to be successful. At last, it has to be mentioned that Costa Rica is more mountainous than its southern neighbour, making it a very expensive measure.

Colon-Panama City expressway
The expressway is four-lane highway from Colon to the capital of Panama, Panama City. The construction of this road has led the travel time between these cities reduced with 50%. A road such as this would be a huge opportunity for Costa Rica. However, a road such as this would be too expensive and hard to realise due to the mountains around the central valley and the protected rainforest through which the road would go in order to connect the new port with the Central Valley. The existing Route 32 has not enough capacity and is frequently closed due to natural causes, such as heavy rain and loose rocks. A road of this size would mean a huge difference in the logistical situation of Costa Rica, but is unlikely to be realised.

7.2 Nicaragua
Nicaragua on the other hand has less developed connections to the international trade market. Given it has no decent ports on the Atlantic it remains dependent on neighbouring countries to transport goods to the U.S. East Coast and Europe. The road infrastructure is mediocre and border processes pose large problems in the logistical chain resulting in long delays. The country will not proof to be a competitor for Costa Rican trade (especially on the Atlantic) and with the construction of the new TCM the trade with Nicaragua is most likely to increase, giving Costa Rica the opportunity to function as the gateway to Nicaragua.

The geographical location of Nicaragua near major shipping routes on both the Pacific and Atlantic coast would offer possibilities for the country to interact in the international trade market. However, the quality of Nicaragua's infrastructure is insufficient to compete on a large scale. The port of Corinto, situated on the Pacific, is the only significant port in Nicaragua. The port offers a berth depth of 11.5 metres, a 610-metre quay and no operational cranes available. The maximum vessel size is 2,664 TEU. In 2013 only four liner services were active in Corinto versus 20 in Limón/Moín. Furthermore, currently only feeder services call in the port, and no changes are expected

in shipping type with the expansion of the Panama Canal. The maximum annual capacity of the port is estimated at 240,000 TEU. The land accessibility of the port based on distance, travel time and congestion encountered to reach highways and major cities was rated as adequate in a analysis by the Inter-American Development Bank (the accessibility of Limón/Moín was rated as poor in the same report) (IDB, 2013).

In 2014 a Chinese investor (Hong Kong Nicaragua Development Group) announced plans to construct a canal through Nicaragua connecting the Pacific and Atlantic seas. Figure 45 shows the planned location of the canal. The plan faces a lot of problems of insufficient finances, environmental issues and engineering reviews leading to delays. Environmentalists protest against the creation of a canal through Lake Nicaragua, the largest drink water supply, and the Cerro Silva Nature Reserve. Although the canal could possibly provide prospected income for Nicaragua, critics still see problems regarding its functionality. Where the 48-mile Panama Canal can be navigated in one 'long day', the 172.7-mile Nicaragua Canal would require ships to navigate in the dark or lay up along the route. Furthermore, to gain sufficient revenue to compensate the construction costs, the fees need to be at least twice the fare of the Panama Canal. Given the relatively short distance between the two canals expectation are that the Nicaragua Canal will not have enough advantages over Panama's (Morris, 2016). Even though the Nicaraguan authorities have already approved the project, the actual execution of the project and its value remain questionable.

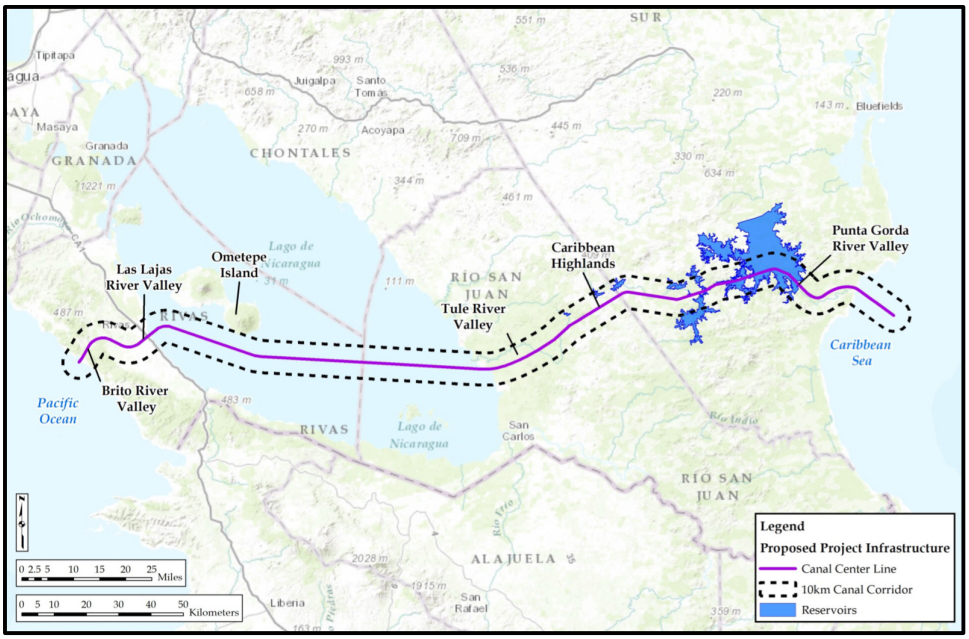

Figure 45: Planned location Nicaragua Canal (HKND Group, 2015)

The quality of road infrastructure in Nicaragua is rated as average in Central America, and better than that of Costa Rica on the World Competitive Index in 2011. This result is interesting as only 10% of Nicaragua's roads are paved in contrast to almost half the roads in Costa Rica (World Bank , 2012b). The World Bank ranked Nicaragua as 95th (Costa Rica was placed 87th) in 2014. It scored especially low on the criterion of infrastructure, followed by customs, logistics competence and tracking & tracing (World Bank, 2014).

Nicaragua's export is primarily focused on the U.S. market (52.3%) followed by Mexico (11.8%), Venezuela (6.8%) and the EU (6.3%) (European Commission, 2015). The most

important export products include electronics, clothing, coffee and red meats (US Trade Representative, 2014).

7.3 Kingston – Jamaica

Currently Jamaica realises a strong negative trade balance of 4,386,264 USD in 2014. How the total export of 1.45 billion USD is distributed can be seen in Figure 46 (Statistics Institute of Jamaica, 2016).

Almost 70% of the total export is dedicated to crude materials and mineral fuels. When looking at export products, top exports of Jamaica are aluminium oxide, aluminium ore, refined petroleum, alcohol >80% ABV, and raw sugar. The top importing products are refined petroleum as well, crude petroleum, alcohol >80% ABV, cars and packaged medicaments. The countries with which Jamaica trades most are the United States of America, Canada, Germany, the Netherlands, United Kingdom, Venezuela, Trinidad and Tobago, China, and Mexico. Most of the export is going to North America and Europe, while Jamaica imports most of its products from Central America and the USA (OEC, 2014). The total throughput of containers at Kingston was 1,638,133 TEU in 2014 (ECLAC, 2015b).

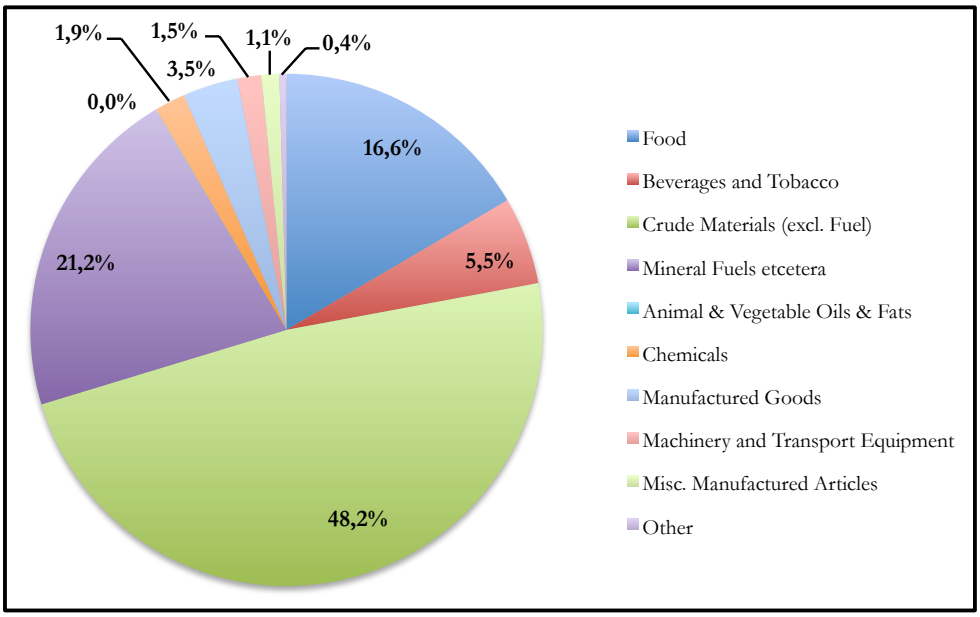

Figure 46: Export distribution Jamaica 2014

An important container transhipment port in the region is the Kingston Container Terminal (KCT). This terminal has currently a capacity of approximately 2.8 million TEU. KCT can handle super-Post Panamax vessels with manually driven and automatically driven cranes. During this research KCT is expanding to a capacity of 3.6 million TEU and the completion of the expansion is almost finished (The Port Authority of Jamaica, 2016a). Additionally, on April 7th 2015 the government of Jamaica signed a concession deal with CMA CGM for 30 years, where the French shipping company is going to bolster the capacity of 3.6 million TEU with additional gantry cranes and port riders (World Martime News, 2015). In the current years CMA CGM is going to modernise the south terminal (Gordon Clay) of the KCT to accommodate more transhipment cargo. Further it wants to establish a new container terminal on land owned by the Port Authority of Jamaica (JCSC, 2012).

The Port Authority has embarked on the development of a Commercial Free Zone/distribution Hub for the Americas, which involves warehousing, display, sale and distribution of products to identify and target buyers. Goods will be moved from the Terminal to the Zone for stripping, repackaging and consolidating, then forwarded to the companies' clients anywhere in the world, duty free. Goods may also be manufactured on the Zone (The Port Authority of Jamaica, 2016b).

Two business lines primarily drive the operations of the Port Authority of Jamaica. The business lines are the handling of containerised cargo, and cruise shipping supported by the harbours and port services. Most containers are handled by the KCT, and the cruise ships are welcomed at four ports. The Kingston Container Terminal handles for almost 80% transhipment containers. The amount of container movements decreased after the worldwide economic recession, but is slowly recovering (The Port Authority of Jamaica, 2015a).

Furthermore, the government of Jamaica signed a Memorandum of Understanding with the China Harbour Engineering Company (CHEC). The Framework Agreement, signed on August 5 2014 for development of an industrial park and transhipment hub at Portland Bight in Southern Clarendon, promises substantial capital investment in Jamaica. Over the lifecycle of the project CHEC has provided a concept document entitled "Master Plan of Portland Bight Industrial Park Jamaica" for review and discussion (The Port Authority of Jamaica, 2015a).

Currently, Jamaica has free zones around its ports. It is strongly advised by the private sector of Jamaica and the World Trade Organisation that Jamaica closes its free zones and makes it special economic zones instead. The main difference between these concepts is that the operator of a free zone has to be the owner of both import and export of cargo. Not so in a special economic zone (SEZ) — here both inbound and outbound cargoes can have different owners. The Ministry of Industry, Investment and Commerce made a working group to investigate its opportunities (Jamaica Observer, 2014). With the implementing of SEZs, Jamaica uses more and more a logistics-centric model that is similar to big ports like Rotterdam, Singapore, and Dubai (Ministry of IIC of Jamaica, 2014).

The implementation of the SEZs is a next step in making Jamaica a global logistical hub, which is part of the so-called Global Logistical Hub Initiative (GLHI) (Ministry of IIC of Jamaica, 2014). The GHLI is introduced to capitalise the trade and business opportunities that will emanate from the expansion of the Panama Canal. Jamaica's Logistical Hub has the purpose to be the fourth global logistics node together with Dubai, Singapore and Rotterdam. The initiative includes seven main projects: improve and expand the Kingston Port, new commodity port (SEZ) at Cow Bay, dry dock (SEZ) for ship repairs and maintenance at Jackson Bay, Caymanas Economic Zone (SEZ), cargo aerodrome and warehousing facilities and industrial park at Vernamfield, building a new railway, and expand the Norman Manley International Airport and Aerodromes (Jamaica Trade and Investment, n.d.).

7.4 Miami – United States of America

The port of Miami is specialised in two types of business. These businesses are the cruise business and the cargo business. Port Miami, also known as the *Cruising capital of the World*, is the global headquarters of five main cruise lines; Carnival Cruise Lines, Norwegian Cruise Lines, Royal Caribbean Cruises, Oceania Cruises, and Regent Seven

Seas Cruises. With a berthing of 42 cruise ships more than 4.5 million people visited Miami (PortMiami, 2016a).

Although the location of the Port of Miami is close to North America, the Caribbean and South America, it was historically not suited for an important trade location. Thanks to a hurricane in 1887, the access from the Biscayne Bay to the Atlantic was better reachable (Chabrier, Hull, Rotman , Tuchman , & Zorn, 2012). Port Miami operates like a landlord port and has lease agreements with three container operators: Seaboard Marine, POMTOC, and South Florida Container Terminal (PortMiami, 2016b). Table 18 shows an overview of the performance of the Port of Miami over the past five years.

Table 18: Overview Port of Miami performance 2010-2014 (PortMiami, 2016b)

Item	2010	2011	2012	2013	2014
TEUs	847,249	906,607	909,917	901,454	876,708
Cargo ships docked	1,663	1,936	1,649	1,348	1,231
Inbound tonnage	3,524,262	3,845,666	3,886,315	3,961,208	3,871,906
Outbound tonnage	3,864,903	4,376,090	4,222,135	4,019,319	3,827,980
Total tonnage	7,389,165	8,222,374	8,108,450	7,980,527	7,699,886

In 2013 and 2014 the handled containers at the port had a decrease of respectively 0.9% and 2.7%. However, it was expected that the trade in 2015 would achieve an increase. This optimism is based on the assumption that the cruise and cargo coupled with the port's incentivised agreements, improving the economy, and thereby an actively increase of new cargo services (PortMiami, 2015a). Besides, the Port of Miami invested for $1 billion in capital infrastructure projects, like deepening the approach channel and improving the rail system. Now Port Miami is able to welcome Super Post-Panamax vessels, and due to a partnership with the Florida East Coast Railway (FECR) it links the port to 70% of the US population in maximum four days (PortMiami, 2016c).

The investments and the new agreements achieved containerised cargo movements of 1,007,800 TEU (PortMiami, 2015b). Trade with Latin America and the Caribbean region represents approximately 50% of the sea trade of Port Miami (PortMiami, 2015b). Figure 47 gives an overview of the shipping traffic in 2014.

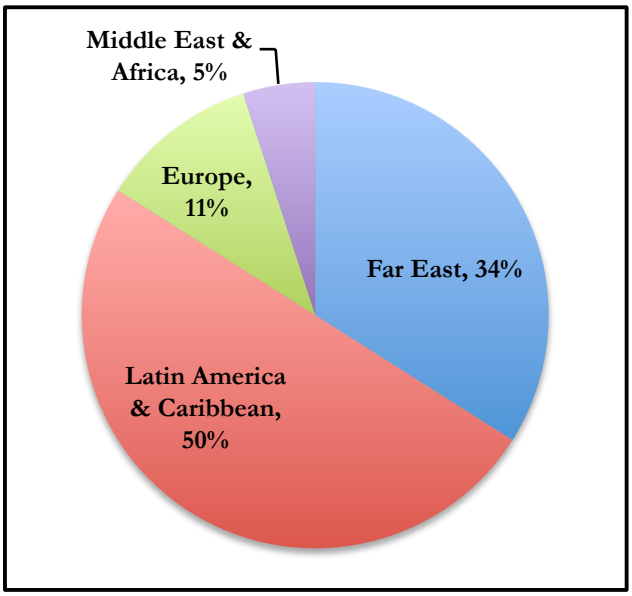

Figure 47: Shipping traffic Port Miami (PortMiami, 2016b)

It shows that only a small percentage of the total shipping traffic is coming from and going to the European continent. The Far East has besides the Americas a great share in the total trafficking. The Port of Miami has signed sister port agreements with three Shanghai International Port (China), Port of Kaohsiung (Taiwan), and Busan (South Korea) (PortMiami, 2016d), which gives the expectation that trade with China doubles over the next decade (China Briefing, 2012).

Port Miami is going to mainly focus on transhipment business. It established, together with the Customs and Border Protection (CBP), a Transshipment Committee that will promote the transhipment business in Miami, which was strongly declined since the 9/11 attack. The Transshipment Committee will provide port users and stakeholders an opportunity to develop best practices and keep open the lines of communication between all parties. Port Miami CBP, Customer Service Corps, will focus on expediting transhipments and ensuring that containers make their connections, solidifying Port Miami's role as a global transhipment hub (PortMiami, 2013).

So, thanks to the geography, good hinterland connections, and the dredged access channel, Port Miami has grown to a big port. It has the most direct service to Latin America and the Caribbean, making it the premier hub for the Americas (WTC Miami, 2014). Additional to the access advantages, Miami has maritime law firms, 69 foreign consulates, and trade offices involved in maritime trading. Miami boasts 25 international banks as well making it the financial heart for the Caribbean, Latin America and South East of the United States. The city is also enriched with a big university and all kind of sophisticated industries, making it a nice environment for international trade and business (Chabrier, Hull, Rotman , Tuchman , & Zorn, 2012).

However, the Port of Miami has also its weaknesses. The 1920s Jones Act requires that all goods shipped between U.S. ports be carried with ships built in the U.S. and owned by U.S. citizens. Currently, very few vessels are registered in the United States, and because there are increasingly few U.S. merchant sailors, Miami is largely unable to engage in domestic transhipment business (Chabrier, Hull, Rotman , Tuchman , & Zorn, 2012). Due to the Jones Act and relative high labour costs, Miami lost transhipment terrain to Kingston (Jamaica) and Freeport (Bahamas) (Rodrigue & Ashar, 2015).

7.5 Freeport – the Bahamas

The last port that will be described is Port Freeport of the Bahamas. Freeport lies at northern top of the Caribbean transhipment triangle, where most of the transhipment activities take place (Figure 42). The Freeport Container Port (FCP) is operating since 1997 and with 57 hectares stacking area (Hutchison Port Holdings, 2013) it has a capacity of 1.5 million TEU (Freeport Container Port, 2016a). The Port has a 24-hour facility with state-of-the-art security, and is able to receive Super Port-Panamax vessels together with Miami. Hutchinson Port Holding privately owns the port.

FCP is planning to expand its capacity even more. In the past years it completed the first four phases of the big expansion, including 1,036 m berth and an addition 12 hectares stacking area. Freeport Container Port (2016b) mentions that the three next phases should include:

- Phase V: 350 m berth & stacking area
- Phase VI: 440 m berth
- Phase VII: 335 m berth & stacking areas

When all phases are completed, FCP established a capacity of 3.5 million TEU (Freeport Container Port, 2016b).

In 2014 Freeport Container Port was ranked 10th in the top 20 of Latin American ports regarding throughput, with 1,400,000 TEUs (ECLAC, 2015b). In 2012, when Freeport Port had 1,202,000 TEU throughput 99% of it was pointed as transhipment traffic (Rodrigue & Ashar, 2015). It is expected that the share of transhipment traffic remains approximately the same. The Bahamas realised 16.3% of the total transhipment in the Caribbean region see Figure 48. To remain a logistical hub, the WTO advices that the Bahamas expand the Freeport Container Port's foreign trade zone to include the adjacent Sea/Air Business Centre and the GB International Airport, providing for a major international logistics hub to be developed. Acquiring US Customs preclearance of cargo from this proposed sterile zone would also be a game changer (Grand Bahama Chamber of Commerce, 2014).

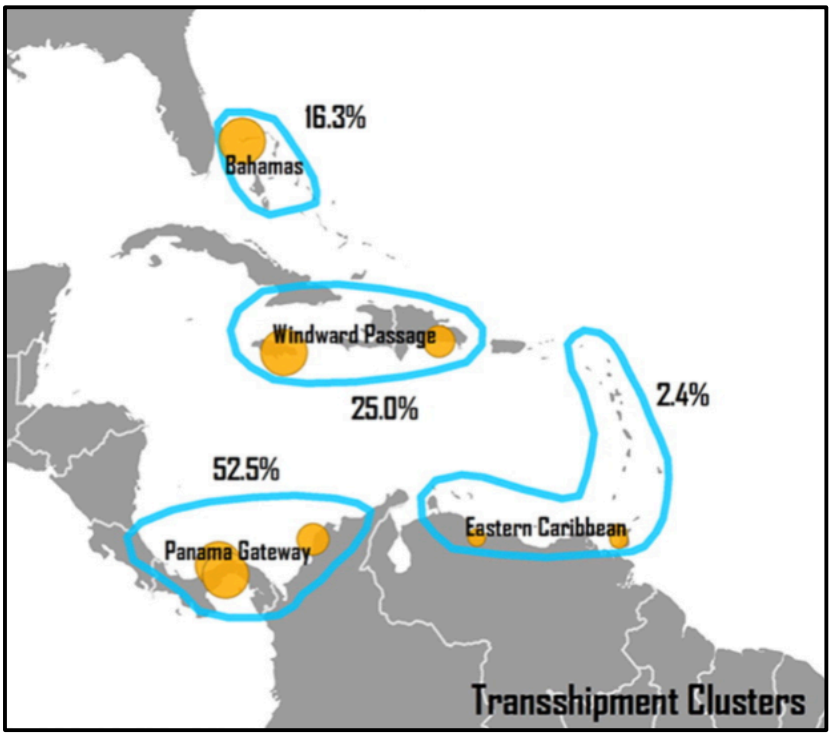

Figure 48: Transhipment clusters & transhipment shares per cluster (Rodrigue & Ashar, 2015)

After the expansion of the Panama Canal, changes are expected. In the first five years, Panamax vessels are likely to be replaced by Post-Panamax vessels, and an additional 5 years later are these ships probably replaced by New-Panamax ships. This could lead to an increase in transhipment, and a change in shipping configurations resulting in another centre of gravity for transhipment (Rodrigue & Ashar, 2015). For further explanation see §12.3.1.

With a change of centre of gravity for transhipment due to the expansion of the Panama Canal danger could occur for the Bahamas transhipment cluster (Figure 48). The increase of transhipment will not be distributed uniformly over the transhipment clusters shown in Figure 48. Because larger vessels will able to sail through the Panama Canal, the seaport of Balboa will lose transhipment traffic. Without this constraint expectations are that more transhipment could settle to a more central location like the Windward Passage with shorter feeder distances. Due to this relocation, the Freeport cluster may also be negatively impacted as transhipment may relocate to the more centrally located ports around the Windward Passage (Rodrigue & Ashar, 2015).

In the last paragraphs developments of different port regions in the Caribbean are discussed. The next paragraph is about the idea of a Central American Customs Union. This concept is invented to increase the relationships and trade between some countries in Central America.

7.6 Central American Customs Union (CACU)

For many years the countries in the Central American region have looked into possibilities to form a centralised trading union, such as the EU or ASEAN. Back in 2006 El Salvador, Honduras, Guatemala and Nicaragua agreed on the introduction of the CA-4 (Central America-4), which includes common international borders and the same passport. This allows citizens to travel freely in the CA-4 region. Panama, Costa Rica, Belize and the Dominican Republic are joined with the CA-4 for economic integration of

the region under the name of SICA (Sistema de la Integracíon Centroamericana) since 1991 (SICA, N.D.).

Advantages for extending the agreement to free import and export across these borders include smoother and less lengthy border crossings and reduced logistical costs. Furthermore, simplifying border processes will help prevent corruption in customs offices (Ministry of Economy and Commerce of Guatemala, 2015). If the Central American countries manage to create a Central American Customs Union, the region would gain opportunities to become the logistics hub of the Americas in the same way Rotterdam is in Europe and Singapore in Asia. (CentralAmericaData, 2015c).

Currently, negotiations on the conditions of the opening of borders are in progress and some countries have even managed to agree on certain crossings. From December 2015 Guatemala and Honduras have started to open their borders for free transportation of freight and passengers in phases and in October 2015 it was announced El Salvador had joined the process of setting up the process of customs integration of Honduras and Guatemala (Prensa Libre, 2015) & (Ministry of Economy and Commerce of Guatemala, 2015). Costa Rica has close contacts with Panama in order to facilitate the improvement of current border passages. In the near future both countries will only check import cargo in the border crossings using new IT systems, which will increase security and speed of the process (Fonseca, 2016). Even though chambers of commerce of several countries (Honduras, El Salvador, Guatemala, Nicaragua, Costa Rica, Panama and the Dominican Republic) and the Federation of Chambers and Associations of Exporters of Central America (FECAEXCA) agree on the importance of a customs union necessary to provide economies of scale to compete with the global market, the prospect of a single customs union will need additional effects from involved governments (FECAEXCA, 2015)

Difficulties in closing the agreements on border crossings involve different customs regulations, the effect of a union on the current free trade agreements of countries and the impact of differing port charges and the resulting possible changes in trade routes. The customs regulation issue includes complications with safety and security standards in each country and the administration of tax and trade (Inter-American Development Bank, 2010) & (La Prensa, 2016).

7.7 Concluding developments in the Caribbean/Central American region

Many developments occur in the Caribbean and Central American region. Every port of significance is participating on the expansion of the Panama Canal.

Table 19 gives a summary of the most important aspects of the discussed ports in the Caribbean/Central American region.

Table 19: Summary most important aspects of ports in the Caribbean/Central-American region

Port region	Developments
Panama	Ports at the Pacific and Caribbean combined have a capacity of 6.6 million TEU Expansion Panama Canal Panama Canal Railway Panama's Colon-Panama City Expressway Could loss throughput on Pacific side due to Panama Canal expansion
Kingston – Jamaica	Focuses mainly on transhipment Container capacity of 2.8 million TEU Expanding to a capacity of 3.6 million TEU Development Commercial Free Zone / distribution hub Become global logistical hub by implementing SEZs Expected to benefit most from Panama Canal expansion
Miami – United States of America	Cruise and cargo businesses > 1 million TEU movements Deepening approach channel, and improving rail system 50% of shipping traffic with Latin America & Caribbean Financial heart for the Caribbean, Latin-America, and South-East USA Disadvantage 1920s Jones Act
Freeport – the Bahamas	Container capacity of 1.5 million TEU Expanding to 3.5 million TEU capacity 99% of throughput is transhipment traffic Could be negatively influenced by expansion Panama Canal

Furthermore the idea of a CACU is discussed. This could bring positive effects to Costa Rica, since it could deal with current border problems and it could bring Central American nations closer together.

8 SWOT analysis logistical system Costa Rica

Based on the previous content regarding the current logistical system in Costa Rica, a SWOT analysis has been conducted in order to define in a clear manner what the current strengths, weaknesses, opportunities and threats of the logistical system in Costa Rica are. Figure 49 gives an overview of the outcome of the SWOT analysis. In the remainder of this section the strengths, weaknesses, opportunities and threats will be discussed respectively. Figure 49 on the next page shows the outcome of the SWOT analysis.

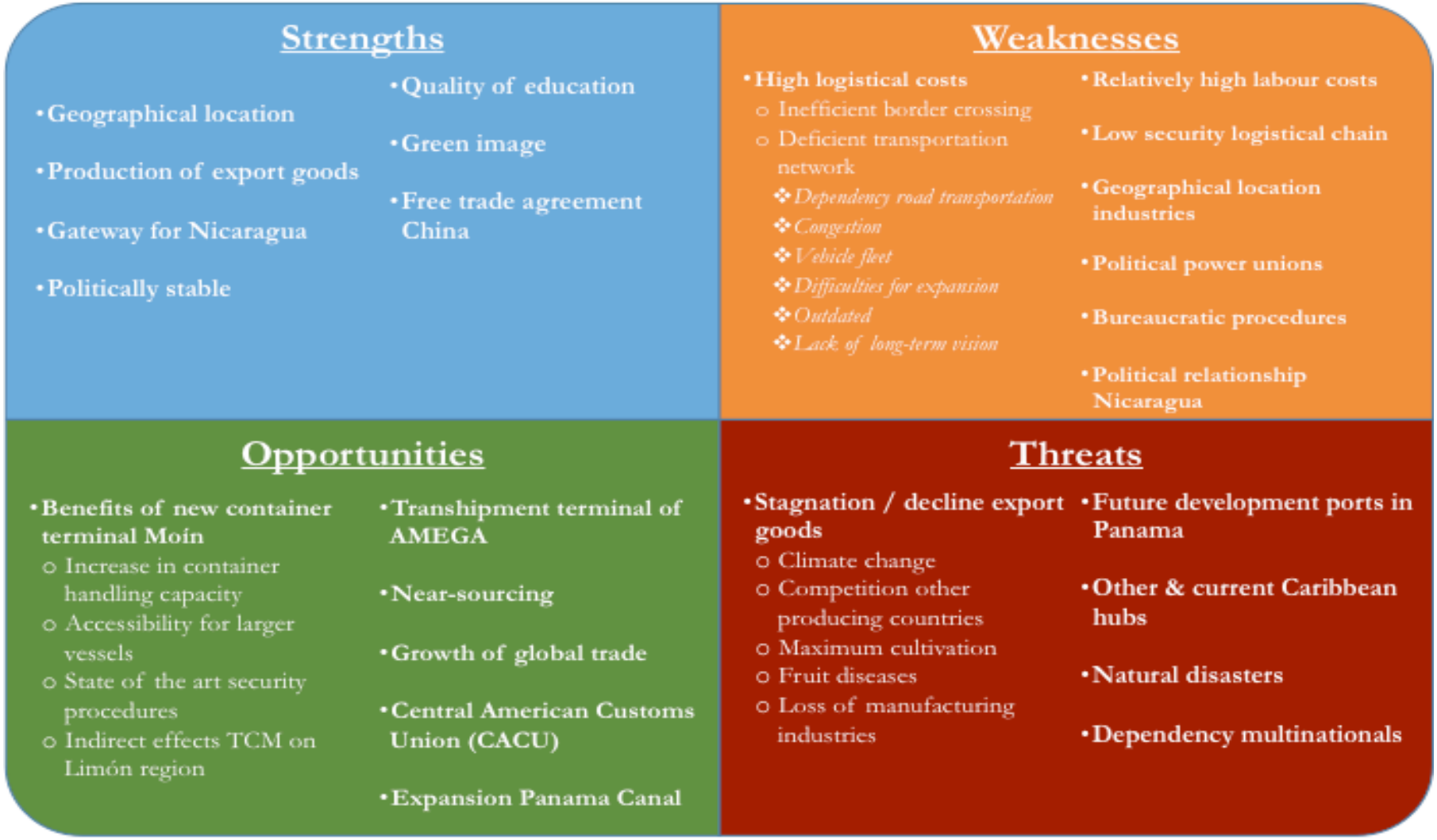

Figure 49: Outcome of the SWOT analysis regarding the logistical system of Costa Rica

8.1 Strengths

This paragraph discusses the strengths, which have been identified regarding the current logistical situation of Costa Rica. Identified strengths are the good usage of its geographical location, the production of export goods, its function as the gateway for Nicaragua, its stable politics, quality of education, its green image and the fact that it has a free trade agreement with China.

Geographical location

Costa Rica makes good use of its geographical location between the Pacific Ocean and the Atlantic Ocean and in the vicinity of the Panama Canal (and thus close to the Circum-Equatorial maritime route), by operating ports on both sides of the country. Costa Rica already moved 1.88 million TEUs in 2013 via the ports of Limón, Moín and Caldera (World Bank, n.d.), and it is expected to grow even further with the opening of the new container terminal of APMT at Moín (TCM).

Production of export goods

Exporting goods with a value over 11 billion USD yearly, Costa Rica is already producing a lot of products to be exported all over the world. In value, medical equipment is the biggest export product (21.7%), followed by agricultural products such as bananas (8.6%), pineapples (8.4%) and coffee (3.2%) (PROCOMER, 2015). Whereas high-tech equipment such as medical equipment is mostly exported via air transport, the low value-density agricultural products are mainly exported over sea, using the ports of Limón, Moín or Caldera. A new port is being constructed in Moín to accommodate a growth in the export of agricultural products.

Gateway for Nicaragua

Since Nicaragua is lacking a port on the Atlantic coast, the ports of Limón and Moín currently act as the main port for goods from Nicaragua destined for the US east coast as well as Europe. It is expected this will only grow with the opening of the new container terminal at Moín and with the improved connection between Costa Rica and Nicaragua due to a new border crossing.

Politically stable

Costa Rica is one of the most stable governments in the region. It was the first country in the world to constitutionally abolish its army and has been a stable democracy since 1949. This has always attracted many foreign investors, which has led to the fact that Costa Rica has one of the highest levels of foreign investments per capita in Latin America (CIA, 2016).

Quality of education

Costa Rica has a relatively well-educated population. It is one of the pioneers of universal access to education in Latin America, causing only 2.2% of its population to be illiterate. Together with Panama it has the highest share of inhabitants completed secondary or tertiary education, and the quality of its education is relatively high in the region (World Bank, 2012a). The country spends 6.9% of its GDP on education, leaving only some Nordic countries and New Zealand to spend more of their GDP on education (OECD, 2016). This has attracted and still attracts many foreign investors, opening manufacturing sites and other business activities (CIA, 2016). However, even though Costa Rica is making a lot of expenditures for the educational system, the results are lagging behind for its efforts compared to other OECD countries.

Green image
Costa Rica is well known in the world due to its green trademark, focused on nature conservation, reforestation and national parks (OECD, 2016). Besides that, the greater majority of its electricity is generated in a sustainable manner, up to 99% of the total electricity production (Peeples, 2015). It is also aiming to be the first carbon neutral country in 2021. This all contributes to the reputation of Costa Rica as being an environmentally friendly country. With the world's growing consciousness regarding the environment and climate change, this can definitely be seen as one of the strengths of Costa Rica. It already attracts a lot of ecotourism, and products originating Costa Rica are perceived as more environmentally friendly than products from other countries.

Free trade agreement China
Costa Rica has many free trade agreements (FTA) with other countries, among which the European Union, the European Free Trade Association, the United States and China. It is the only country in Central America to have a FTA with China, and one of three in Latin America (China FTA Network, 2016). Having a FTA makes trading between countries easier, and having a FTA as one of few with an important trade country as China can certainly be beneficial. Furthermore, negotiations have started with the republic of South Korea to set up a similar agreement.

8.2 Weaknesses
This paragraph discusses the identified weaknesses of the current logistical situation of Costa Rica. First the high logistical costs will be discussed and its contributing factors, followed by the low security in the logistical chain, geographical location of industries, political power of the unions the bureaucratic procedures and the complicated political relationship with neighbour Nicaragua.

High logistical costs
Fact is that Costa Rica has relatively high logistical costs. It is estimated that logistic costs amount to around 40% of the total costs of a product in Costa Rica (PROCOMER, 2016a). Besides a deficient transportation network, which will be discussed later, this is caused by the fact that labour costs are relatively high and inefficiency regarding administrative matters, for instance at border crossings (LCSSD Economics Unit, 2012a).

The transportation network in Costa Rica has a lot of deficiencies and is ranked very low compared to other Latin American countries based on the perspective of executives (LCSSD Economics Unit, 2012a). The following aspects have been defined contributing to the state of the transportation network:

- Dependency on road transportation
  Costa Rica is lacking significant other modes of transport other than road transportation for the domestic transportation of goods. As mentioned before, the railway system has been out of operation since the 1991, and its current usage is very marginal. There is no significant inland water transport neither, leading to a major dependency on the road transportation.

- Congestion
  In the period 2008-2014, the total amount of vehicles has increased with 40%, while the overall road density has only increased with 9.8% and the main road density increased with 1.7% (ECLAC, 2015a). This is leading to a lot of congestion problems, especially at the bottlenecks at the Greater Metropolitan

Area of San José, Route 32, Route 27, Peñas Blancas & Puerto Limón, which have been discussed previously in §4.1.3. Many of the bottlenecks also suffer from a reliability issue, since external factors such as heavy rainfall can affect the operation of the roads tremendously.

- Vehicle fleet

  In Costa Rica many American-style trucks are being used for the transportation of containers. At the Buffalo weighing station close to the ports of Moín and Limón, most trucks (around 70%) were of the Costa-Rican T3-S2 class, whereas around 10% of the trucks were of the Costa-Rican T3-S3 class (MacAngus, Montufar, & Chaverri, 2012). These classes amount to class 9 and class 10 vehicles of the FHWA classification respectively, and are trucks with respectively 5 and 6 axles pulling one trailer (Cambridge Systematics, N.D.). These trucks are mostly older trucks imported from the United States, and have difficulties with the geometry of the roads in Costa Rica. Costa Rica has narrow roads compared to the United States, mostly two-lane highways and tight curves through mountainous regions. These large trucks are not suited for these environments, and it is causing problems especially when major routes are closed (such as Route 32, Route 27).

- Difficulties for expansion transport infrastructure: Institutional framework; geographic characteristics; legislative matters

  It is well known in Costa Rica that the expansion of transport infrastructure is problematic and that many project suffer from huge delays or even cancellations. There are three main reasons causing difficulties in the expansion of transport infrastructure, for instance new roads. The first one is the fact that "the transport infrastructure planning and decision making processes are highly fragmented among different ministries and government" (OECD, 2016). Since the late 1990s, several independent and semi-independent agencies have been created. These have ample administrative freedom and decision powers over specific issues. These agencies have been created in order to solely devote the Ministry of Public Works (MOPT) to the planning of transport infrastructure, instead of being in charge of planning, building, maintaining and operating transport infrastructure (OECD, 2016). However, in Costa Rica this may be one of the reasons why public infrastructure projects are often the result of individual institutional efforts, do not follow common approaches and suffer from adequate preparation (CGR, 2012).

  The second reason making expansion of transport infrastructure hard are the geographic characteristics of the country. Having a mountain chain running over the full axis of the country makes it hard connecting both ocean sides and causes high engineering costs for expansion the current transport infrastructure.

  Lastly, Costa Rica is known for their efforts regarding forest conservation, reforestation and their numerous national parks. This puts constraints on the possibilities to expand current infrastructure, since law protects these nature reserves in the country. 26% of the total area of the country is protected (OECD, 2016).

- Out-dated
  Partly due to rise in amount of vehicles as well as the long decision-making process of new infrastructure, many roads are not designed for the current demand. Many highways consist of two-lanes only, making it hard and dangerous to overtake slower vehicles. Besides that, there is a lack in separation of traffic, both in the distinction between short-haul traffic versus long-haul traffic as well as slow traffic versus fast traffic.

- Lack of long-term vision
  The current state of the network is also due to deficient strategic-planning and a lack of long-term vision regarding transport infrastructure. From 2002 to 2013, it also suffered from chronic underspending, averaging 0.8% of GDP less than the OECD average. Besides that, spending has been irregular due to the absence of a multiyear budget plan, causing public investment in transport infrastructure to be negotiated every year (OECD, 2016).

Relatively high labour costs
Costa Rica is one of the most developed countries in the region, with a relatively high standard of living and relatively well social services. This welfare goes hand in hand with relatively high labour costs compared to other countries in Central America (ATKearney, 2016). This especially poses a problem for low skilled jobs, such as the agricultural sector, since other countries with a lower educated population can take over these businesses more easily.

Low security of logistical chain
An important weakness recognised by the stakeholders is the increase of drug trafficking with the use of fruit transportation from Central-America. This is due to the low security in the logistical chain, especially for fruit transporters making use of refrigerated containers (Freshplaza, 2016). A quick glance on the local press shows that there have been major cocaine captures in Europe, which have its origin in Costa Rica (Dyer, 2015) (Tico Times News, 2014b) (Tico Times News, 2014a). Due to the drug trafficking the reputation of Costa Rica and its fruit producers is being damaged, decreasing their competitiveness (Briceno, 2016).

Geographical location industries
Most of the manufacturing industries are located in the greater metropolitan area of San José. This poses difficulties for the logistical system, since raw materials or half-fabricates have to be transported to the manufacturing sites and upon completion of the process it has to be transported for export or consumption as well. Together with the local traffic and through traffic passing San José, this adds up to the already existent congestion around San José.

Political power of unions
Unions play an important role in the society of Costa Rica. Many employees are enrolled in unions and this specifically accounts for regions outside of the Greater Metropolitan Area of San José. These unions have a lot of political power, since they can order strikes, upon which they are not reluctant doing. The Tico Times has an overview of all the strikes conducted in the last years, and it shows that also relevant strikes have taken place regarding transport infrastructure (truckers, harbour labourers) (Tico Times News, 2016).

Bureaucratic procedures

Almost all of the actors interviewed have indicated that bureaucratic measures make doing business hard and inefficiently in Costa Rica. One could for instance think of inefficient border crossings due to excessive paperwork and having multiple regulations, which just differ a little for one procedure. Taking a look at the Ease of Doing Business ranking, it shows that Costa Rica did improve last year and is now ranked as the 58th country in ease of doing business (World Bank , 2016b). It shows that it is especially hard starting a business, the minority investors are not very well protected and contracts enforcement needs improvement. These are especially relevant for small- and medium enterprises.

Political relationship with Nicaragua

Various interviewees have mentioned that the political relationship between Costa Rica and Nicaragua has been restraining both countries. The difficulties have grown historically due to cultural and economical differences. Relatively many Nicaraguans have immigrated to Costa Rica, either legal or illegal, for Costa Rica is wealthier. One example of a problem caused by the political relationship is the new border crossing at Las Tablillas, which has turned out be problematic. Another example is that Costa Rica has come to terms with Panama for a mutual border check procedure, but implementation for the same procedures at the Nicaraguan side are still a long way to go.

8.3 Opportunities

This paragraph discusses the opportunities identified for the logistical situation of Costa Rica. First it discusses opportunities, which arise from the new container terminal in Moín (TCM), followed by opportunities that exist in a new transhipment terminal. Furthermore, the opportunities in the need for educated workforce will be discussed, ending with a growth in global trade and the possibility for a Central American Customs Union.

Benefits of new container terminal Moín (TCM)

Several new opportunities arise due to the constructing of the new container terminal in Moín, which will be operated by APMT. The identified benefits are an increase in container handling capacity, improved security at TCM and the indirect effects TCM can have on the region.

- Increase in container handling capacity
  The new container terminal at Moín (TCM) offers great opportunities for the logistical situation in Costa Rica. The current capacity of the ports of Moín and Limón is reached, and after full completion of the TCM capacity will be around 2.5 times as high. After full completion of the terminal, it will have a capacity of 2.7 million TEU (APM Terminals, 2013). Besides that, it will focus on Costa Rica's major export products (fruits) by allocating 60-70% of the terminal to refrigerated storage capacity (APM Terminals, 2015).

- Accessibility for larger vessels
  The first phase of the construction of the new terminal will entail an access channel with a depth of 16 metres, whereas the access channel upon completion will have a depth of 18 metres. This gives the opportunity for larger ships to call at Moín, which currently has a draft of 9 metres. The draft of the new container terminal makes it possible to accommodate Panamax vessels and higher (APM Terminals, 2015).

The greater depth of the new terminal accommodates bigger oil tankers as well. There have been plans about a modernisation and reopening of the oil refinery of RECOPE (Costa Rica's national oil and fuel distribution company) in collaboration with a Chinese company in Moín (Port Storage Group, 2015). This could in turn lead to lower fuel prices.

- State of the art security procedures
  The new terminal will be ISPS certified to guarantee safety and security on site. It will make use of state of the art IT systems, incorporating scanners and biometric checks. A one-stop shop policy will be used, in contrary to the current policy, in order to accommodate an efficient and effective security check (Fonseca, 2016).

- Indirect effects on Limón region
  The new container terminal in Moín can provide opportunities for the whole Limón region. The existence of a state-of-the-art terminal can affect the region by providing higher educated jobs than currently are being deployed. Having a modern terminal can also be a positive factor for attracting other businesses.

  Currently, no storage facilities exist at the ports of Moín of Limón. Export goods are stored at container depots in the vicinity of the ports, awaiting the arrival of the vessel. With the new container terminal, the role of the depots will be diminished. The locations of the depots could be used for the development of new businesses, whether or not in combination with a free trade zone regime. Situated within a free trade zone, companies receive tax benefits when investing in Costa Rica. Up until now, most free trade zones are located in the Greater Metropolitan Area of San José and have been used by a lot of servicing companies as well as companies manufacturing medical equipment (Arce Alvarado, 2016), but a free trade zone in the vicinity of the new container terminal could help attract (foreign) investors.

Transhipment terminal of AMEGA

Besides the new APM Terminal at Moín, there are plans of building another new container terminal at Moín by AMEGA, the Mega Terminal of the Atlantic. This new container terminal would be for the greater majority devoted to the transhipment of goods, and would ultimately be combined with a railway line as well as a pipeline to a new to-be-built Pacific Port to act as a dry canal (AMEGA, N.D.).

This new transhipment terminal poses an opportunity for Costa Rica since there is already a party willing to finance and build the project, and it will yield the country with new jobs as well as infrastructure.

Need for educated workforce (globally and locally)

Global need for higher educated workforce

With the current trend of near-sourcing, opportunities raise for Costa Rica to develop itself as a country in which North American companies will settle. This could provide additional jobs, development of the country as a whole, and could give a boost to its economy. With the FTA with China, it is possible for companies settled in Costa Rica to import cheap raw materials, add value in Costa Rica, and export it further to the United States or Canada.

Local need for higher educated workforce

Costa Rica altered their focus from the agricultural sector towards the electronics and medical markets after noticing the high competition on unskilled jobs in 1993. The governed end focused on providing an increase in higher education in the country, and from a World Bank study it can be derived that the Costa Rican population is generally higher educated than in other Central American countries (World Bank, 2012a). However, currently Costa Rica copes with a shortage of high skilled workers mainly the several disciplines of engineers, administrative assistants and sales representatives with a fluency of the English language (La Nacion, 2013). A report of the Manpower group in 2013 indicated that 40% of the companies in Costa Rica encountered problems filling their vacancies, because of the gap between the demand of companies and the labour supply (El Financiero Costa Rica, 2014).

Growth of global trade
As has been the case for the last decades, it is the projection that the global economy as well as global trade will remain growing in the future (PWC, 2014). This could be beneficial for Costa Rica if they could make use of this trend; by attracting part of the manufacturing processes or other value adding processes to Costa Rica, instead of other countries in the region.

Central American Customs Union (CACU)
As mentioned before, one customs union can offer major benefits for all participating countries. It can increase trade in the region and generate economies of scale, by smoothening border crossings and making them less lengthy, reducing the logistical costs. Guatemala and Honduras have set up bilateral agreements already, and negotiations for El Salvador to join have started as well (Tico Times News, 2015c). Panama and Costa Rica have started negotiations for their mutual customs control at the land crossings.

Expansion Panama Canal
The expansion of the Panama Canal will double the waterway's capacity. A new lane of traffic will be created by the construction of new and bigger locks. In the previous situation, vessels carrying up to 5,000 TEUs could pass the Panama Canal; in the future situation, this will increase to around 13,000 TEUs. Due to the increased capacity, the currently encountered congestion is expected to decrease, as well as the locking times and thus travelling times (Canal de Panamá, 2015).

This all makes it more attractive for shipping lines to use the Panama Canal, and due to the bigger vessels it is expected to become cheaper as well, compared with the current situation. If there is more traffic traversing the Panama Canal with bigger vessels, there lies an opportunity for Costa Rica in attracting part of this traffic and gain economical advantages.

8.4 Threats
In this part, the identified threats for Costa Rica are further explained. It deepens into the stagnation/decline of the production of export goods, the future development of the ports in Panama, development of current and other Caribbean hubs, natural disasters and dependency on multinationals.

Stagnation / decline production export goods

As mentioned before, agricultural products like bananas and pineapples represent an important part of the total export to foreign countries. The last years Costa Rica established an increase in exporting bananas and pineapples as can be seen in Figure 50.

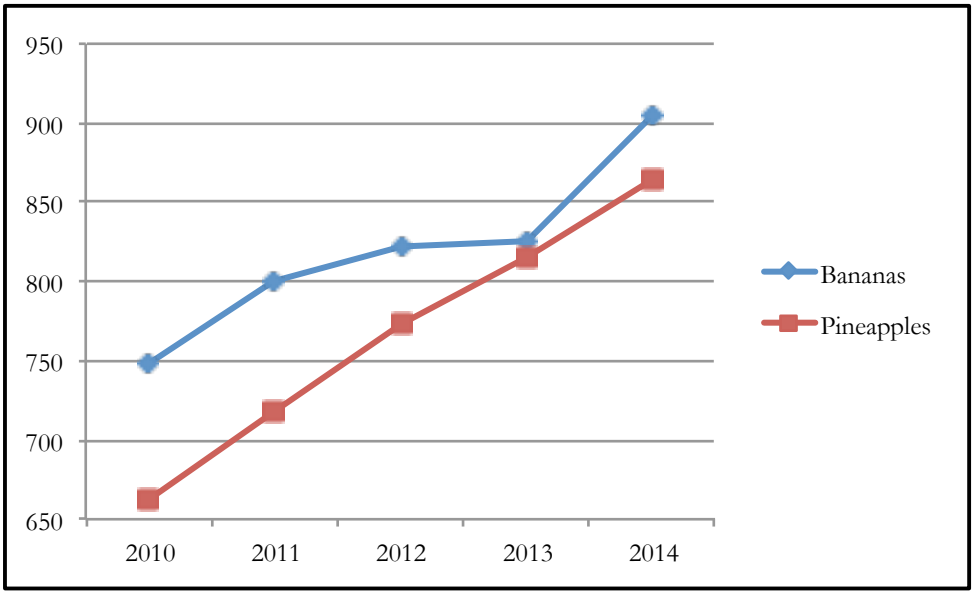

Figure 50: Growth banana and pineapple export 2010-2014 (in mln USD)

The growth of bananas was stagnating between 2010 and 2013, but it increased its export in the year after. Pineapples on the other hand established a steadily growth between 5.6% and 8.3% in the previous years (PROCOMER, 2015). However, the selling of bananas in the first eleven months of November in Central America are 2.4% less than in the same period the year before. At the end of November 2015 Costa Rica exported 1,786,469 MT bananas (CentralAmericaData.com, 2016). When extrapolating this exporting amount, at the end Costa Rica exported for 1,948,875 MT of bananas. PROCOMER (2015) wrote that Costa Rica produced 2,171,384 MT in 2014, so this is a decline of 10%. This decline in production comes not out of the blue, because several threats face the production of agricultural products. Next, (possible) causes of this threat are explained.

- Climate change

  The world is warming up and this phenomenon affects every country in the world. The climate change in the world is associated with more extreme temperature differences, rising of the sea level, and heavy weather circumstances (e.g. heavy rainfall and strong winds). The climate change in Costa Rica has effect on the consequences of El Niño; more extreme winds, more heavy rainfall, and an increase in temperature. It is forecasted that rain at the Caribbean side decreases in August, comes to normal levels in September, and increases again from November on, while September and October are the months with the most precipitation (Tico Times News, 2015a). The above-mentioned decline in production is partly caused by extreme rainfall in 2015 that causes floods. This caused losses of $90-100 million in 2015 regarding to 2014 (freshfruitportal.com, 2015). Also the western part of Costa Rica is affected by climate change, but it has the inverse of the east side: more draughts (see §5.2). Costa Rica acknowledges the environmental problems and takes measures to reduce the

production of emissions. Actions through activities in transportation, energy, forestry, agricultural livestock and waste management are planned (Ministry of Environment and Energy, 2015). Nonetheless, the change of climate is a big threat for the production of agricultural products, which on itself affects the logistical situation in Costa Rica.

- Competition other producing countries
  A second threat for producing export products is the competition from other countries. More and more countries in Asia, Africa and Latin America are producing agricultural products and offer sometimes lower prices compared to Costa Rica. Especially in a period of economic downfall and slowly economic recovery it is more attractive to import cheaper agricultural products. With the great recession of 2008, international demand has been contracted; there are preferences for lower price products due to lower incomes. The Costa Rican offer has struggled to adjust its costs and that the products meet the needs market, which also could be moving Costa Rican products in international markets (Estado de la Nacion, 2015). So, when cheaper labour countries increase the production of Costa Rica's agricultural products and increase the quality of these products, this could be a serious threat for the nation.

  There is already a trend going on in Nicaragua to cultivate bananas and pineapples as well. Nicaragua has the advantage of lower labour costs than Costa Rica, which is making it possible for them to produce at lower costs and increase their competitiveness compared to Costa Rican producers (Fonseca, 2016).

- Maximum cultivation
  A third treat regarding the stagnation/decline of the production of export is that the maximum cultivation will soon be reached. To create new land for cultivating bananas deforestation and land transformations are required, because land to cultivate bananas requires specific characteristics. Because the government of Costa Rica is not very eager to deforest it rainforest, and floods threat some current banana fields, Costa Rica might reach in the coming years a maximum cultivation (Alesch, 2005).

- Fruit diseases
  A fourth very serious threat is the occurrence of fruit diseases. All banana plants are of the same species, which make them have all the same strengths and weaknesses. Banana plants are susceptible to fungus. For example, the Black Sigatoka disease is a fungus that affects the leaves of the banana plant. Luckily, using chemicals that on their turn affects the quality of the soil and water can prevent this fungus (Alesch, 2005). However, a more common disease like the Panama disease (Fusarium) affects the roots of the banana plants. There is no prevention against a disease like the Panama disease, so when the plants get affected the plants must be destroyed and the harvest fails resulting in high costs and no export product (Ploetz, 2000). Also pineapples are susceptible for diseases. The most common diseases are mealy bugs found on the surface of the pineapple, pink disease, and bacterial heart rot (Rohrbach & Apt, 1993).

- Loss of manufacturing industries
  A last threat regarding the production of export goods is the loss of manufacturing industries, with as biggest example the withdrawal of Intel's

microchip factory in 2014. At the end of 2014, Intel shut its microchip factory and thereby 1,500 jobs were lost and Costa Rica lost 20% of the country's export (The Economist, 2014). Other large companies, which have chosen to situate themselves in Costa Rica are Walmart, Amazon, Cargil and Indecomm (ATKearney, 2016). Withdrawal of these companies for Costa Rica could be a threat for the country.

Future development ports in Panama

Panama invested $5.25 billion for tripling the capacity of the Panama Canal and changing the way shipping lines ply their global routes. This could either boost the container trade or disappoint expectations of gaining extra container volume. Besides the investment in the Canal, the government decided to invest $3.2 billion in its logistical sector to secure the incoming of extra cargo as larger vessels can carry nearly three times more containers. Panama aims to be the most competitive transport route for which it is transforming itself into a maritime and logistical hub for the Americas (Netherlands Embassy in Panama, 2015). By having experience and by expanding the ports of Panama it attracts bigger vessels, which can be a threat of the newly-build Moín Terminal by APM Terminals (see §7.1).

Other & current Caribbean hubs

In the Caribbean region more ports are developing itself as (logistical) hubs. As mentioned before Panama is expanding its hub activities, but Cuba and Jamaica are doing this as well. In May 2015 the CMA CGM Group signs an agreement to operate a logistical platform in Port Mariel with cooperation of a Cuban company. This logistical platform includes 17 hectares including 12,000 m2 warehouses and 5,000 m3 of reefer warehouses (CMA CMG Group, 2015).

A third important container transhipment port in the region is the Kingston Container Terminal (KCT) in Jamaica. This terminal has currently a capacity of approximately 2.8 million TEU. KCT can handle super-Post Panamax vessels with manually driven and automatically driven cranes. In this period KCT is expanding to a capacity of 3.2 million TEU and the completion of the expansion is almost finished (The Port Authority of Jamaica, 2016b). When Costa Rica wants to develop one of its ports at the Caribbean coast as a transhipment hub, it has serious competition from Jamaica (see §7.2).

Further, the current ports of Miami and Freeport has a significant share of transhipment traffic in the Caribbean region. Miami is deepening its port, so it can receive large vessels. Freeport Container Port is expanding its port to a capacity of 3.5 million TEU (see §7.4 and §7.5). This makes these ports a serious threat for transhipment opportunities for Costa Rica.

Natural disasters

Costa Rica is a small country with substantial exposure to natural disasters like earthquakes, floods, hurricanes, volcanic eruptions and landslides. According to a study of the World Bank, Costa Rica was ranked on place two of countries most exposed to multiple hazards, with 80% of the country's GDP and 78% of the population in high-risk areas (World Bank, 2011). The most active volcano of Costa Rica is the Arenal, which erupted in 2010, is just east of San José. It has the potential to spew ash over the city as it did between 1963 and 1965. The hurricanes are mostly along the Caribbean side of the country and the probability of heavy rainfall with frequent flooding is in this region during rainy season. The rainy season, from May to November, causes also dangerous

landslides 2016 (CIA, 2016). Landslides can cause serious logistical problems just like in June 2015. Due to heavy rainfall, landslides occurred across Route 32 and Route 126, and shut off the total east coast of the rest of the country (Tico Times News, 2015b). So, natural disasters can cause big logistic problems, destroy harvests, and is dangerous for the Costa Rican population.

Dependency multinationals

The last identified threat is the dependency of multinationals. In the banana industry and pineapple industry three main multinationals, Del Monte, Dole, and Chiquita, own a significant part of the production sites. The past years, these producers gain more terrain and the expectation is that in these big three producers gets more influence. A big threat for the society of Costa Rica is that these multinationals gain such a market share and power, that all profits flow to these multinationals. It is better for the society to have small and medium enterprises instead of the population to all be employees of multinationals (Buhrs, 2016).

8.5 Concluding SWOT analysis logistical system Costa Rica

This chapter showed the identified strengths, weaknesses, opportunities and threats. Main strengths of Costa Rica are the production of export goods, geographical location, and that it functions as a gateway for Nicaragua. Main weaknesses are the high logistical costs and the relatively high labour costs. Opportunities for Costa Rica are the benefits for of the new TCM, near-sourcing, and the growth of global trade. At last, biggest threat is the stagnation/decline export goods.

9 Confrontation matrix Costa Rica

This last step in the first part of this research is to combine the identified strengths, weaknesses, opportunities and threats. The conceptual framework that will be used is the confrontation matrix, also called TOWS matrix where the letters 'T', 'O', 'W' and 'S' has the same meaning as in SWOT analysis. This technique is proposed to be an analytical tool that facilitates matching external opportunities and threads with internal strengths and weaknesses (Weihrich, 1982). The matrix consists four quadrants; SO, ST, WO, and WT on which strategies can be based. It is the purpose to maximise the strengths and the opportunities, and to reduce the weaknesses and the threats (Weihrich, 1982).

The SWOT analysis of chapter 8 is used as basis for the confrontation matrix, and further a scale of -2 to 2 is used for matching external factors with internal factors. No score, or read as zero, indicates a weak or non-existent relationship. For each opportunity is asked which strength helps taking advantage of it or which weakness inhibits doing so. The same counts for the threats; which strength helps to reduce the threat or which weakness inhibits fighting against the threat. Figure 51 shows the confrontation matrix for Costa Rica. First the opportunity quadrants are explained followed up by the threat quadrants.

		Opportunities									**Threats**										
		Increase in container handling capacity	Accessibility larger vessels	State-of-the-art security procedures	Indirect effects TCM on Limón region	Transhipment terminal of AMEGA	Near-sourcing	Growth of global trade	Central American Customs Unions (CACU)	Expansion Panama Canal	Climate change	Competition other producing countries	Maximum cultivation	Fruit diseases	Loss of manufacturing industries	Future development ports in Panama	Other & current Caribbean hubs	Natural disasters	Dependency multinationals	**PLUS**	**MIN**
Strengths	Geographical location		1			1	1			2					1					6	0
	Production of export goods	1	2				2	2				1			1					9	0
	Gateway for Nicaragua	1	1					1	1	1									1	6	0
	Politically stable								1			1			1					3	0
	Quality of education						2								1					3	0
	Green image				1		1					1			1					4	0
	Free trade agreement China	1	1		1		1	1				2							1	8	0
Weaknesses	Inefficient border crossings						-1	-1		-1		-1			-1		-1			0	-6
	Deficient transportation network	-1					-1					-1			-1			-1		0	-5
	Relatively high labour costs				-1		-2	-1				-2			-2					0	-8
	Low security logistical chain	-1			-1			-1		-1		-1								0	-5
	Geographical location industries				-1													-1		0	-2
	Political power unions																			0	0
	Bureacratic procedures				-1		-1	-1				-1			-1			-1		0	-6
	Political relationship Nicaragua	-1							-1			-1								0	-3
	PLUS	3	5	0	2	1	7	4	2	3	0	5	0	0	5	0	0	0	2		
	MIN	-3	0	0	-4	0	-5	-4	-1	-2	0	-7	0	0	-5	0	-1	-3	0		

Figure 51: Confrontation matrix Costa Rica

9.1 SO quadrant

The first opportunity benefits from the strengths of the production of export goods, that it is a gateway for Nicaragua, the production of export goods, and by the free trade agreement with China. A trade agreement could cause an increase of trade and therefore using container-handling capacity. When acting like a gateway for Nicaragua, it imports and exports goods via Costa Rican ports, making more use of the increase capacity. The second opportunity has a strong positive relationship with the fact that Costa Rica is an export product producing country. By having more export, larger vessels are required making the accessibility of larger vessels a good match. As well the geographical location strengthen this opportunity, because due to its position many shipping lines pass by Costa Rica or already sail to Costa Rica. The green image and the free trade agreement with China advance of the possible indirect effects of the TCM in the Limón region. This makes the region already more attractive, which attracts additional businesses. Near-sourcing opportunities can benefit from the quality of education in Costa Rica. Currently, the education quality is higher in Costa Rica than in its neighbouring countries, making this an advantage for Costa Rica. Besides the quality of education, its producing capacities and the geographical location of Costa Rica give extra strength to this opportunity. Also the free trade agreement with China and the green image of Costa Rica makes it attractive to settle businesses in this country. Production of export goods, gateway for Nicaragua, and free trade agreement with China help taking advantage of benefitting of the growth of global trade. Firstly, because it is already exporting and can increase this activity. Secondly, because the trade of Nicaragua will increase as well making more use of the Costa Rican ports, and thirdly due to the free trade agreement with China Costa Rica can benefit more from the global trade. The political stability and serving as a gateway for Nicaragua can enforce a potential Central American Customs Union. The last opportunity, the expansion of the Panama Canal, gets more effect for Costa Rica thanks to its geographical location. Costa Rica is a direct neighbour of Panama, and both ports of Costa Rica are closely located to the Panama Canal. Functioning as a gateway for Nicaragua makes this opportunity extra beneficial as well. So, biggest strengths are the production of export goods in Costa Rica, its free trade agreement with China, and serving as a gateway for Nicaragua and the geographical location. Main opportunities are the making use of the effects of better accessibility for larger vessels, near-sourcing, and of the growth of global trade.

9.2 WO quadrant

A deficient transportation network inhibits an increase in container handling capacity, because a weak hinterland can reduce the throughput of a terminal. Also a worsening relationship with Nicaragua makes a threat not making use of the increased capacity. A low security of the logistical chain makes high costs and delays, which makes Costa Rica unattractive. Opportunity two and three do not have troubles from the identified weaknesses. The indirect effects of the TCM on the Limón region can be endangered by the high labour costs, low security logistical chain, geographical location of the current industry, and the bureaucratic procedures. Partly by quite some bureaucracy it takes a long breath to do business in Costa Rica, and the fact that most industry is settled in the GAM is not advantage of the indirect effects. It could move the indirect effects to the GAM region instead of the Limón region. The opportunity of near sourcing that gains extra effects by many strengths could also inhibited by several weaknesses. Especially Costa Rica's high labour costs make it less attractive to start near-sourcing businesses here. The bureaucratic procedures, its inefficient border crossings, and the deficient transportation networks influence this opportunity negatively as well. It is less attractive to export the near-sourcing products via Costa Rica due to higher logistical costs and

unnecessary waiting and paper work at border controls. The positive effect of the growth of global trade can be inhibited due to inefficient border crossings, high labour costs, low security of the logistical chain, and bureaucracy. The last opportunity can be disadvantaged by the political relationship between Costa Rica and Nicaragua. As mentioned in the report before, this relation is not very good and a worsening of this relationship could ruin CACU. Concluding, main weaknesses are the poor security of the logistical chain, the relatively high labour costs, and Costa Rica's bureaucracy. The indirect effects of TCM on the Limón region can highly been endangered by many weaknesses as well as making benefit of the growth of global trade.

9.3 ST quadrant

In this part of the matrix, it is reviewed if the strengths of Costa Rica, as identified in the SWOT analysis, can help in reducing the threats posed for the country. The numbers in the quadrant show the size of influence on the threat. A serious treat for Costa Rica is the loss of manufacturing industries. However, a lot of the strengths might cause companies to choose to stay in the country because of its unique features like the geographical location, produced goods and, the quality of the environment, political situation, and education. An important aspect of the strategy to keep the companies in Costa Rica will be to use these features and make them explicitly known to the companies. None of the Costa Rican strengths can help against climate change, natural disasters or fruit diseases. This is because these threats are caused by nature. One could argue that the green image can help reduce climate change, but the size of the country is too small to be of a real difference when acting on its own. Also, the development of other regional hubs in the region is not affected by the strengths of Costa Rica. The dependence on the large multinationals can be reduced by the free trade agreement with China, which when managed properly can bring new companies to Costa Rica. The gateway to Nicaragua also reduces this dependence, since it provides a new way of gaining income. The threat the other countries in the region pose is reduced by some of the same features that can help keep the companies in Costa Rica; the production, green image, and the relatively stable political situation. However, the most important strength is the free trade agreement Costa Rica has with China. This agreement makes them far more likely to trade with China and attract companies from China than the other countries in the region. Therefore this agreement makes them far less vulnerable for competition.

9.4 WT quadrant

This quadrant reviews how the weaknesses of Costa are disadvantageous in battling the identified threats. The weakness that influences the threats the most is the high labour cost. This is a big problem for keeping companies in the country and for competing with other countries in the region. Other factors also prevent Costa Rica from competing with other countries, the inefficiency of the borders and other procedures are a problem that other countries have tackled in a better way. Also, the security and state of the logistical system pose a problem. These last two factors also influence the prevention of businesses moving to other countries. The effects of natural disaster are worsened by the state of the transportation system. The bad state leads to immediate shut down when something happens and makes it harder to repair the damages, due to bad accessibility. Also, inefficient insurance procedures and the centralization of all the important companies and institution worsen the effects of some of the natural disasters. The centralization leads to problems since when that particular area is hit, all the important institutions are hit at once, which will make reaction significantly harder. What can be concluded from the threats and weakness section is that the loss of companies to other countries in the region is a very serious threat to Costa Rica and is mainly caused by the

high labour cost. Especially in Nicaragua these cost are lower. The lower standards for working conditions and the lower level of education of the workforce in Nicaragua also cause these higher costs.

9.5 Concluding confrontation matrix

In this chapter all gained information on Costa Rica's strengths, weaknesses, opportunities and threats are combined. It gave a clear overview which internal and external factors influence each other positively or negatively. It became clear that the some combinations like production of export goods and near sourcing give a good base for feasible strategies. The four quadrants of this confrontation matrix will be a good foundation for the development of feasible strategies in Part II of this report.

10 Conclusion Part I

In concluding on the research of the current situation in Costa Rica three of the sub questions as stated in paragraph 1.2 are answered. To answer '*What type of goods are most important for Costa Rican trade and what are the origins and destinations?'* the major export products, the domestic and international flows of goods and their adjacent strengths and weaknesses are discussed. Costa Rica's maritime transportation is heavily reliant on the agricultural sector, mostly on the production of bananas and pineapples (43% of export volume). These products are exported to various destinations with Europe and the United States as biggest markets. In value, medical appliances are the most important export product. These appliances are mostly exported by air, with the United States as most important destination. Costa Rica has major ports on both sides of the country, on the pacific side this is the Caldera port and on the Caribbean side the Limón/Moín port, which terminals lie only six kilometres apart. Puerto Caldera is focused on import cargo from Asia and the U.S. West Coast, while the Limón/Moín complex primarily exports to the U.S. East Coast and Europe. A new terminal is being constructed on the Caribbean side, close to the current Moín terminal. This terminal, which will be operated by APM Terminals in a 30-year concession, will handle all container cargo on the Caribbean side. One of the main issues influencing the maritime sector in Costa Rica are the relatively high transportation costs in the country. These costs are mainly caused by the lack of adequate infrastructure to reach the different ports, slow border processes and high security costs. The route 32 that connects the most important production areas with the largest port (Limón/Moín) faces many natural problems such as landslides due to heavy rain, leading to delays or closure of the road. Also the densely populated Central Valley, which hosts all the major cities has problems with dense congestion during rush hours, as many freight trucks pass through the metropolitan area due to the lack of ring roads. Furthermore, border processes in most Central American countries are complex and time consuming causing unnecessary delays at border posts (e.g. Peñas Blancas) and in ports.

The logistical situation of neighbouring countries is addressed by answering the second sub question '*How is the current logistical system of Costa Rica performing in comparison with neighbouring countries?'* Panama and Nicaragua are discussed in more detail whereas of near Caribbean countries only the ports are taken into account. Panama has managed to gain large advantages from its geographical location by means of the Panama Canal, two major ports to provide both the Atlantic and Pacific and a railroad connection to offer a dry canal alternative. Furthermore, Panama's Free Trade Zone policy has caught on with international investors due to its financial advantages and simpler procedures. By maintaining many of these and other port related business (e.g. distribution centres) in the port areas, Panama achieves to keep the metropolitan area relatively free of freight transport. Nicaragua on the other hand has less developed connections to the international trade market. Given it has no decent ports on the Atlantic it remains dependant on neighbouring countries to transport goods to the U.S. East Coast and Europe. The road infrastructure is mediocre and border processes pose large problems in the logistical chain due to long delays. The country will not proof to be a competitor for Costa Rican trade (especially on the Atlantic) and with the construction of the new TCM the trade with Nicaragua is most likely to increase, giving Costa Rica the opportunity to function as the gateway to Nicaragua. Freeport (Bahamas), Miami (U.S.) and Kingston (Jamaica) are the three largest ports operating in the region. Given their focus on transhipment of goods, these ports pose less of a threat to the import/export-focused

ports in Costa Rica. However, whenever Costa Rica plans to adjust its strategy to operate as a hub to between the regional markets and the U.S. and Europe competition may be expected.

To be able to set up strategies for Costa Rica to improve its economic position threats and opportunities are identified. The last sub question in this section provides insight how these will affect the country. *What opportunities and threats can influence Costa Rica's economic position in the international trade market?* One of the main concerns is the loss of companies to other countries in the area. The relatively high labour cost and bureaucratic procedures can be causes for companies to relocate outside of Costa Rica. The high dependency on agriculture makes fruit diseases a big threat. Furthermore, climate change has significant effect on the chance of diseases occurring and might even result in unsuitable weather conditions (unseasonal rainfall, droughts) lowering agricultural yields. The location of Costa Rica in the route from drugs producing countries to customer countries makes it vulnerability to drugs trafficking. Recent increase in trafficking numbers will negatively affect its reputation as a stable, safe and green country, when not being handled properly. The new container terminal in Moín poses to be a first step in tackling the drugs related problems, for it provides state-of-the-art security for imported and exported containers. A large opportunity occurs from exploiting the benefits of the new TCM, as it will provide higher security, more container handling capacity and accessibility to larger vessels. Another opportunity lies in the education of skilled workers. Costa Rica has a high quality educational system and the local and global demand for skilled workers is rising. The problem is that currently workforce, even though of high quality, is not sufficient to meet this demand. If more skilled workers are available, this might cause companies to stay or even relocate to Costa Rica. Additionally, an important asset in getting new companies to Costa Rica can be the Free Trade Agreement with China, since Costa Rica is only one of the three countries in Latin America that has such an agreement. If they can exploit this agreement it can cause Chinese companies to invest in Costa Rica and bring manufacturing or value-added businesses to Costa Rica. This will improve the diversity of export products and make the country less dependant on the agricultural sector.

Part II of this research will provide strategies for Costa Rica to deal with the threats and exploit the strengths and opportunities found in Part I. When applied correctly these strategies can improve the logistical and economical situation in the country and lead towards a sustainable development of Costa Rica.

PART II
-
POSSIBLE FUTURES AND STRATEGIES

11 Possible futures Costa Rica

This chapter gives an overview of the scenarios used in during this study. Scenarios are used to determine which port strategy is required by each scenario. First factors are identified that form the scenarios. Subsequently, scenarios are chosen and worked out.

11.1 Scenario dependable factors

To generate scenarios, factors have to be determined to construct these scenarios. The identified factors need to be changeable, meaning that a factor can be increased or decreased or in other words become more or less. By choosing factors common sense and the SWOT analysis (chapter 8) are used. The following factors are used:

- Economic growth Costa Rica
- Development other ports Caribbean region
- Climate change

Among the development of other ports in the Caribbean region different factors are included. It takes costs, handling time, and capacity into account. If ports develop further, the port costs could decrease, with a possible result that it becomes more competitive. In Tavasszy et al. (2011) by reducing the generalised costs of the Port of Antwerp to the level of its main competitor Rotterdam, Antwerp gained additional container flow at the detriment of Rotterdam, Bremen, and Hamburg, ports that are operating in the same competitive range.

After the factors are identified, it has to be determined what the relatively normal economic growth of Costa Rica is, what the current developments in the Caribbean regions are and how the current climate change develops. When the 'normal' values of these factors are known the first scenario is constructed: extend current situation. To determine other scenarios a matrix is used shown in Table 20.

Table 20: Scenario matrix

Less / More	**Economic growth**	**Development ports Caribbean**	**Climate change**
Economic growth	X	More economic growth Less development ports Caribbean	More economic growth Less climate change
Development ports Caribbean	More development ports Caribbean Less economic growth	X	More development ports Caribbean Less climate change
Climate change	More climate change Less economic growth	More climate change Less development ports Caribbean	X

After constructing the scenario matrix the rows and columns are summed to produce different scenarios. This makes the following six scenarios:

- More economic growth, less development ports Caribbean, less climate change

- Less economic growth, more development ports Caribbean, less climate change
- Less economic growth, less development ports Caribbean, more climate change
- Less economic growth, more development ports Caribbean, more climate change
- More economic growth, less development ports Caribbean, more climate change
- More economic growth, more development ports Caribbean, less climate change

It is important to construct (extreme) scenarios. Since there are many actors with different objectives involved in the global logistic system, it is virtually impossible to predict how changes in any given component of the system will affect the system as a whole (Halim, Kwakkel, & Tavasszy, 2015). Looking at these factors, the two most extreme scenarios are the two underlined scenarios. The first underlined scenario is an extreme positive scenario for Costa Rica implying more economic growth for Costa Rica, less development of ports in the Caribbean (less competition), and less climate change. Logically, the other extreme scenario is a negative one: less economic growth, more development of ports in the Caribbean, and a bigger climate change.

The last developed scenario is the scenario that is most likely to occur. Over the period 2006-2014 Costa Rica established an average growth of 4.4%. This average includes the economic crimp in 2009 and a very high economic growth in 2006 (8.8%) (World Bank, 2016a). The economic growth was the last few years ±3-3.5% and it is forecasted that the economy will grow stronger due to an improved monetary system (OECD, 2015) and the newly operated Moín Terminal by APM Terminals. Secondly it is likely that more regions in the Caribbean will develop or expand their ports. Buhrs (2016) mentioned that, for example, Barbados is also researching to construct a new port area. Thanks to an expecting economic growth in both advanced economies and emerging markets & developing economies the world trade will increase in the coming years (IMF, 2016). An increase in world trade could attract new trade regions, resulting in other countries in and around the Caribbean Sea developing new harbours. At last, it is most sure that the warming-up of the Earth prosecutes. During the last Climate Summit in Paris agreements are made to make sure the planet does not warm more than 2 degrees Celsius up. However, all comprehensive national climate action plans (INDCs) are not yet enough to keep global warming below 2ºC (European Commission, 2016). So, the expectation lasts that global warming will increase in the coming decades. This makes the last scenario as follows:

- More economic growth, more development ports Caribbean, more climate change

11.2 Scenarios

This paragraph explains the four scenarios listed in §11.1. First the scenario about the current situation is explained followed up by the extreme positive scenario. The third scenario explained is the extreme negative scenario, and the part is dedicated to the most likely scenario.

11.2.1 Scenario 1: Business as usual

As mentioned before, in this scenario the current situation will be extended. In this scenario an annually *average economic growth* of around 4% will be established. Further, the *ports in Kingston (Jamaica), Mariel (Cuba), Miami (USA), Freeport (Bahamas), and Panama will expand during this scenario*. Moín Terminal tries to become a big player in the region, with a 2.7 million TEU capacity at least at the end of the concession. With a port complex at the Caribbean site of 80 hectares with 1,500 meters quay, 5 berths, 2.2 km breakwater and an access channel 18 meters deep; it has potential to serve as a shipping hub for the Caribbean and Central America (APM Terminals, 2015). The Caldera port will remain mostly an import port for products like maize, wheat and iron from the USA and Asia. As in the current situation, medical equipment industry remains important, and other industries will not move to other areas by themselves. This means that Costa Rica demands a lot of its logistical system and the high logistical costs need to be reduced to not become a problem of Costa Rica's endeavour. This scenario includes also a *'mid-range scenario' of global warming*, which is on average an additional 2 – 5 °C (Christensen et al., 2007). Costa Rica has to take measures to prevent great damages to its crops due to climate change. For example better drainage to cover the heavy rainfall and reduce the probability of floods. A second example could be to plant crops on higher attitudes (McPhaul, 2008), and planting more shade trees to insulate plants from extremes in temperature may help the vulnerability of the harvests (DaMatta, Ronchi, Maestri, & Barros, 2007).

11.2.2 Scenario 2: Growing sky high

The second scenario is the most positive scenario implying *more economic growth*, *less competition from other ports in the Caribbean region*, and *less environmental change* than expected. Costa Rica's economy has a steady growth and increases more than expected. The trade balance becomes more in equilibrium, because export volume as well as export value increase more than import. The new Moín Terminal has been doing business very well, and the blooming economy of Costa Rica creates an environment to attract more industry. At the same time, the main port at the Pacific, Caldera port, could increase its export share. TCM does benefit from low development in the competitive ports. Thus, the economy pressures the logistical system more than before. By having two strong ports, Costa Rica profits of Nicaragua not having sufficient harbour facilities at all. A significant part of Nicaragua's export will flow by road and short-sea shipping via Costa Rica to the rest of the world. Next to a bright future for Costa Rica, worldwide governments agrees on measures to extremely reduce emissions, making the global warming less than 2 °C. This result in less extreme weather, smaller probability on natural disasters, and higher production yields. The government enlarges its green image, and less environmental impacts makes Costa Rica even more attractive for touristic activities.

11.2.3 Scenario 3: Storm is coming

As the title implies this scenario is the worst thinkable situation with *less economic growth for Costa Rica, more global warming, and more competition from other ports in the region*. The exporting volume and value is disappointing and more harvests fail more often due to bad weather conditions. Thanks to climate change more natural disasters like floods and landslides

happen affecting the economy, the touristic sector, and logistical system even more. Most of Costa Rica's industries do not expand and have no incentive to move out the Metropolitan area resulting in heavy congested roads around the Central Valley, and high unemployment rates in the other regions. Besides heavy traffic jams, Costa Rica still suffers from the high logistical costs, and thereby also from the competition in the region. Other Caribbean/Central-American ports are performing better, and other countries see opportunities as well, so the new Moín terminal focuses only on the import and the export of goods. Port Caldera needs to import more goods, which must be transported to the Central Valley. All the developments are not in the favour of the government and the people show their discontent. Concluding, in this scenario Costa Rica faces huge challenges regarding economy, climate, trade, and logistics.

11.2.4 Scenario 4: Booming business in the Caribbean

The last scenario *Booming business in the Caribbean* is mostly an intermediate of the first and second scenario with good economic prospects, competition in the region, but also significant climate effects. The political stable government has the opportunity to compete with other Caribbean countries. Due to an improving economy more trade is established in the country and the export grows steadily. At the Caribbean side potential exist for some short-sea shipping and transhipment, possible resulting in some extra industry. The economic progress pays also off at the Caldera port, where less empty containers are shipped to other countries. By having two well performing harbours at both coasts Nicaragua will flow a part of its export via the Caldera port and Moín port, just like in *Growing sky high*. It becomes slightly more efficient by exporting more goods than in the past years. Despite the good performance of the Costa Rican economy it is able to compete with ports like Panama, Miami, Freeport, and Kingston. Costa Rica faces also the effects of the climate change by more extreme weather types: more high temperatures, more frequent storms, and less total rainfall. The increase in trade in Costa Rica and the changes in weather gives challenges for the roads. More traffic develops in and through the Central Valley, and around both ports. However, still one sufficient road exists between the San José Metropolitan Area and the Caribbean, which is also vulnerable for floods and landslides.

This chapter explained four developed strategies: *Business as usual, Growing sky high, Storm is coming,* and *Booming business in the Caribbean*. Next chapters deepen into existing port strategies with case studies. Chapter 14 defines suitable strategies for Costa Rica based on the confrontation matrix, the scenarios of this chapter and the literature of the next chapter.

12 Literature port strategies

Chapter 12 has the focus on literature about hinterland strategies, foreland strategies, and (port) governance. First the relationship between the confrontation matrix and the coming literature is explained. Literature will help to define clear strategies for the Costa Rica. Paragraph 12.2 discusses literature about hinterland. In §12.3 foreland strategies are explained, and this chapter closes with governance strategies in §12.4.

12.1 From confrontation matrix to literature

In order to identify possible strategies for Costa Rica, the confrontation matrix will be analysed. For three important research fields existing theories will be reviewed. Then, the factors from the confrontation matrix will be linked to these fields. Some of the factors in the confrontation matrix are not considered in the strategies, since they cannot be influenced. The three fields that will be addressed are *hinterland, foreland,* and *governance*. The hinterland of a port is the connection of this port with the surrounding area or even the whole country and further. Foreland is the connection the port has with other ports and shipping lines. The governance section will deal with governmental strategies concerning the port region.

Strategy for the hinterland can eliminate or at least decrease one important weakness of Costa Rica, the deficient transportation network. A better hinterland will mean a more efficient transportation network. Also, it will allow the country to seize the opportunities of the increase in container handling capacity and the larger vessel sizes, since the extra containers can be handled better. The possibility of the better handling of containers can also increase the strength of being a gateway for Nicaragua. The security of the whole logistic chain might also improve if the hinterland is better connected and the containers are moved faster.

Improving the foreland of Costa Rica will help fight the weaknesses of the inefficient border crossings and the low security of the logistics chain. This reduction is caused by better connections of the shipping with the hinterland and the improved relation with connected ports. When the foreland conditions are improved, the threat of competition of the other countries in the region might also be decreased, since there is a smaller probability to become a regional hub when Costa Rica is the main hub in the region.

Better governance in the region can lead to the attraction of new companies to the port region, but also to a relocation of existing companies from the central valley to the port region. If a good governance strategy is applied this could lead to prevention of the loss of manufacturing companies and reduce competition from other countries by having a better business environment. A relocation of some companies from the GAM to the port region or other regions may also lead to a (small) reduction in the deficiency of the transportation network. Good governance can also increase the effects of the free trade agreement with China, since the position of the government and the regulation concerning businesses can be a reason for foreign investors to decide to invest in Costa Rica.

Some of the factors will not be included in the research of this chapter, this is because of two reasons; the first is that some of the factors are too hard, or impossible to influence with the strategy. Labour cost, climate change, bureaucratic procedures, natural disasters, and fruit diseases are examples of factors that will not be researched further but still influence the strategy that will be proposed. The second reason is that no further

research is needed or that this research will not be done in this report but will form a recommendation for others to research.

12.2 Hinterland strategies

This paragraph discusses various hinterland strategies in order to support a smooth connection between the seaport and the hinterland. First, connections to the hinterland will be discussed. Secondly, the concept of inland terminals will be elaborated upon, followed by the so-called freight villages and the port development phase of regionalisation. Finally, a case study regarding the port of Barcelona will be discussed, where the port authority played a major role in the development of various logistic services.

It is important to note that there is a distinction between captive hinterland and contestable hinterland. Captive hinterland is a region where one port has a clear competitive advantage. Usually, the vast majority of cargo from this region is transported via this one port. Contestable hinterland is a region where there is no such clear competitive advantage, and various ports are competing for cargo transported to or from this region. It is especially in these contestable hinterlands where the hinterland accessibility plays a very important role. With the rise of transportation modes, accessibility to transportation and corresponding transportation costs, most ports do not have a clear captive hinterland any more and should compete with other ports for all their hinterland (de Langen P. , 2008).

12.2.1 Hinterland connections

This subparagraph is dedicated to hinterland connections in general. It deepens on road connections, rail connections and inland waterway connections. Worldwide, in most examples the port authority plays an important role in the development of the port region. The landlord model is mostly used in container terminals where the publicly port authority plays a central role (Baird, Privatization trends at the world's top-100 container ports, 2002). Hence most landlord port authorities do not aim for profit maximisation, but it has to differentiate its port from other ports by maximising throughput, contributing to economic development, and enabling trade (Brooks & Cullinane, 2006). When ports compete in quantities, an increase in corridor capacity will increase the output of the own port, reduce the rival port's output, and increase own port's profit. However, an increase in inland road capacity gives not per definition more profit to the port due to various offsetting effects. (Zhang, 2008). So, a port authority generally invests in facilities such as access channels, berths and quays, breakwaters, sites for terminals, sites for manufacturing and logistics activities, and hinterland access infrastructure. Coming together, one of the four core activities of a port authority is area management, which includes proving space for growth, intensify land use, develop required (public) transport infrastructure, and secure environmental performance in port area (de Langen P. , 2008).

Due to globalisation ports have become an important chain in worldwide logistics, competition between ports is shifted from competition between ports to competition between transport chains (Notteboom & Winkelmans, 2001). This means that a sufficient connection to the inland is, next to market potential, required to attract shippers and economic activities, and to provide a good competitive position. A lot of ports serve a congested hinterland; this is party the cause that costs of hinterland transport are generally more expensive than maritime transport costs. Thus reliable and high-quality transport services are required to and from the hinterland. The quality of hinterland services depends on different actors like trucking companies, rail operators,

barge shippers, port authority, terminal operator, customs and inspection, and the government's policy. So, to get an effective hinterland stakeholders have to met the following criteria: infrastructure needs to be developed sufficient, infrastructure needs to be used efficiently, transport chains needs to be well coordinated, an increasing need in sustainable hinterland transportation system, and provided services need to be attractive (de Langen P. , 2008).

So, a port authority can also turn on different buttons to fulfil the criteria. Figure 52 gives a compact overview of actions that can be taken by port authorities to improve the connection with the hinterland. The blue rectangles represent the criteria for good hinterland access, and the green rectangles show possible means to fulfil the criteria. The development of rail and barge terminals aimed to reduce the (containerised) traffic on the road, and such enhances the regionalisation phase in port and port system dynamics (Notteboom & Rodrigue, 2005). It is the port authority to take initiative in these actions, because regional authorities may not have the incentive to do so, because importers, exporters and logistic service providers benefit most of it, not the local population. An example of such a measure is taken by the Port of Rotterdam Authority, which has taken the initiative to develop a container transferium, located outside the port area, where trucks can deliver containers for the port. These containers move the final kilometres by barge, thus reducing highway traffic (Port of Rotterdam, 2015c). A second mean is to apply infrastructure access rules for rail and road. Infrastructure users may not coordinate their activities sufficiently, so setting rules could improve the utilisation of the infrastructure and so improving the port's competitiveness. Examples of rules are: only allow trucks on port access routes when they have reserved a slot at the terminal, Only allow trains on rail tracks when rail terminal operator confirms to have capacity to handle these trains in their allocated slots (real time), only allow (empty) trucks on the port access roads outside rush hours (de Langen P. , 2008) or charge extra money for trucks bringing their load during peak hours.

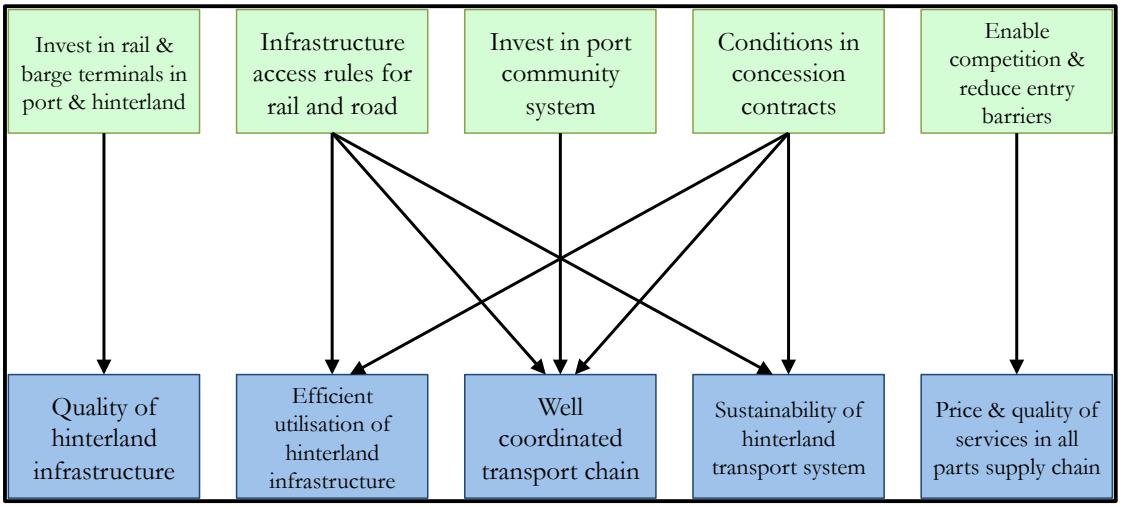

Figure 52: Options for involvement port authority for improving hinterland connection based on de Langen (2008)

A third option is to invest in a port community system. Ports like Singapore, Antwerp and Rotterdam have integrated systems where companies in the port as well as port authorities are involved. This is done, because clear data and document exchanges are required between companies to provide an even more effective port (Fabbe-Costes, Jahre, & Rouquet, 2006). A next action is to make agree on conditions in concession contracts. A port authority can include conditions to a concession that has the aim for

improving hinterland connections. By granting concessions and by including additional conditions a port authority could have a big influence in the development of the hinterland connections (Notteboom, 2007). A last measure port authorities have is allowing competitors and reducing entry barriers to the network by for example allowing multiple train operators on the rails. Competition leads to innovation and price reductions.

So, to conclude, port authorities have different options to improve the hinterland connection of their seaports.

12.2.2 Inland terminals

Hinterland transportation costs are generally higher than the maritime costs, and most bottlenecks in the door-to-door chain occur in the hinterland transportation (van der Horst & de Langen, 2008). Whereas in the beginning of the development of inland freight distribution systems trucking services tend to be sufficient, in later stages trucking services can be insufficient due to congestion, energy consumption and empty movements. These are incentives to develop the hinterland strategy, for example by means of inland terminals (Notteboom & Rodrigue, 2009).

An inland terminal is basically a node in the hinterland network of seaports, where goods for/from the seaport are received or dispatched to. Various types of inland terminals exist, characterised by the activities being conducted (and the corresponding value-added processes), network position and the modes being handled. First, various types of inland terminals will be discussed, starting with the concept of dry ports, followed by load centres, transmodal terminals and satellite terminals. These inland terminals often attract other activities, transforming the area into so-called logistic villages. This concept will be discussed after the various inland terminals.

Dry port

The concept of a dry port is developed to strengthen the position of a deep-sea port, control the flow of goods in a better way, and to reduce the traffic in the port city. Leveque & Roso (2002) define a dry port as follows: *"A dry port is an inland intermodal terminal directly connected to seaport(s) with high capacity transport mean(s), where customers can leave/pick up their standardised units as if directly to a seaport"*. At full-service dry ports services like storage, maintenance and repair, consolidation, storage of empty containers, and customs clearance should be available. Besides the services provided at the dry port, it successfulness depends on the quality of the road/rail/inland waterways interface; therefore it is required to have a reliable, scheduled high-capacity transport modes to and from the port. After goods are delivered to a seaport it is directly transported via an alternative mean of transport to the dry port where it has its customs check, and will then be released to the customer. Based on the function and location three types of dry port concepts are identified: *distant dry ports, mid-range dry ports, and close dry ports* (Roso, Woxenius, & Lumsden, 2009).

The distant dry port concept will mostly be implemented, because the distance and size of the flow make rail or inland shipping viable from a pure cost perspective. Benefits of the distant dry port regard to the modal shift, which reduces the traffic jams at the port's gates and in the port city. A second import benefit is that a seaport enlarges its activities in a wider hinterland, and can offering shippers low cost and high quality services (Roso, Woxenius, & Lumsden, 2009). A successful example the Isaka Dry Port, functioning as an official dry Port for the port of Dar es Salaam, Tanzania (Tanzania Railways

Corporation, 2004). The midrange dry port on the other hand is situated within a distance from the port generally covered by road transport. The midrange port serves as a consolidation point for different modes of transport implying that administration and technical equipment specific for sea transport are just needed in one terminal. Besides acting like a consolidation point, a midrange dry port has also the ability to function as a buffer to reduce the pressure on the seaport's stacking areas. An example is the Virginia Inland Port where a full range of customs service is available for shippers (Roso, Woxenius, & Lumsden, 2009), and it has attracted about $100 million investments (Woodsbridge, 2004). Long distance road operators and those using intermodal rail services seem to favour arterial priority schemes, dedicated streets for port access and longer operation hours by ports (Golob & Regan, 2000), but when this is not possible a close dry port at the edge of a seaport can be introduced. Goods are transported via rail from the seaport to the dry port just outside the city, and from here further distributed via rail/road/waterways to its final destination (Roso, Woxenius, & Lumsden, 2009). An example is the Enfield Inland Terminal close by the Port of Sydney. It should facilitate more effective clearance of containers from the port and increase the productivity and capacity of existing port lands (Sydney Port Corporation, 2013).

Load centre
A load centre is a standard terminal where goods are being loaded upon a transportation mode towards the main terminal. It is an intermodal terminal, basically being a stop along a transport route towards the maritime port (Notteboom & Rodrigue, 2009). An example is a rail terminal servicing a regional market area. Goods to the rail terminal would be transported to the load centre by truck and be loaded upon a train towards the port. Barge terminals are other commonly present load centres.

Transmodal terminal
Having long distance containerized traffic from various directions could require transmodal activities, to transfer the freight from one transport route to another (Notteboom & Rodrigue, 2009). For example, if there is a vast network of freight transportation routes and only one route to the main port, it is necessary to transfer the freight from one line to another. This is an activity that takes place mostly in freight traffic over rail, since railway networks are generally very rigid, but could also take place in freight transport by barge or truck.

Satellite terminal
A satellite terminal is a terminal mainly located in the vicinity of a main maritime terminal. It performs activities for which no more space exists at the main terminal, or activities that have become to expensive to conduct at the main terminal (Notteboom & Rodrigue, 2009). Many satellite terminals exist currently around Puerto Limón, which act as storage areas awaiting arrival of the vessel, since there is no storage space available at the current ports of Limón and Moín. Upon arrival of the vessel, containers are transported to the port by drayage.

Figure 53 shows a visualisation of respectively a transmodal terminal, a load centre and a satellite terminal.

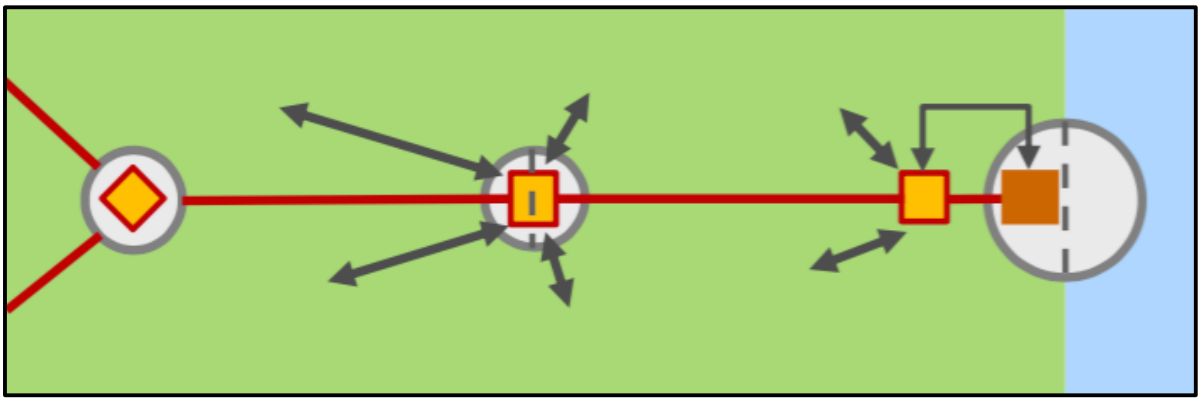

Figure 53: Visualisation of transmodal terminal (l), load centre (c) and satellite terminal (r) (Notteboom & Rodrigue, 2009)

12.2.3 Freight transport terminals & freight villages

Due to the location of inland terminals as an access node to the connection between the hinterland and the port, they attract many auxiliary activities and thus form a cluster of logistic activities. The inland terminals evolve into freight transport terminals, of which there are various types. Distinction is made by Notteboom & Rodrigue (2009) related to the added value of the freight transport terminals. Four different freight terminals have been identified, respectively ranging from the highest added value to the lowest added value; gateway, freight distribution cluster, inland port and satellite terminal.

Gateway

In the context sketched by Notteboom & Rodrigue (2009), the gateway is the freight transport terminal with the highest added value. It is the entry to the maritime transportation network and a world-class gateway should contain "the whole range of value added activities related to transportation, from financing to modal and intermodal infrastructures". Basic gateways focus on the transhipment between maritime and inland transport systems only.

Freight distribution cluster

A freight distribution cluster is characterised by "a complex of large inland terminals and freight distribution centres that command the distribution of a vast market area". Distribution centres can have three major types of function. Warehousing is a basic function performed by the majority of distribution centres, to act as a buffer in the supply chain of products. Besides warehousing, cross-docking is also a major function for some distribution centres. It is a process that commonly takes place in the last end of the retail supply chain, and inbound loads are sorted and transloaded to their final destinations. Finally, transloading is the third major function of distribution centres. With transloading, freight from maritime containers is transloaded into domestic containers or truckloads and vice-versa. Some freight distribution clusters can have as much added value activities as gateways (Notteboom & Rodrigue, 2009).

Inland port

Inland ports are usually single intermodal terminals, coupled with various distribution activities. It often acts as load centres in the supply chain.

Satellite terminal

Freight transport terminals with the least added value as defined by Notteboom and Rodrigue (2009) are satellite terminals. These satellite terminals usually perform a very

specific function, mostly transloading in the vicinity of the gateway. As said before, there are a lot of satellite terminals in the vicinity of Puerto Limón.

Logistic zones & freight villages

As is depicted before, inland terminals attract other logistic activities based on the function of the terminal. Clustering of logistic sites in the vicinity of the terminal lead to the creation of logistic zones. These logistic zones include all kinds of logistic companies and ancillary activities. Besides traditional cargo handling and services, many related services can be found such as distribution centres, shipping agents, trucking companies, forwarders, and container repair facilities and packing firms (Notteboom & Rodrigue, 2009). Although it is often the case, logistic zones can also exist without the presence of an inland terminal in the vicinity.

The concept of logistic zones in the hinterland is well advanced in Europe already. The first development took place around 1970 near Paris, and nowadays almost all European countries have such logistic zones. These zones are often created by means of regional development policies, including various stakeholders such as producing firms, intermodal operators, regional and local authorities, central government and Chamber of Commerce and Industries (Notteboom & Rodrigue, 2009).

Logistic zones having logistic sites as well as access to an intermodal terminal are often referred to as freight villages (or logistic centres). A logistic centre is defined by EUROPLATFORMS (the European Logistics Platform Association) as a centre within which all activities relating to transport, logistics and the distribution of goods are carried out by various operators on a commercial basis. The facilities and buildings available in the village (warehouses, distribution centres, storage areas, offices, truck services, etc) can either be owned by the operators or can be owned by third parties and rented out to the operators. It is vital that the logistics centre must be open to allow access to all companies involved in the activities mentioned before, in order to comply with free competition rules. Preferably, it also encompasses public services for the staff and equipment for the users. To encourage intermodal transport for the movement of goods, logistics centres are mostly served by multiple transport modes. It is important that a logistic centre is managed in a single and neutral legal entity, preferably by public-private partnership, to ensure synergy and commercial cooperation.

Even though inland terminals offer a lot of benefits, some logistic activities function better in the vicinity of the port. Notteboom & Rodrigue (2009) have identified the following logistic activities, which typically function well in the vicinity of a port:

- Logistics activities resulting in a considerable reduction in the transported volume
- Logistics activities involving big volumes of bulk cargoes, suitable for inland navigation and rail
- Logistics activities directly related to companies which have a site in the port area;
- Logistics activities related to cargo that needs flexible storage to create a buffer (products subject to season dependent fluctuations or irregular supply);
- Logistics activities with a high dependency on short-sea shipping.

Besides this competitive part between ports and inland terminals, their relationship is also of a complementary kind. An inland terminal benefits from having a well-

functioning seaport, and a seaport benefits in its turn from a well accessible hinterland, for example by means of an inland terminal. Geographical clustering of logistic companies offers benefits for all due to synergies and economies of scale. This clustering usually takes place naturally in the seaport, inland terminal and along the axis between them. This process can be accelerated by local-, regional- and national governments by policies containing financial, regulatory or real estate incentivising measures (Notteboom & Rodrigue, 2009).

The result is a logistics polarisation and clustering, and the creation of so-called logistics poles. The seaport is the main node in this network, with other inland nodes forming a centre in logistic clusters. Even though the seaport is the driving node of the network, it is mutually dependent on the inland nodes for its competitiveness. Figure 54 shows the forming of logistics poles in four phases.

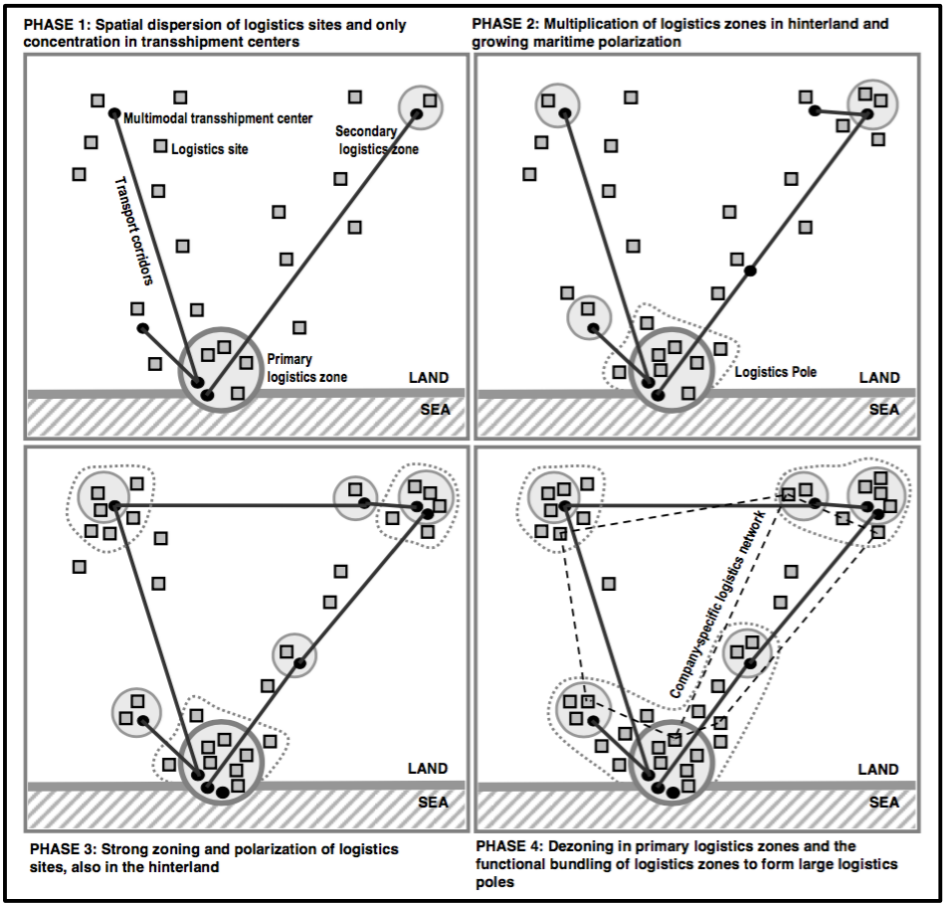

Figure 54: Logistics polarisation and the creation of logistics poles (Notteboom & Rodrigue, 2005)

12.2.4 Port regionalisation

As is depicted before, the performance of seaports is strongly dependent on the performance of their hinterland networks. This phase in the development of a port is an extension to traditional port spatial models, such as the Anyport model by Bird (1980), which is merely focused on the development of the port itself. Notteboom & Rodrigue (2005) have called this phase the port regionalisation phase. During this phase, the port's perspective of port development is brought to a higher geographical scale, beyond the port perimeter. The need for a vast inland network is recognised and efforts are being made to develop its hinterland network, for instance by setting up or improve its regional load centre network. In other words, the integration of inland freight distribution centres

and terminals with gateway ports. Eventually, each port will have its own regional load centre network, with specific load centres and multimodal logistic platforms to accommodate in a smooth connection between the port and its hinterland. Figure 55 gives a schematic overview of this final regionalisation phase of ports, including a so-called off-shore hub, which will be discussed in the Foreland strategies paragraph.

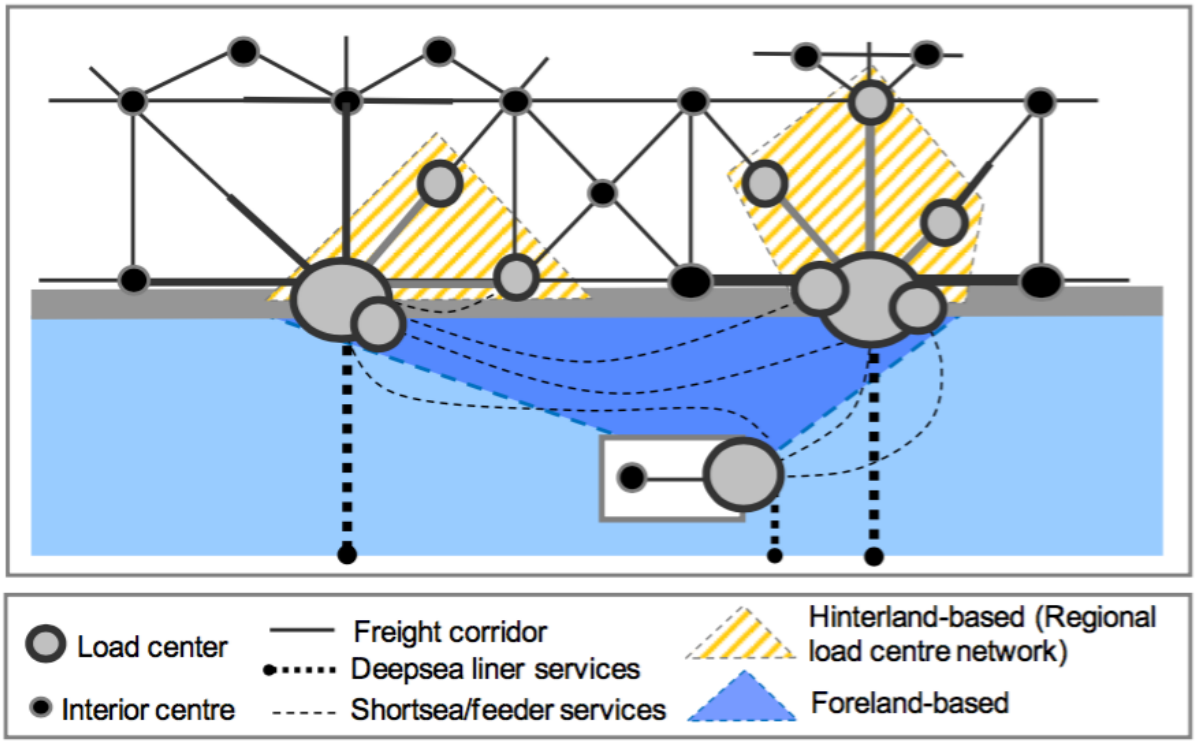

Figure 55: Regionalisation phase in the spatial development of a port system (Notteboom & Rodrigue, 2009)

The role that port authorities can play in the regionalisation phase is limited to that of facilitator. Many port authorities are in favour of an efficient intermodal connection to the hinterland in order to be competitive compared to other ports. Port authorities add value in this matter by setting up taskforces with various stakeholders (carriers, shippers, transport operators, labour and government bodies) to identify and address issues affecting the logistics performance. On the other hand, up till now most port authorities do not engage in advanced forms of strategic partnerships with inland port, due to fear that a well integrated hinterland (for instance in the form of logistic poles) will make inland locations just as beneficial as the port's location. Therefore, it is mostly the market that sets up these cooperative networks, or some limited informal programs initiated by the port authorities (Notteboom & Rodrigue, 2009).

In the next chapter entails a case study regarding the port of Barcelona, where the port authority did play a major role in the development of the hinterland accessibility and activities.

12.3 Foreland strategies

This paragraph gives insight in different foreland strategies mentioned in literature. First it deepens into the development of transhipment hubs in the Caribbean. Then foreland regionalisation is discussed. The last paragraph is about the integration of the foreland and the hinterland.

12.3.1 Development of transhipment hubs in the Caribbean

To connect a port to its origins and destinations, foreland and hinterland connections play a big role. Whereas the hinterland facilitates routes over road, rail or inland waterways, the foreland consists of a network of intermediate ports creating a maritime network. The foreland of a port can be defined as the overseas area with which the port carries out trade (Barke, 1986). Figure 56 shows schematically the connection of main shipping lines in the foreland to inland terminals in the hinterland through the orange-circled ports.

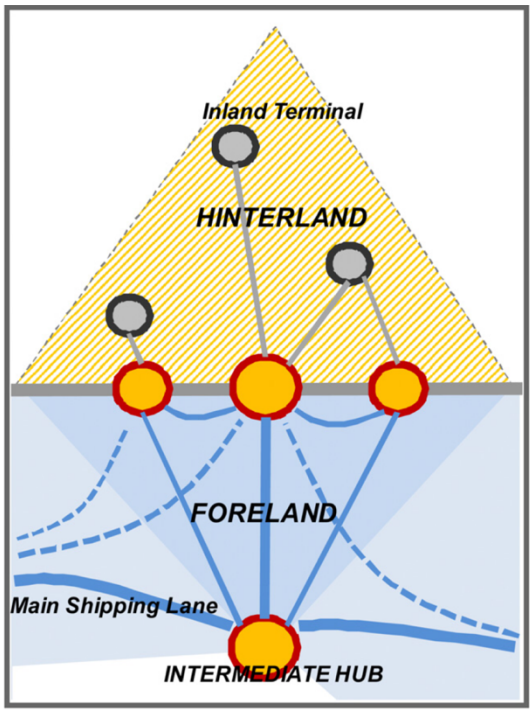

Figure 56: A graphical conceptualisation of foreland and hinterland (Rodrigue & Notteboom, 2010)

Four categories of ports can be distinguished based on the percentage of transhipment done: gateway/feeder port, regional gateway port, hub port and pure transhipment port (PTP). These port types are respectively handling around 10 per cent, 25 per cent, 50 per cent and 75 per cent transhipment cargo (Rodrigue & Ashar, 2015). As gateway or feeder ports generally dedicate less than ten per cent of activities to transhipment, meaning that the focus is on import/export cargo and hinterland connections. A gateway port is defined as a large port servicing a large hinterland and that is directly connected to ports in their foreland (larger middle circle). A feeder port is generally a smaller port servicing its hinterland, of which large part of the cargo is shipped through a transhipment hub (smaller circles in the figure represent feeder ports, whereas the transhipment hub is also known as a intermediate hub). The ports of New York, Los Angles and many Caribbean ports are examples of feeder ports. The ports of Antwerp, Rotterdam and Hong Kong operate as regional gateway ports performing both transhipment whilst servicing a vast hinterland. The ports of Valencia, Barcelona and Cartagena are examples of

transhipment hubs providing 50-75 per cent of operations in container transhipment, but additionally service their hinterlands. The ports of Singapore, Balboa and Colombo operate as pure transhipments hubs, offering around 90 per cent transhipment. Transhipment hubs are often located near a strait or passage in the major long haul shipping routes.

At this moment 40 per cent of all transhipment is conducted in the Asia-Europe trade routes. Even though in the Caribbean region transhipment is present, its presence and growth has been significantly lower than in the Asian region. With 8 percent it represents the world´s smallest transhipment market, and the only mentionable one in the America´s. Most islands in the region only provide small economies and poor hinterlands, proving not a significant driver in port development. Its proximity to the Panama Canal and the major shipping lines has however stimulated the investment in transhipment (McCalla, Slack, & Comtois, 2005). The largest numbers of transhipment are handled in solely five ports in the region, Colon (Panama), Balboa (Panama), Freeport (Bahamas), Cartagena (Colombia) and Kingston (Jamaica). The ports handled respectively 3,131,618; 3,023,559; 1,426,822; 1,425,042 and 1,189,980 TEU in transhipment in 2012 being 81.3%, 94.0%, 99.0%, 56.2% and 86.3% of each ports total activities (Rodrigue & Ashar, 2015). In line with the expansion of the Panama Canal speculations arose regarding the impact on shipping networks in the region (US DOT MARAD, 2013). The general expectation is that US East Coast ports will be handling more traffic and that more Post-Panamax size vessels (8,000 TEU) will be used for direct services. Rodrigue & Ashar (2015) investigated the impact of the expansion on the amount of transhipment and feedering in the Caribbean region and found that the increase of transhipment activities is more likely. However, they do expect in the first five years a steady increase in direct calling using Post-Panamax vessels, only to gradually change the service pattern to more transhipment as larger New-Panamax ships (13,500 TEU) will be deployed. As the larger vessels cannot be efficiently handled in many ports more transhipment business will need to be introduced in the region. The top two shipping configurations in Figure 57 show the direct calling methods as expected in the first five years after opening of the canal's expansion. The bottom two figures show possible transhipment configurations that will develop with the introduction of the New-Panamax vessels. The configuration of a Circum-Equatorial route suggests shipping lines to sail ships around the world calling in only a few ports along the way. An additional advantage of this configuration is the elimination of backhauls. This restructuring of the shipping network by an integration of European, Asian and South American routes is also known as "the Fourth Revolution" (Ashar, Revolution now, 2002). Until the expansion is completed the Panama Canal poses to be a bottleneck in the construction of such a global network.

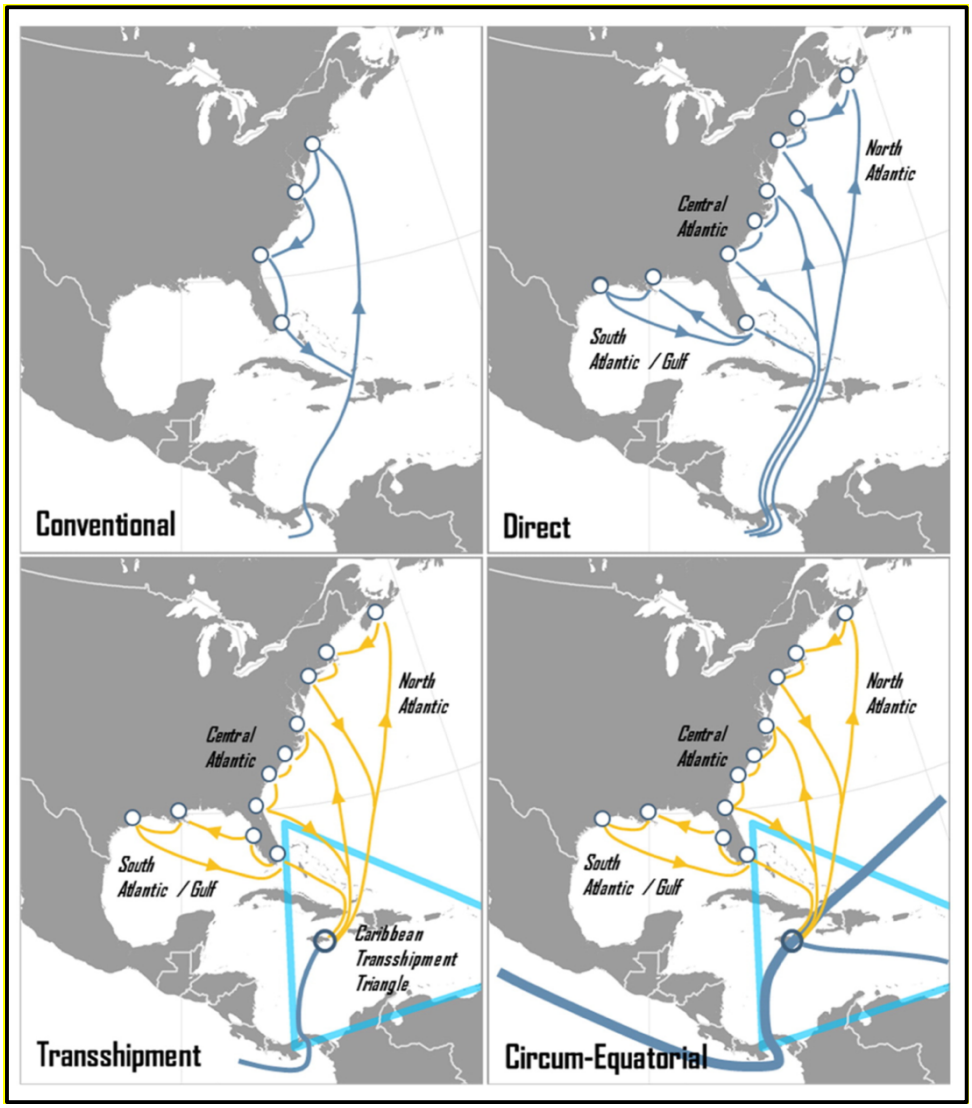

Figure 57: Transhipment configurations East Costa North America & Caribbean (Ashar, 2012)

In some cases it can be efficient or is it necessary due to nautical constraints (e.g. berths with insufficient depth) to change certain ports into feeder ports. Rodrigue & Ashar (2015) identify five configuration types for transhipment: tail cutting, intersection, bypassing, hubbing (hub-and-spoke) and relay (see Figure 58).

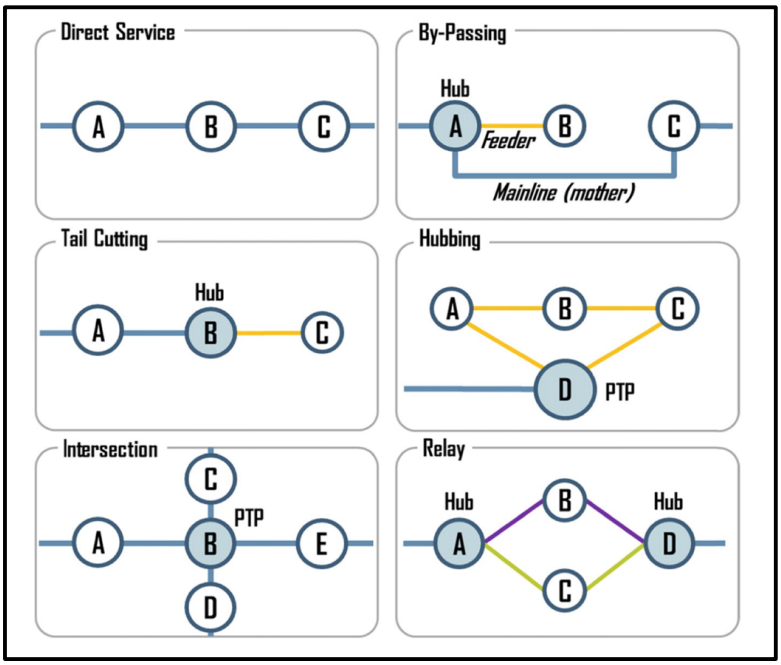

Figure 58: Transhipment patterns (Rodrigue & Ashar, 2015)

Direct services call on a series of ports directly. In case cargo flows to this port decline, or perhaps increase making the shipping liners use larger vessels that cannot call the smaller 'B' port, a certain port can be by-passed. The 'B' port will then be addressed through hub port 'A'. Port 'A' is still connected to port 'C' on the mainline. In case a certain port is not considered part of the mainline anymore due to previously mentioned reasons, it can be cut from the tail. Here port 'B' will fulfil the hub function for port 'C'. The hubbing pattern includes a pure transhipment port (PTP) connected to the mainline from which several smaller ports will be addressed in a round trip (in this case ports 'A', 'B' and 'C'). It can also be convenient to position a PTP on the intersection of major shipping lines as is shown in the bottom left picture of the figure. To conclude, Rodrigue & Ashar (2015) distinguish the relay transhipment pattern. In this configuration two hubs on main shipping lines are connected by diverging routes. The routes call different ports in between. Hubs 'A' and 'D' offer possibilities to tranship cargo on other vessels to combine cargo from different origins to the same destination port 'B' or 'C'. Especially bypassing, intersection and relay patterns will be useful in developing round the world shipping networks.

12.3.2 Foreland regionalisation

With the development of containerisation the intertwining of hinterland and foreland has become largely inevitable leading to a change in the spatial structure of hub port cities in Europe, North America and Asia (Rodrigue & Notteboom, Foreland-based regionalization: Integrating intermediate hubs with port hinterlands, 2010). In the light of these changes Notteboom and Rodrigue (2005) defined the concept of port regionalization. Port regionalization adds an additional level to previous port development models and so forth introduces the development of port cities to regional port hubs. As the volumes of containerised cargo increased in the 1980s, intermediate port hubs were constructed to handle modern containerships and primarily focussing on transhipment. Advantages for these ports lay in the available lands for future expansions and lower labour costs. Traditional ports however, did still accommodate transhipment services and as more cargo was handled in the port the distribution region of the traditional gateway port expanded. Next, regionalization kicked in stimulating the

formation of inland load centres and terminals increasing the level of synchronisation and as such the capacity of the corridors.

To be able to increase the effectivity of ports it is important not only to focus on good hinterland connections, but also look into connections to the maritime foreland, see Figure 56. Intermediate hubs tend to be built in proximity to major shipping routes and provide good nautical accessibilities (Rodrigue & Notteboom, Foreland-based regionalization: Integrating intermediate hubs with port hinterlands, 2010). These terminals are often (partially) owned by carriers or multinational terminal operators. The creation of such intermediate ports led to the development of hub-and-spoke networks in the maritime business. The hubs are mostly located near intercontinental shipping routes in the equatorial region (De Monie, 1997). Large ships on the east/west corridors often call transhipment hubs, where containers are shifted to smaller feeder ships serving the north/south, diagonal and regional routes. Two operational types for feeders are used: the first includes direct feeders from the hub to feeder ports, whereas the second involves indirect feeder vessels to loop multiple feeder ports before returning to the hub port (hubbing). Making use of direct feeder vessels will result in lower transit times but generally requires more feeder vessels. The indirect feeder system benefits from economies of scale, but includes longer transit times and longer distances. Decisions of carriers for the type of feeder service depend greatly on the diversion distance, the nautical conditions, the volume of containers, possibilities for combined transhipment activities with import/export from a hinterland, costs, port productivity and the strength of the carrier in the served markets (Zohil & Prijon, 1999). In using intermediate hubs carriers need to weigh the advantages of economies of scale of large vessels to the extra feeder costs, more container lifts and longer transit times. Developments of shipping networks into hub-and-spoke networks can be seen in Asia, where high-order service networks have fewer ports of call and bigger vessels than the present networks of lower order (Robinson, 1998).

Intermediate hubs tend to be vulnerable due to the narrow focus on container transhipment. The main competitive resources include location, nautical accessibility, terminal infrastructure (e.g. cranes) and terminal productivity. Competitors easily imitate these elements. Notteboom & Rodrigue (2010) argue that the changes for such intermediate hubs improve if more value-added services are offered. For example, for transloading and customisation services to adapt to regional market characteristics, or providing possibilities for shipping companies through transloading to maintain their assets in constant circulation of their own network. Another advantage of this approach is lower repositioning costs of containers. Introducing custom clearance at intermediate hubs can also prove advantages for cargo shipped in the same trading block (such as EU, NAFTA or ASEAN).

Based on a model by Theys, Ryoo and Notteboom (2008) the logistical activities of ports can be estimated. They found from a demonstration on the port of Busan that hinterland characteristics remained fundamentally important in terms of logistical attractiveness even though ports were involved in services to transhipment cargo. Figure 59 shows the interaction between transhipment, hinterland connections and the location of logistics centres. It turned out that in case of a well-developed hinterland connection of a gateway port, loading centres and distribution centres would be located closer to the consumption and production areas in the hinterland (C), whereas a poor connection stimulated the development of loading and distribution activities in the port area (D). Moreover, in the case of feeder ports, a good hinterland connection would lead to more

logistical activities in the port area (E). However, in case of a bad hinterland connection, the logistics facilities were more likely to develop in the area around the overseas port (F). (A) and (B) show the locations of logistics centres in case no transhipment is done.

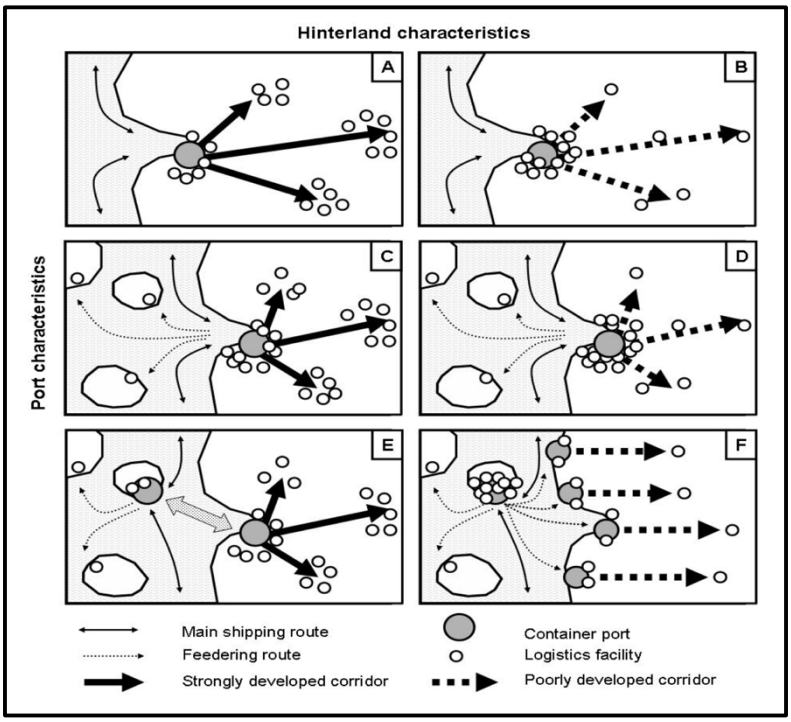

Figure 59: Location of logistics activities as a function of port and hinterland characteristics (Theys, Ryoo, & Notteboom, 2008)

12.3.3 Integration of foreland and hinterland

If gateway ports are called with larger vessels, complications can arise for the hinterland. Where larger amounts of cargo through economies of scale present advantages in foreland regions, this can pose problems for hinterland networks. Larger vessels lead to time centralised unloading of cargo and a major pressure on the hinterland infrastructure. As such, additional strategies are needed to prevent congestion, difficulties to meet expected levels of service and higher costs (Rodrigue & Notteboom, 2010). Figure 60 shows schematically the negative effects on an underdeveloped hinterland connection (higher costs per TEU-KM) and the advantages of a hinterland using the regionalization strategy (lower costs per TEU-KM).

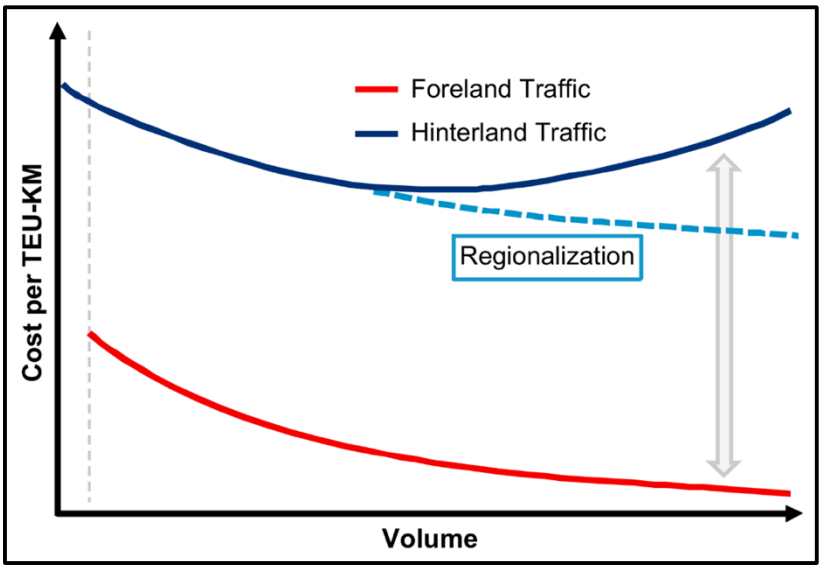

Figure 60: Cost per TEU-KM for hinterland and foreland traffic (Rodrigue & Notteboom, 2010)

Next to regionalization strategies, transhipment hubs can pose opportunities to decrease the amount of cargo unloaded in a short period of time making use of multiple smaller feeder vessels. Furthermore, it can set up a system that enables shipping connections that might otherwise not be feasible considering the transport loads and the networks of shipping lines (Rodrigue & Notteboom, 2010). However, it will be important to find the right balance between economies of scale for the shippers and meeting frequency and reliability requirements of cargo owners (Rodrigue & Ashar, 2015).

12.4 Governance strategies

This section will deal with governance in ports. Governance can be an important part of the strategy for a country and a government to ensure the continuing development of the ports and deal with the different situations that might occur in the future due to global changes. Governance deals with how the government manages the regulation regarding ports and how they spend the available resources to improve the quality and efficiency of the ports. However, due to the nature of the concession that Is given to APMT to build and operate the new Moin terminal for the next 30 years, it will be impossible to change the way the government influences the operation of the port. Therefore, this section will start with a short analysis of the strategy of the government concerning the new terminal. After that possible strategies for governance of the area surrounding the port are presented, which later will be applied to the current situation of Costa Rica. If these strategies are applied correctly, the positive effects of the Moin terminal on the Limon region and even on the country as a whole can be strengthened. The focus of this section is not on the infrastructural governance, but more on the economical and social governance. The infrastructure will be addressed in the foreland and hinterland sections.

12.4.1 Moín port governance

The World Bank outlined different port administration strategies in which the responsibility of the infrastructure, superstructure, port labour and other functions differ per strategy. The four models are called the service, tool, landlord, and private port model (World Bank, n.d. B).

Table 21 shows the allocation of responsibilities for each of the different models.

Table 21: Allocation of responsibilities for the port models (Brooks M. , 2004)

Model ➔ Responsibility ➘	**Service**	**Tool**	**Landlord**	**Private**
Infrastructure	Public	Public	Public	Private
Superstructure	Public	Public	Private	Private
Port labour	Public	Private	Private	Private
Other activities	Majority public	Mixed	Mixed	Majority private

In this table, with the infrastructure the land and all other infrastructure on sea level is meant. The superstructures are all the structures above sea level, such as the cranes, warehouses, and rail infrastructure. When reviewing the current Costa Rican situation concerning the contract awarded to APMT, the chosen model is a crossover between the landlord and the private model. The infrastructure, in this case the land, is owned by JAPDEVA, a governmental organization. They rent out this land to APMT as part of a 30 years concession. Part of this concession is that APMT builds the port infrastructure and superstructure, which then is privately owned by APMT until the end of the concession. After the concession these structures become property of JAPDEVA. The jobs to be created are filled in with people assigned and schooled by APMT and are therefore private. The other activities on the terminal are managed by APMT, but have to be within the rules set in the concession with JAPDEVA. Because of the tariff barriers and other rules set in this concession, the model used is not completely private. In the private model, the prices are completely set by the private organization. Therefore, the other activities are more a mix of private and public than a majority private. The advantages of the landlord model as mentioned by Brooks (2004) are the ability to adapt to new market conditions and higher efficiency since the operator is also the owner of all the equipment used in the port. The downside is that it requires coordination with the public landowner on who is doing the marketing and planning. In the Moín case, this is all done by APMT and therefore handled properly. For the private service model, the advantage is the lower tariffs due to market conditions, but a port regulating and operating may lead to abuse of the natural monopoly position.

Baird (2000) presents another way of defining different port models. First, he defines three functions that are performed in all ports; the regulator, landowner, and utility function. Who performs each of these three functions defines in which category the strategy of the government concerning the specific port is placed. Table 22 shows the activities belonging to each of the mentioned functions in ports (Baird, Port privatisation: Objectives, extent, process and the U.K. experience, 2000).

Table 22: Activities belonging to different port functions

Regulator	**Landowner**	**Utility**
Laws & regulations Port police Emergency services Licensing port works Ensuring competition Customs Port planning & monitoring	Manage port estate Port policy & development strategies Civil engineering works Marketing & promotions Maintain channels Maintain wharves Provide land access	Cargo handling Towage Line handling Waste disposal Security On-dock warehousing Equipment maintenance

When these activities are applied to the new Moín terminal, it is clear that APMT performs the utility function, and even though it is not landowner, they also perform this function for the time of the concession. The activity; provide land access is not performed by APMT. As a part of the concession, this will be done by the government in the form of a new to be built road. For the regulator function it is harder to determine who mainly performs it, since the activities are divided between JAPDEVA and APMT. The government makes laws, but both private and public parties can impose regulation for vessels in the harbour. The tasks regarding customs are divided between APMT and the government. APMT provides the material and the government institutions concerned with customs will check the in- and outgoing containers. Therefore, both the public and the private party perform the regulator function. A distinction between the approach of Baird (2000) and Brooks (2004), which was described in the previous paragraph, is that Baird also deals with specific activities in determining the amount of privatization of the port of concern.

What can be derived from the two models, concerning the new Moín terminal is that the effect of the governance structure chosen by the government is likely to result in an efficient port. This is mainly because the main goal of a privatised company is to gain profit from the project and will therefore try to be as cost efficient as possible. The main danger of the privatization is that the monopoly position gained by APMT will result in large profits for the company, of which only a small percentage will flow into the Costa Rican economy. Another weakness of the governance structure is that the power given to APMT with the monopoly position could be abused. However, due to the properties of the concession contract, Costa Rica will also benefit from this concession since it will give them a new modern port (after the concession) that is already connected with other ports around the world. Also, a set percentage of the profit of APMT will be paid to the Costa Rican government. The abuse of power is also very unlikely, since APMT can only benefit from this port if it is operated properly and if they follow the agreements made in the concession contract.

12.4.2 Governance of the port area

This section will deal with the area surrounding the major ports, and how this area can be governed to increase the impact of the new and existing ports. This impact can ensure the development of the Limon region and will, when implemented correctly ensure new jobs and a higher welfare for the inhabitants of the region (Zhang, 2008). When the new Moín terminal becomes fully operational and the hinterland is managed correctly, the whole Costa Rican nation will benefit from it, apart from the benefits it will bring Costa Rica after the concession when the terminal is handed over to the government. Many current cases show that in order for private parties to help in the development of the region, they demand economic benefits from the port. Examples of this help in developing the region are supporting new infrastructure and port expansion (Haezendonck, Dooms, & Verbeke , 2014). This section will identify possible governance structures to ensure the involvement of these private parties in the development of the region. Also, strategies to make the region more attractive as a main base for companies will be identified. Later the strategies will be applied to the current and possible future status of Costa Rica, and a strategy for the country can be chosen in the different future scenarios. An interesting thing to notice is that the current port authority, JAPDEVA is also the institution responsible for the development of the region in which the current Limon and Moín ports are located and where the new terminal is currently being realised.

Port Hinterland Impact matrix

First a more general approach to hinterland governance is introduced. The concept is designed by Haezendonck et al. (2014) and is called the Port Hinterland Impact (PHI) matrix. This matrix can be used to determine the impact of a port on the hinterland, and therefore on what strategies could be applied to manage this mentioned impact. When implemented correctly the matrix can be a tool for support in establishing the right forms of contracting between the port authorities, government and economic stakeholders in the region (Haezendonck et al., 2014). Figure 61 shows the empty matrix, consisting of two variables; the geographical reach, and the dependency on the port. When the economic actors are placed into this matrix, an image is created of the area the port influences and of how dependent the different stakeholders logistical chains are of the port. A larger dependence on the port means that it is harder or more expensive to find a substitute if the port is out of order. The matrix has different applications; the one most suitable for Costa Rica is to place the different export products in the matrix. This will create an image of which products are most important to the port and where the most value is created in the area the port provides it services to. When this image is created, future strategy can be adapted to the most important stakeholders in the region. Also, opportunities can be identified to involve stakeholders currently not or very limitedly involved in the port region.

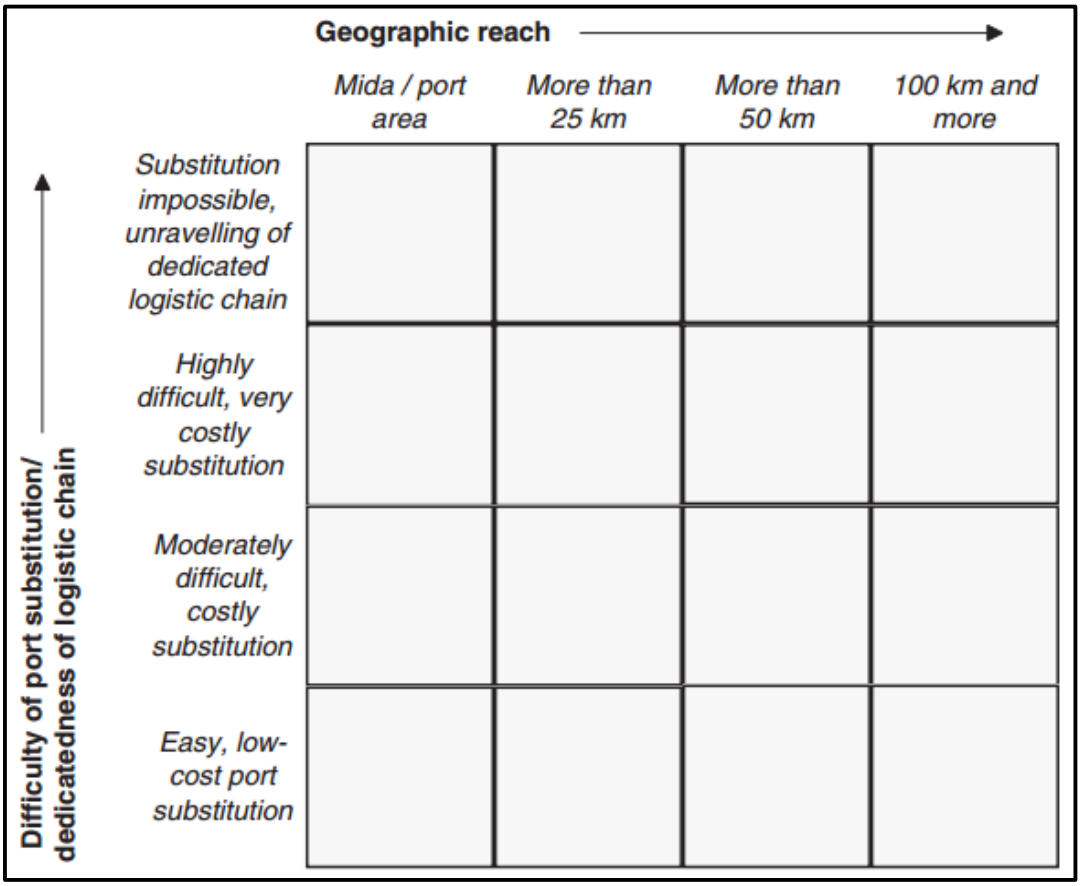

Figure 61: Empty PHI matrix

Governance strategies

When the position of the different product value chains is clear, strategies to manage them have to be applied. There are several possibilities to do this, which will be described now.

The first strategy to connect the authorities and the economic stakeholders is derived from the co-management strategy. Co-management involves the formation of a management structure between the producers and users of resources and the local government(s). The OECD (2001) gives the following definition for co-management: "*Co-management is a process of management in which government shares power with resource users, with each given specific rights and responsibilities relating to information and decision-making*" This structure can also be applied on hinterland governance. The co-management structure is this case is a area management form where the government collaborates with economic stakeholders and helps them to establish themselves in the hinterland of the major ports. In order to do this, an environment must be created in which the companies feel that it will be beneficial to move their assets. The government can help create this environment in the hinterland of the ports by identifying the needs for the companies that produce or add value to the most important export products of the port concerned. Schmitt, Gleason, Pigozzi, and Marcus (1987) mention the most important factors for business relocation and for a viable business environment. These factors are: Distance and labour considerations and tax considerations. This means that enough labourers have to be available who are skilled enough to perform the tasks needed for production. Also, there is an economical motive, which seems logical since the main goal of the economic actors if making profit from their goods. Another factor derived from the distance factor is the infrastructure, if there is no proper infrastructure to move the goods to their point of destination, in this case the port, there will be economical disadvantages. These disadvantages will be harmful for the competitive position of the companies and the country. If the government can establish a form of cooperation with the economical stakeholders to improve these factors in the hinterland, its accessibility will increase.

Whereas the first strategy is focussed on relocation the current companies to the hinterland of the ports. The second strategy is focussed on attracting producers of products that currently are not being exported. The attraction of new product groups to a country can be a way to deal with the problem of the cultivation limits on some of the exported goods. The easiest way to do this is to get companies to outsource their activities to Costa Rica. In order to establish this, the strong suites of the country have to be exploited to make the country the most attractive country to invest in. If a country is the most attractive in the region, it is more likely that a company will move its production over there. Once again, these companies need a workforce that is sufficiently schooled and trained and infrastructure is important for them to be able to quickly move their products to the ports to ship them. For Costa Rica specifically this strategy can be interesting since their main export products are bananas and pineapples, which deal with a limitation on the maximum production. The new Moín terminal has a plan to grow and move more and more containers over time. By making the country more interesting for foreign companies, the growth in container movement can be realised. Lui, Feils, and Scholnick (2011) notice that one of the main reasons to outsource to other countries is the institutional quality of a country. Political stability, Government effectiveness, rule of law concerning businesses, corruption and regulatory quality are all factors that determine the institutional quality in a country (World Bank, 2015b). When reviewing these factors for Costa Rica, one can see that the political stability in Costa Rica has declined since the beginning of the 21th century. The governmental effectiveness and the regulatory quality have slightly improved but still are far behind the western countries. When comparing Costa Rica to other countries in the region they score much higher than Panama and Nicaragua on almost all factors. The best scoring country in the region is the Bahamas, scoring almost as high as the USA and the leading European countries.

13 Case studies: Barcelona and Rotterdam

In this chapter two cases studies are used to show how different strategies are applied to world-class ports. The first case study (§13.1) is about Barcelona and focuses mainly on hinterland strategies. Paragraph 13.2 is a case study of the Port of Rotterdam and has the focus on hinterland, foreland, and inland terminals.

13.1 Barcelona (de Langen & van den Berg, 2011)

The case study regarding the port of Barcelona is interesting because it is one of the few cases where a port authority plays such a leading role in the development of hinterland accessibility and activities. Even though in this case it is the port authority that plays a leading role, it is still a good case study of hinterland strategies conducted, regardless of the leading actor. The case study is conducted by de Langen & van den Berg (2011).

The focus of the port authority of Barcelona from only the port to the hinterland as well was conducted in three consecutive strategies. First the port area was to be developed and expanded. This created a platform where cargo could be transferred between various modes of transport in a reliable, fast and efficient way. Secondly, the hinterland network was developed. Hereby it differentiated itself from other ports by creating a network of services to connect the port and its hinterland. Thirdly, the supply chain of the port was developed. This led to a more efficient supply chain of the customers, by means of infrastructure and services to the hinterland and the removal of barriers to use the port.

The first plan was to expand the port in order to facilitate larger volumes. The port authority also came to the conclusion that it could attract cargo from outside Catalonia, which it did not do before. In the first plan this was conducted by promotional activities. The port authority invested in people to promote the port of Barcelona in the hinterland, acquired knowledge about the difficulties, help with possible difficulties and providing information for various logistics related aspects. These people acted as customer service of the port, and were located in various cities around Barcelona where the port wanted to increase its market share, such as Barcelona, Madrid, Zaragoza, Toulouse and Lyon. These representatives of the port authority also researched potential new geographic markets.

The consecutive strategic plan was to develop various logistic facilities. This had to be done because the port authority discovered that the market did not initiate new activities, even though they seemed to be commercially viable and beneficial for the port. The market because of risk, capacity constraints or lack of management attention did not initiate these activities. This made the port authority realise that it had to take a leading role in the development of these logistic facilities. As a consequence, the port authority invested in the rail terminal in Zaragoza, a new intermodal terminal close to Figueras and the logistics zone in Perpignan. Hereby, a platform was provided to start developing logistic services that attracts maritime cargo flows.

The third step of the port authority was to enhance the hinterland connections. This is performed by connecting the hinterland terminals by rail shuttle. The port authority of Barcelona invested in this context in a rail shuttle to Lyon, which was outside the traditional hinterland of the port. This was an example of a project, which seemed commercially viable, but was not undertaken by the market; therefore, the port authority decided to invest in the rail shuttle themselves to improve the hinterland connection.

One particular project conducted by the port authority will be featured here. It was the first project where the port authority of Barcelona participated in the hinterland. It contained the development of a container depot at first and a rail terminal later, in Zaragoza. Zaragoza is a city, which lies in between the economic centres Madrid, Barcelona, Bilbao and Valencia. Therefore, it is ideally suited to act as a logistics hub. The port authority at first developed a container depot, which provided forwarders and hauliers the possibility to combine traffic and increase productivity due to economies of scale. This turned out to be a success, and soon it became clear that to ensure the connectivity between the port of Barcelona and Zaragoza, investments in the rail terminal had to be made. The port authority was a major party in the investment of the rail terminal of Zaragoza. Nowadays, the rail terminal in Zaragoza serves a hub for trains going to Madrid and empty containers coming from Madrid. Furthermore, additional logistic services have developed in the vicinity of Zaragoza.

13.2 Case Port of Rotterdam

The port of Rotterdam is an interesting case study because it is one of Europe's main (container terminal) ports. It serves a vast hinterland, reaching inland Europe such as Germany, France, Austria, Switzerland, and further, but acts as a hub for entire Europe as well. It is connected by various transportation modes, such as road transportation, rail transportation, barge connections, short-sea shipping and pipelines. In 2014, The World Bank ranked the Netherlands as the country with the best port infrastructure in the world. The port of Rotterdam, being the major port of the Netherlands, played a huge part in this. In this subparagraph, various concepts applied by the port of Rotterdam will be discussed. First its foreland network will be discussed, followed by the hinterland connections and its inland terminals.

Rotterdam is the largest port of Europe, and with a throughput of almost 12.3 million TEU's in 2014 it was ranked as the 11th largest container port in the world (Port of Rotterdam, 2015a). Around 1/3rd of the container throughput was feeder throughput and therefore classified as transhipment, while 2/3rd of the containers was going to or from the hinterland (Port of Rotterdam, 2015b). Its main competitors in the region are typically in the Le Havre – Hamburg range, containing the ports of Hamburg, Bremerhaven, Antwerp, Wilhelmshaven, Amsterdam, Zeeland Seaports, Ghent, Zeebrugge, Dunkirk and Le Havre. Of these ports, the first three are the largest container ports.

13.2.1 Rotterdam foreland

Rotterdam is due to its nautical accessibility (depth) a major gateway to Europe on the worldwide container network. All the major deep-sea shipping lines call at the port of Rotterdam, and it is connected to over 1000 ports worldwide.

As stated before, 1/3rd of all the containers handled in Rotterdam are being transhipped. Rotterdam, as its competitors, serves as a hub for the Baltic States as well as many other locations in Europe. Mainline vessels are connected to these hubs, from where feeder services connect the hubs to for instance the Baltic States. This option is opted for because the geographic location of the Baltic states longs for a long diversion distance and the nautical accessibility of the Baltic states is limited (Rodrigue & Notteboom, Foreland-based regionalization: Integrating intermediate hubs with port hinterlands, 2010). Other locations, which are connected to the port of Rotterdam by feeders are for instance the UK, Ireland, Spain, Portugal and Scandinavia (Port of Rotterdam, n.d. A).

13.2.2 Rotterdam hinterland connections

Rotterdam is well connected to its hinterland by barge, rail and road. In 2014, the modal split for maritime container destined to or from the hinterland was 35.7% barge, 10.9% rail and 53.4% road (Port of Rotterdam, 2015b). It is the port's goal to achieve a maximum of 35% of all containers transported to the Maasvlakte by road, with a share of 20% via rail transportation and 45% via barge transportation (Port of Rotterdam, 2011). In 2014, the modal split for containers transported over road to the Maasvlakte accounted to around 45% (Port of Rotterdam, 2014).

An interesting concept being encouraged by the port authority of Rotterdam is that Rotterdam is often the first stop in Europe for international shipping lines as well as the last stop in Europe. Due to its excellent hinterland connections, the cargo can be on its way to the final destination before the vessel is on its way to the next port. The opposite is true as well, the cargo can be send later to the vessel from the expeditor, because the vessel will call at Rotterdam as the latest stop in Europe (Port of Rotterdam, n.d. B).

The port of Rotterdam has various rail connections to destinations all over Europe. Rail connections provide a fast, efficient, reliable and sustainable transportation mode, and are best suited for long-distance and large volume cargoes. Over 250 weekly intermodal rail shuttles serve the Port of Rotterdam, transporting containers, dry bulk, general cargo and chemical goods. Many of the various terminals in the port have their own rail terminal, which makes it possible to load cargo from the sea-terminal onto the train immediately. Furthermore, a dedicated cargo railway line serves the port to Germany (Betuwelijn). This ensures a fast and reliable connection to Germany, leaving the port at only three hours from the border (Port of Rotterdam, n.d. C). Figure 62 shows the amount of rail connections in the hinterland of the Port of Rotterdam.

Figure 62: Hinterland rail connections of the port of Rotterdam (Port of Rotterdam, n.d. C)

Inland waterway connections provide in a cheap and sustainable way of transporting large volumes of cargo, with low costs as well as low CO_2 emissions per ton transported cargo. Rotterdam is located at the mouth of both the Rhine as well as the Maas,

providing connections to entire Europe, such as Germany, Austria, Belgium, France, Switzerland and so on. High-frequency shipping lines are available from Rotterdam to all these destinations, making it a reliable transportation mode. Even though somewhat slower than for instance rail transportation or road transportation, destinations in the Netherlands, Germany and Belgium can be reached within a day, with Switzerland being four days sailing away. Figure 63 shows the barge connections the port of Rotterdam has within Europe (Port of Rotterdam, n.d. C).

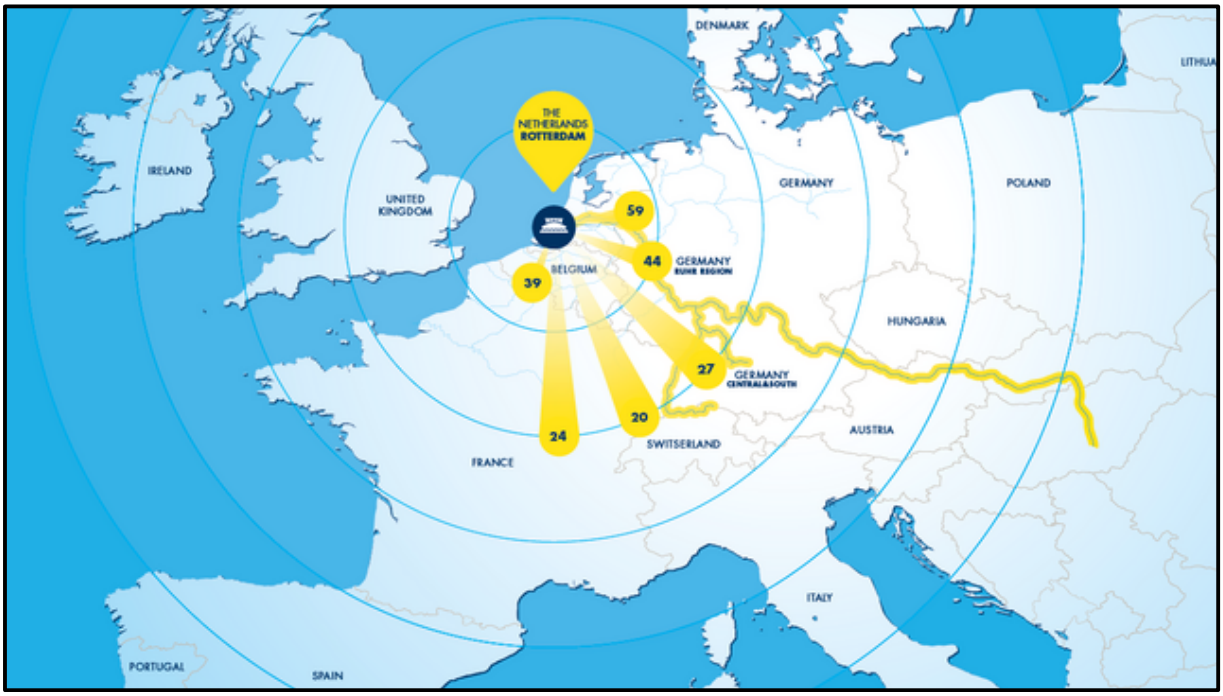

Figure 63: Hinterland barge connections of the port of Rotterdam (Port of Rotterdam, n.d. C)

Road transportation is still the dominant transportation mode for containers going to or from the port of Rotterdam. Road transportation generally is the transportation mode for fast transportation over short distances, as well as the so-called last mile transportation. For the Port of Rotterdam, it is mainly used for the transportation of containers in the Netherlands (90%), with 40% of all containers staying in the Rotterdam area. Only 10% of containers transported via road leave the country. It is the Port of Rotterdam's goal to reduce the amount of containers transported via road transportation, since it is the least environmentally friendly transportation mode for hinterland transportation. The Port of Rotterdam is well connected to the national and European motorway network via motorway A15, which leads to Germany (Port of Rotterdam, n.d. C).

13.2.3 Rotterdam inland terminals

A lot inland terminals and container depots exist in Europe serving the Port of Rotterdam. Most of these inland terminals provide intermodal connections and facilities, making intermodal transportation to the port possible. These inland terminals differentiate from each other by the accessibility & connectivity to the Port of Rotterdam (inland shipping/rail connection), services provided (a.o. warehousing, reefer connections, tank cleaning etc.), safety & security, customs and ICT systems (EDI and track & trace). The terminals and container depots are located all over Europe, mostly along an inland waterway connection to the port or large economic centres. Some inland terminal act as an extended gate of the Port of Rotterdam, which means all necessary

administrative handlings (customs) can be performed at the inland terminal instead of at the terminal in the port itself.

The port of Rotterdam authority has its own intermodal initiative, called InlandLinks. This maps all the inland terminals connected to the port of Rotterdam, and has a function to match terminals with customers based on their needs. At the moment of writing, 88 inland terminals were mapped with full information regarding their connectivity to the port and the services offered, while an additional 188 inland terminals were mapped with lacking further information (InlandLinks, N.D.). Figure 64 gives an overview of the inland terminals for the Port of Rotterdam as mapped by InlandLinks.

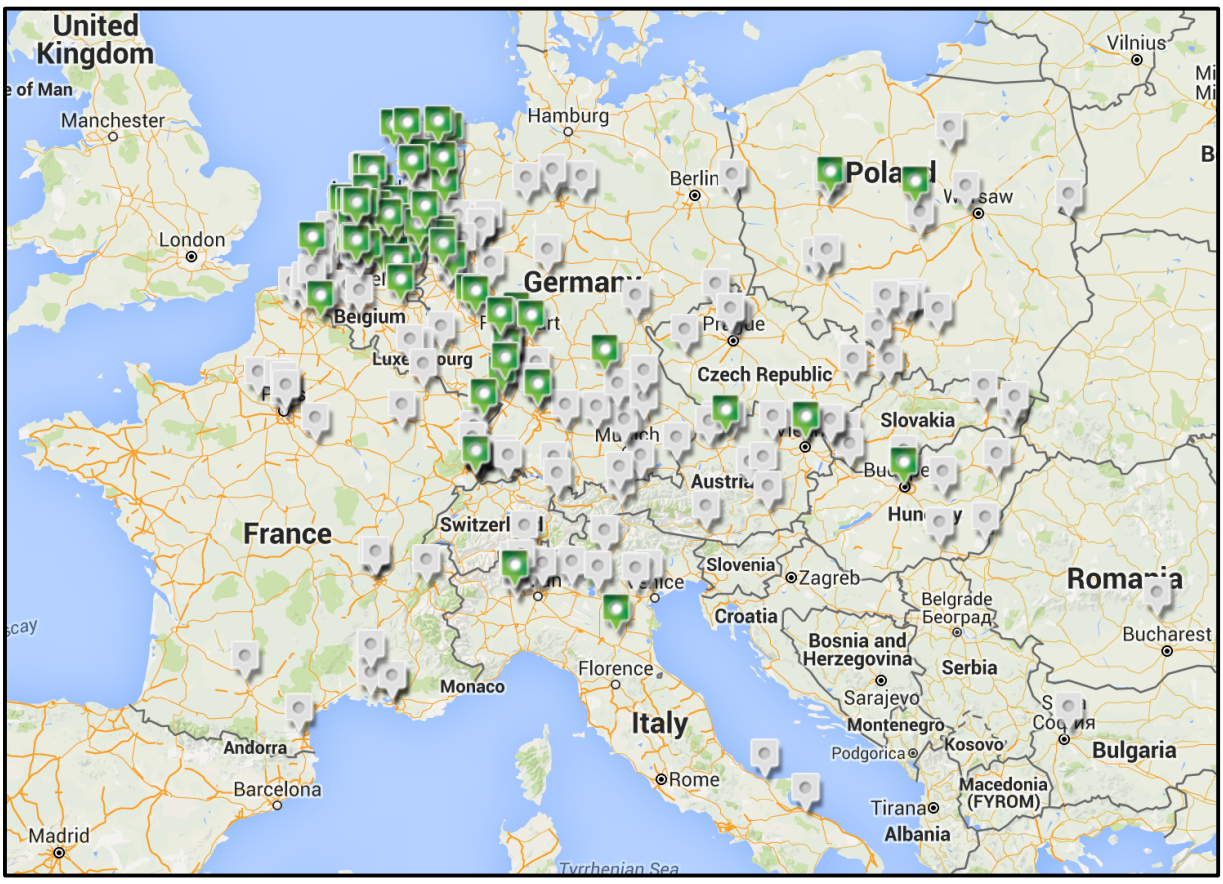

Figure 64: Inland terminals for the Port of Rotterdam, as mapped by InlandLinks (InlandLinks, N.D.)

The port authority of Rotterdam has, just as the other port authorities in the Hamburg – Le Havre range, made a lot of effort for the hinterland-based regionalisation of the port, in order to serve the hinterland regions in Western Europe and Central- and Eastern Europe. It has developed market intelligence of the hinterland markets and has developed partnerships with region in the hinterland. It also has 'Rotterdam representatives' in the hinterland, in cooperation with other firms from Rotterdam, whose main task it is attract cargo for the Port of Rotterdam (de Langen & Chouly, 2004).

Container transferium concept

A recently implemented concept, supported by the port of Rotterdam, is the container transferium concept. This concept originates from passenger transportation. A transferium is a transfer facility, usually located along a motorway at the edge of a city,

where people from outside the city park their car and use public transportation to reach the centre. Being part of the policy to reduce the modal split of road transportation transporting containers to and from the Port of Rotterdam, this container transferium is located along motorway A15, east of Rotterdam. Here, truckers can leave their container as well as picking up a new one. It works as an extended gate of the port, with all kinds of facilities such as paperless customs, full service maintenance & repair depot and a gas testing station. With 75% of the containers from the Maasvlakte, which leave Rotterdam by truck passing the transferium, it can save truckers a return trip from the transferium to the Maasvlakte (60 km one-way) over the congested motorway A15. This can save up to 4 hours (including terminal handling time). The containers are delivered to the correct terminal in the port within a day by barge. With this new container transferium concept, the Port of Rotterdam tries to relieve the congestion around Rotterdam and especially on motorway A15.

14 Suitable strategies for Costa Rica

In this chapter two strategies are identified that match opportunities found in the confrontation matrix. The strategies provide ways to gain additional economic advantages for Costa Rica by improving its logistical system, as was stated as the main focus in the research question in paragraph 1.2: *In what way can Costa Rica improve its logistical system to gain additional economic advantages, while matching future development in maritime transportation?* Furthermore, measures to execute the strategies that enhance the country's strengths, decrease its weaknesses and diminish the power of threats as were derived from the confrontation matrix are discussed. The measures are based on the findings of the examined literature in chapter 12. The Port Hinterland Impact matrix is used to analyse the reach of Costa Rica's ports in the hinterland and underpin the importance of these connections in the strategies. The first strategy focuses on enhancing Costa Rica's strength of the *production of export goods* as identified in the confrontation matrix. The accompanying measures focus on minimising the negative effects of the *loss of manufacturing industries* and *competition of other countries,* which are identified as the largest threats of the *production of export goods*. The second strategy entails to become a regional hub and gateway to Central America. Especially Costa Rica's strength of being a *gateway to Nicaragua* can be maximised upon realising a hub status in the Caribbean region. Many identified opportunities can be linked to the execution of this strategy, of which the *expansion of the Panama Canal,* the increasing *global trade* and the benefits of TCM (most prominently, *accessibility of larger vessels* and *increase in container handling capacity*) are most important. The main threats in the light of a regional hub are *future developments of the Panama ports* and *other and current Caribbean ports.* The measures included in the regional hub strategy are focused on improving Costa Rica's position in international trade by taking care of the countries weaknesses and the opposed threats of neighbouring ports. Both strategies are discussed in detail in respectively paragraph 14.2 and 14.3. After explaining the strategies in depth, the strategies are applied to the scenarios as presented in chapter 11. For each scenario the application of a certain strategy (or a combination of measures) is advised and explained in paragraph 14.5. The chapter concludes with an indication of the robustness of the proposed strategies and the advantages that can be derived from their application.

14.1 Determining the hinterland reach of ports

To be able to determine the opportunities for Costa Rica in facilitating a significant hinterland, the Port Hinterland Impact (PHI) matrix is used. As was explained in paragraph 0, Costa Rica's export products need to be placed in the matrix to determine their importance to the port and the dependency of their origin regions to the port, Table 23. As the analysis focuses on export products, the Moín region is considered in the analysis as the main port area. Since Caldera's export numbers are significantly lower. Figure 65 shows the origins of Costa Rica's most important export products.

Table 23: PHI matrix filled in for Costa Rica

Difficulty of port substitution/dedicatedness of logistic chain \ *Geographical reach*	**Mida/port area**	**More than 25 km**	**More than 50 km**	**100 km and more**
Substitution impossible, unravelling of dedicated logistical chain	Bananas Pineapples	Bananas Pineapples	Bananas Pineapples	Pineapples Other fresh fruits Processed fruits
Highly difficult, very costly substitution				Beef, agricultural products Nicaragua
Moderately difficult, costly substitution				Medical equipment Electronics
Easy, low-cost port substitution				

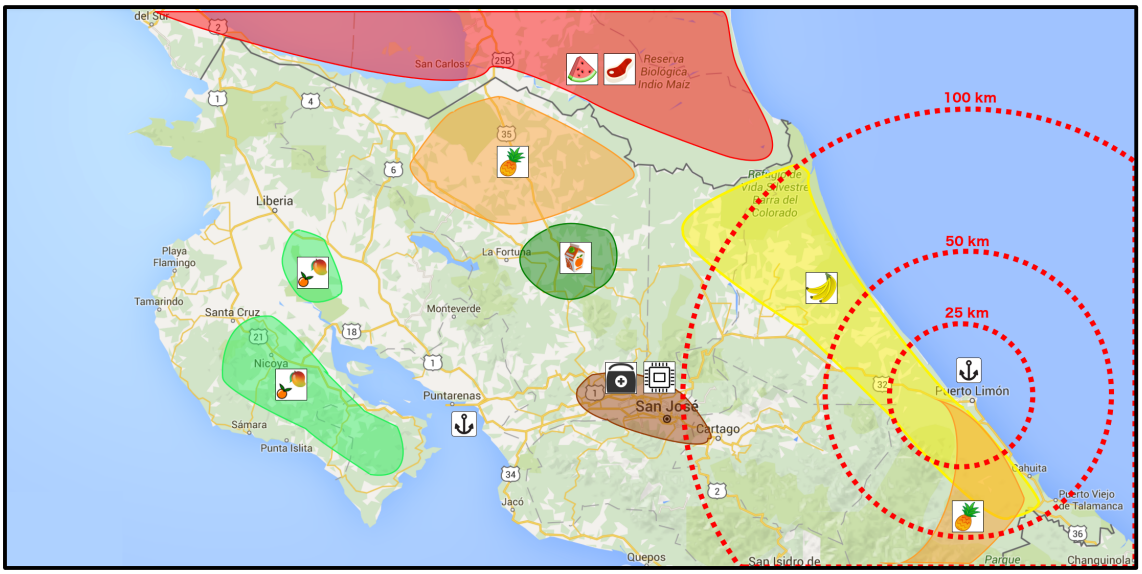

Figure 65: Map showing locations of export products

14.1.1 Costa Rica

From Costa Rica a variety of products is exported. In volume, the agricultural sector provides the largest share, while medical equipment and electronics generate the highest value. Bananas are mainly produced in the eastern part of the country, in or near the Limón region. Pineapples are more widely spread throughout the country, located in the northern region and near and Panamanian border. Other fresh fruits, vegetables and processed fruit products are mainly produced in the northern region of the country and some in the northwest near the Nicaraguan border. As most products are destined for European and U.S. East Coast ports, the port in Moín provides the most direct connection. No other Atlantic ports are better accessible or provide advantages over Puerto Limón/Moín and TCM. Industry is primarily located in the Gran Metropolitan Area (GAM), where electronics and medical equipment is produced. Larger medical equipment and electronics are generally shipped from Limón/Moín. However, the

unreliability of Route 32 due to land slides and slow terminal processes pose large disadvantages for the seaport. Due to the high value of especially medical products, producers often decide on transportation via the Juan Santamaría airport in the Central Valley region instead of maritime transportation. As transportation time to the destination market plays a larger role with high-value products, a fast and reliable connection from producer to port, smooth handling of border processes and fast loading/unloading of cargo are important to be able to compete with the airport.

14.1.2 Nicaragua

It is important to have a good connection to Nicaragua, for the transportation of current goods (e.g. frozen ground beef and watermelon) but especially following the trend of agriculture production slowly moving over the border due to lower labour costs. Agricultural products remain the main share in volume handled at the Moín terminal, and are expected to be as well for TCM. Nicaragua could decide to take goods to Honduras for transport to the U.S. East Coast and European markets. Puerto Cortes is the first Atlantic container port of a decent size (other than Moín) reachable from Nicaragua. The port facilities are limited and port maintenance is insufficient to repair damages of natural disasters to the docks. The port offers accessibility to 2,490 TEU size vessels with a berth depth of 10.5 meters, 800 meters quay and a Panamax size crane. It is known to have several administrative and infrastructural bottlenecks, including slow export procedures, poor coordination of border authorities and entrance congestion. Furthermore, although the distance is roughly similar to Moín, current road connections are poor and border crossing takes on average 9 hours, whereas Nicaragua-Costa Rica takes around 3 hours (World Bank , 2012b). Given the infrastructure conditions it would not be beneficial for Nicaragua to ship via Honduras, especially when TCM offers better terminal facilities. However, the tense relationship between Nicaragua and Costa Rica could influence decisions of producers and freight forwarders.

14.1.3 Dependency of the hinterland

Based on the analysis of the PHI matrix it can be derived that most products are highly dependable on TCM as substitution is almost impossible. Especially agricultural products like fresh and processed fruits are bound to use the TCM. Costs to transport to other ports are too high and the goods too perishable for the extra transportation time. Furthermore, costs of air transportation cannot be compensated by the relative low value of the products. Opportunities exist for TCM to compete with the airport to attract medical equipment and electronic devices. However, as long as reliability and fast travel times cannot be offered it is not hard for producers to stick to air transportation. Finally, With TCM Costa Rica has the best and closest terminal for Nicaragua on the Atlantic side. Nicaraguan goods will be easier transported via Costa Rica than neighbouring ports, however the political relationship with Nicaragua plays an important part in the ease of crossing the border.

It can be concluded that the hinterland of TCM is quite stable as there is a low risk of competition of neighbouring ports. However problems with the deficient transportation network can negatively influence the amount of cargo transported, as congestion and long border crossing times increase transportation costs. It is recommended that Costa Rica improves the (use of) infrastructure in the Limón area, the northern region and the connections to Nicaragua.

14.2 Strategy 1: Attractive investment climate

One of the strategies for Costa Rica to gain additional economic advantages is to have an attractive investment climate in the region. In this manner, the current *production of export*

goods (which has been identified as one of the main strengths of Costa Rica) can be expanded (to services as well) and exploited. This direction of strategy is supported by at least two of Costa Rica's opportunities, namely the trend of *near-sourcing* and the *benefits of the new container terminal in Moín*.

The trend of *near-sourcing* has been identified as the main driver of this strategy. As has been mentioned in the SWOT analysis, paragraph 8.3, predominantly businesses from the United States which have been outsourcing part of their processes to Asia (mainly China), are looking to outsource their activities closer, geographically and culturally spoken, as well as time-zone wise.

Expansion of the production of export goods and services is made possible by the construction of the new container terminal of APMT. Due to this new container terminal, the container handling capacity of the country is enlarged by a factor 2.5. While the container terminal specialises in the transportation of Costa Rica's main export goods (fruits), it also offers possibilities in transporting other goods.

In pursuing the strength *production of export goods*, two main threats have been identified which can have a negative impact for gaining additional economic advantages; *loss of manufacturing industries* and *competition of other countries*. The goal is to minimise the effect of these two threats, by having an attractive investment climate and thus attracting companies to Costa Rica. In §12.4 three factors have been defined upon which companies base their decision whether or not to relocate their business. These factors are the human resources, the logistical situation and the ease of doing business. These three factors form the main body in the strategy to make Costa Rica a more attractive investment climate compared to their competitors, and will be discussed in the following paragraphs. Specific measures will be given and discussed when possible.

14.2.1 Human resources

In order to attract companies to relocate their activities to Costa Rica, it is important to have a large enough, skilled labour pool. The activities of the companies forming the near-sourcing trend will require skilled people, since Costa Rica cannot compete for the unskilled jobs due to its high labour costs. Costa Rica already altered their focus from the agricultural sector towards the electronics and medical markets after noticing the high competition on unskilled jobs in 1993 (Roett & Guadalupe, 2008). The government focused on increasing higher education facilities in the country, and from a World Bank study it can be derived that the Costa Rican population is generally higher educated than in other Central American countries (World Bank, 2012a).

However, Costa Rica currently copes with a shortage of high skilled workers, mainly within several disciplines of engineers, administrative assistants and sales representatives with a fluency of the English language (CentralAmericaData.com, 2013). A report of the Manpower Group in 2013 indicated that 30% of the companies in Costa Rica encountered problems filling their vacancies, because of the gap between the demand of companies and the labour supply (CentralAmericaData.com, 2014b). This fact also comes forward in the Global Services Location Index performed by ATKearney (ATKearney, 2016). This index poses to "bring rigor to companies' decisions about where to locate offshore operations". Costa Rica ranks as the 19th country in this report, with the factor 'people skills and availability', accounting for 30% for the index, lagging significantly behind compared to the other countries as well as to the other two factors

accounting in the Global Services Location Index. Main competitors for Costa Rica on this ranking are Brazil (4th), Mexico (8th), Chile (9th), Columbia (20th) and Panama (31st).

For Costa Rica to make use of the near-sourcing trend and to attract companies to the country, it is therefore very important to match supply of workforce with the demand from the market. The following measures are examples of how to decrease the gap between the demand and supply of the workforce:

Education tailored to the needs of the market

One of the ways to decrease the gap between demand and supply is for educational institutions to educate students for the right jobs. Hereby communication between the businesses and the educational institutions is of vital importance. Educational institutions need to adapt the curricula to the talent needs, and need to gain expertise herein themselves if necessary.

An example of a country, which has employed this measure is Mexico. Mexico is a competitor for Costa Rica as another attractive location in Central America for near-sourcing. Mexico focuses on the consumer electronics sector, mainly the manufacturing of audio and video devices, telecommunications and computer equipment and its parts. With its export potential the sector is rapidly increasing and back in 2011 already representing the second largest exporter to the U.S. What has been helping Mexico by achieving the production of so many consumer electronics is the fact that many people are educated for those activities. Every year 114,000 engineering and technology graduates enter the job market, making Mexico an attractive location for these skilled activities (PR Newswire, 2011).

Matching businesses to right locations

Besides having the right people for the job, it is also important for both of them to be in the same location. Hereby, communication between companies and an institution, which has an overview of the country and its characteristics, is necessary. In Costa Rica, such an overview could be given by CINDE.

COMEX is currently developing a model, based on human DNA, which maps the characteristics of all locations in Costa Rica. Making use of an intelligent algorithm, this model then matches businesses to those locations, that suit their needs the best. In the model not only the human resources are taken into account, but also other factors such as proximity to gateways, infrastructure and relevant other firms (Fonseca, 2016).

Collaboration Free Trade Zones & universities

Another measure that could better match the demand of the companies with the supply of the workforce is improving the collaboration between Free Trade Zones and universities. Free Trade Zones are areas where investors can receive tax benefits when investing and establishing themselves in the zone. By a better collaboration between the zones and the universities, companies are easier linked with the skilled labour force. The students also get an easier possibility to gain practical experience, for instance by internships. This measure has already set in progress by COMEX (Costa Rica Hoy, 2015), but further extension can lead to even more benefits.

Language proficiency

In order to become an attractive location for foreign companies to relocate their activities in Costa Rica, a good English proficiency is vital. This is necessary in order to communicate well with other parts of the company or clients.

A better English proficiency can be achieved by incorporating English (more) in education. In this way people also get used to using English in their professional life. Hereby it is important to note that it is not sufficient to only have the materials used in English (such as course books), but to actively learn speaking and presenting in English, for instance by having full English education programs.

14.2.2 Logistical situation

Another factor, which has been identified as important for companies to relocate their businesses, is the local logistical situation. As has been the outcome of Part I, Costa Rica has relatively high logistical costs compared to the surrounding countries. This is partly due to the deficient transportation network, which has been found to be among others out-dated, congested and mainly dependent on road transportation. By improving the transportation network (and thus the logistical situation), Costa Rica can exploit its function as the gateway for Nicaragua even better and make better use of its geographical location. A weakness that has been identified, especially in relation to being a gateway for Nicaragua, is the political relationship with Nicaragua. This certainly affects being a successful gateway for Nicaragua and should be taken into consideration.

Of course, the logistical situation of Costa Rica is already being improved with the construction of the new TCM. This will also partly help in improving the security in the logistical chain, because APMT will maintain very strict and reliable safety and security regulations. However, it will only improve the security for the chain linked to the TCM terminal, and is not likely to help with the drug trafficking from south (Panama/Colombia) to north (Mexico/United States).

Further on, several measures will be discussed which can contribute to the improvement of the logistical situation of Costa Rica. It should be noted that these measures are directions for solving the problem of the logistical situation in Costa Rica; further research regarding their (financial) feasibility is necessary before implementation.

Improve Route 32

The route between San José and Puerto Limón (Route 32) is a critical link in the connection between the new TCM and the economic centre of the country. Currently, the route suffers from insufficient capacity as well as reliability issues. During the rainy season the road is often out of service due to landslides, virtually closing of Puerto Limón from the Greater Metropolitan Area of San José (GAM).

Even though there are plans for the expansion of Route 32 between Puerto Limón and the intersection with Route 4 (Pococí), it is not expected that this will solve all current problems. It will strengthen Costa Rica in being a gateway for Nicaragua, especially when the border crossing at Los Chiles and the new road "Tapon de Chilamate" (§4.1) are fully operational. But to solve the problematic connection between Puerto Limón and San José, expansion of Route 32 is also necessary between San José and Picocí. A 4-lane wide motorway is necessary in order for regular traffic not to be hindered by the slow traffic (large trucks). Better protection against landslides is necessary as well in order to resolve the reliability issues of the road. Figure 66 gives an overview of the already planned expansion between Puerto Limón and Pococí and the additionally needed expansion

between Pococí and San José. There are also other possibilities to match demand of traffic on Route 32 and the capacity of Route 32 without expansion. Examples are given in §12.2.1.

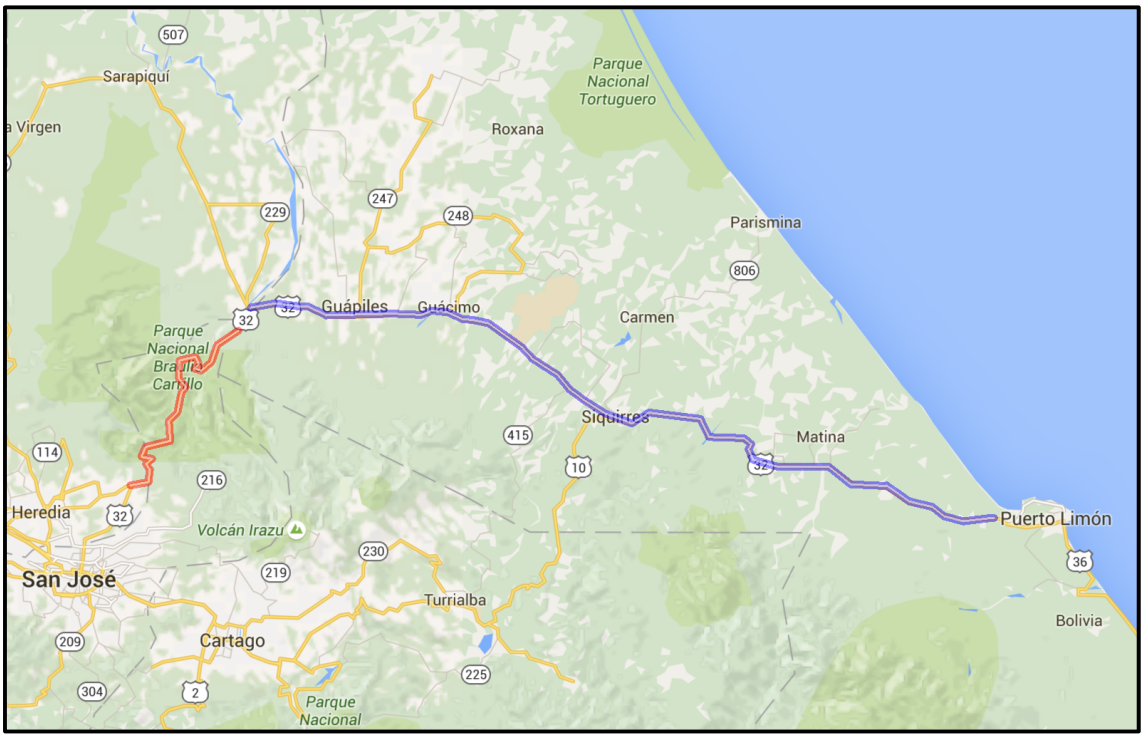

Figure 66: Planned expansion (blue) and additional needed expansion (red)

Coordinating the demand

Instead of increasing the supply of the infrastructure network, another measure in order to relieve the pressure on it is coordinating the demand. In paragraph 12.2.1, several measures have been identified that could help structuring the demand. For example, trucks could be allowed only to use Route 32 if they have a reserved slot on the terminal or freight forwarders could be charged extra for delivering containers during certain rush hours. However, these measures are not expected to be sufficient to solve the problem, and should be used as a short-term solution only since it does make doing business a bit harder.

Inland terminal

In order to ease the congestion problem currently being encountered in the GAM, the development of an inland terminal could be part of the solution. If there is one major inland terminal, all containers being received at the TCM could be transported there. Currently, many companies have their own terminal inside the GAM. It would be beneficial for all if there would be one location where all companies would be situated. Combining this location with other logistical activities such as distribution centres and warehouses can proof advantages. Large containers and large trucks would only be necessary on the connection between the inland terminal and the TCM, whereas at the inland terminal the containers would be transhipped onto smaller trucks, which can perform the "last-mile" transportation inside of the GAM. The inland terminal would become like a freight village, where economies of scale are being achieved. This could be stimulated with a Free Trade Zone policy, and the inland terminal could optionally act as an extended gate of the new TCM. With an extended gate of TCM, customs procedures could be handled at the inland terminal, being closer to the final destination. However,

since Costa Rica has a low security in the logistical chain already, further research is needed to see if the high security levels of TCM can be maintained in that case.

The challenge in this solution lies in the location of the freight village. It would need a good infrastructural connection to the new TCM, forming a logistic pole (§12.2.3). The infrastructure between TCM and the freight village should have enough capacity to handle the great amount of containers being transported. Furthermore, it would need to be relatively close to the GAM, in order to be more beneficial than transporting goods directly to the terminal. Specific locations, which have come up during the research to construct an inland terminal are between the GAM and Route 32. A downside of this location is that problems with Route 32 remain and the fact that land is scarce. However, if Route 32 is to be expanded through the national park, it is a good option. Another location, which has been brought up by one of the interviewees is at Orotina, close to the area where the new airport is planned. This location however lies all the way at the far side of the GAM seen from TCM, and would need serious infrastructure developments in order for an inland terminal to be beneficial for connection to TCM. Another location to be considered would be in the northern region of the country, especially if a (transatlantic) railway line would be constructed (more elaborated in the following paragraph). However, the connection between these northern regions and the GAM longs for serious infrastructural development as well. If the previous transatlantic railway could be reinstated and upgraded, probably the best location for an inland terminal would be east of San José in the Cartago area. But reinstating the old railway line between Puerto Limón and San José and making it fit for cargo transportation will be a difficult and costly task.

Figure 67 gives an overview of the discussed locations, with respectively the location along Route 32 (1), the location close to the planned new airport at Orotina (2), the northern region (3) and in the Cartago area if the old railway line would be reinstated (4).

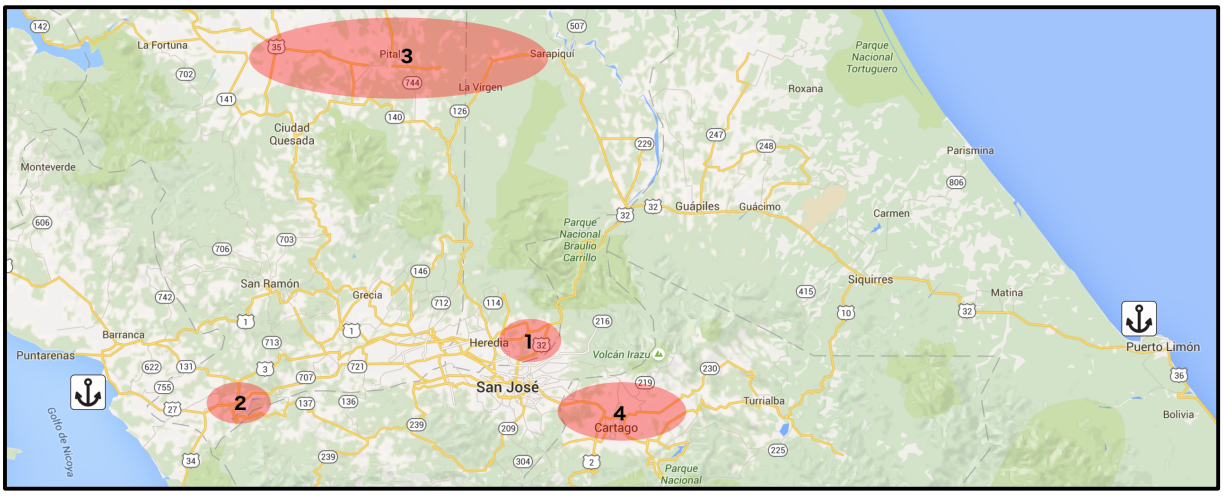

Figure 67: Possible locations for an inland terminal for TCM

Reinstating railway

As has been briefly discussed previously, one way to connect an inland terminal with the TCM would by rail. A good example of this can be seen in the port of Barcelona, see §13.1. By connecting the freight village with the port via rail, intermodal transportation can be offered, which can be beneficial in terms of relieving the congestion, and improving reliability and capacity. There are already some premature plans in construction a transatlantic railway line. These plans entail a railway line through the

northern regions of the country, because of its relatively flat landscape. Such a railway line could also pose benefits with regard to this strategy of making Costa Rica an attractive investment climate in light of the near-sourcing trend, but it would need a comprehensive action plan. This plan will be elaborated in the next paragraph.

Another railway line, which could pose a lot of benefits is reinstating and upgrading the railway line between San José and Puerto Limón. With reinstating the railway line between the capital city and the Caribbean coast, the pressure on Route 32 could be relieved tremendously, and in combination with an inland terminal the congestion in the GAM could be decreased as well. However, reinstating the old railway line and upgrading it to be fit as a cargo line would be a very challenging task, mainly due to the mountainous terrain. Especially if the line would be dedicated to the transportation of (heavy) cargo, the project would be very challenging from an engineering perspective, probably making it not financially feasible.

Border procedures & Central American Customs Union

Nowadays, a lot of time and costs are wasted with the crossing of borders. Several measures could resolve this problem. First of all, the new border procedures, which are currently being negotiated, are very promising. It can halve the procedures and thus time and costs being conducted at the current border crossings with Panama. Furthermore, along with the new TCM its customs controls will also be more efficient and effective. The use of scanners and new IT systems provide a one-stop-shop customs control smoothening the import and export of goods significantly.

With Costa Rica being a gateway for Nicaragua, this strength can be exploited even more if similar border procedures could be negotiated. However, this turns out to be harder than with Panama due to the tense political relationship with Nicaragua. Even though it is expected that having mutual customs procedures can be beneficial for both countries, up until now no negotiations have been started. Costa Rica would do well in trying to make mutual customs agreements with Nicaragua in order to decrease the logistical costs when transporting goods between both countries. There have been talks about an overarching union, the Central American Customs Union (CACU). Having such a union could pose great benefits for all countries in Central America, since the logistical costs for inter-trade could be reduced. Costa Rica could take the lead in reviving these plans.

Location of industries

Costa Rica has a policy in place by means of Free Trade Zones where investors receive tax benefits when investing a certain amount for their business in Costa Rica. Up until now, the majority of these zones are located in the GAM, pressuring the logistical system around the capital city. For some firms it makes sense to be close to San José, because of the human resources available there, its proximity to the airport and the quality of living. However, many other firms would be better off if they were located outside of the GAM, for instance if their businesses are very dependent on the ports of Caldera or Moín, or if they work with the products being cultivated in the rural areas. By setting up Free Trade Zones outside the GAM and making them more beneficial than the zones inside the GAM, Costa Rica could make these areas more attractive. This could be strengthened by setting up partnerships with educational institutions (discussed previously in §0) in order to make more human resources available and making the area more attractive.

14.2.3 Ease of doing business

The third factor that has been identified in the attraction of companies is the ease of doing business in a country. Costa Rica already has two factors, that put Costa Rica in favour compared to other countries. For decades, Costa Rica has been politically stable, which is an attracting factor for companies to locate themselves. This strength is however losing a bit of its value because surrounding countries are being more politically stable themselves compared to previous decades.

A distinguishing aspect in favour of Costa Rica is the fact that is has Free Trade Agreements (FTAs) with important countries in Asia. It is one of three countries in Latin America having a FTA with China. Moreover it currently has a FTA with Singapore and negotiations with South Korea have been started. It can be beneficial for companies looking to relocate themselves to Costa Rica if trading is simplified with these countries, that are known for being producers of many half-fabricates and raw materials for activities which could be relocated to Costa Rica.

However, there are also aspects of Costa Rica that make it harder doing business in Costa Rica. First of all, there are the complicated border crossings, which have been previously discussed in chapter 12. Having easier border crossings with the surrounding countries makes the whole region more competitive, which can help in the decision of companies where to near-source their activities. Furthermore, there is the problem of bureaucracy in general. Costa Rica has turned out to be a very bureaucratic country, making doing business less efficient, time consuming as well as costly.

Border procedures & Central American Customs Union

The measures regarding the border procedures as well as pursuing a Central American Customs Union, which have been discussed previously in §14.2.2 can also help in easing the doing of business in Costa Rica.

Integrated IT systems

Technological developments have already opened up possibilities for the ease of doing business in various (Western) countries. It can reduce the paperwork and bureaucracy tremendously. Paperwork can be digitalised, which can mean approvals can be given digitally and thus remotely and faster. Whereas currently several approvals are necessary for the customs declaration of goods, in the future this could all be incorporated into one system, where the various aspects are homogenised as much as possible. Costa Rica is already developing such a system and it is expected to reduce the currently encountered bureaucracy.

14.2.4 Development northern region

In light of the near-sourcing trend and the possibility of a transatlantic railway line through the northern regions of the country, the northern area should be developed as the location where foreign investors would like to relocate their activities to. Due to Nicaragua's competition in agricultural products, the northern region would need a change in business activities. Land would be available for investors to relocate to, and with the railway line a very good infrastructural connection would be guaranteed with ports on both sides. This can especially be beneficial in light of the near-sourcing trend, if companies would be importing raw materials, half-fabricates or components from Asia (Pacific side), processing and finishing the imported goods in the northern region and exporting the goods from the TCM to the United States east coast or Europe.

The largest threshold in this action plan would be to have enough skilled workforce available. Herein the government should make a lot of effort in the (re)training of people in the northern region, in combination with educational institutions and the companies Costa Rica would be willing to attract. All the measures, which have been discussed in paragraph 14.2.1 can help herein.

14.3 Strategy 2: Regional hub – gateway to Central America

Next to investing in the attraction of overseas businesses to settle in the country, Costa Rica can profit from the development of industries and infrastructure in the whole Central American region. The confrontation matrix identified several opportunities that enable Costa Rica to create a node in the emerging logistical system. Most important are the benefits that can be derived from the new TCM in Moín (especially *accessibility of larger vessels* and *increase in container handling capacity*), the *Panama Canal expansion* and the growth of *global trade*. Additionally, the possible development of the *AMEGA transhipment terminal* and the current negotiations in Central America on the *Central American Customs Union (CACU)* provide ways to become more involved in the logistical chain.

To be able to compete with neighbouring ports for the regional hub function it is necessary to offer multiple advantages. As was derived from literature in chapter 12, especially a port's location and a strong hinterland connection can improve the importance of a port in the maritime network.

The *geographical location* of Costa Rica with noteworthy ports at both Caribbean and Pacific coasts and a close proximity to the Panama Canal offer it possibilities to increase its position in the maritime shipping network. Furthermore, Costa Rica's function as *gateway to Nicaragua* plays a large role in promoting its ports as a beneficial loading and unloading location. Since Nicaragua has no ports of mentionable size on the Caribbean side Costa Rica can promote the use of its new Moín port as a regional hub for the hinterland of Nicaragua. Although the geographical location of Costa Rica on the border of Nicaragua is beneficial, several weaknesses, *inefficient border crossings* and the tough *political relationship with Nicaragua,* pose barricades that could jeopardise the advantages that could be gained with the more advanced gateway function. Shippers and forwarders could be discouraged by the lengthy, bureaucratic and costly procedures at Costa Rican and Nicaraguan borders. In current practise all cargo is checked on both sides of the borders, without the support of IT systems, as was discussed in paragraph 7.6. Furthermore, as the relationship with Nicaragua has been tense for a long time, radical reactions could occur influencing the logistical system in a negative way. For example, closing the border for all cargo or changing the export focus to Honduras would seriously impact the amount freight in the Costa Rican export. However, even though the expected impact is high, the likelihood of occurrence is low (Fonseca, 2016).

Additional weaknesses that Costa Rica faces that could decrease the quality of the regional hub include the current *deficient transportation network* and the *low security of the logistical chain*. Chapter 4 indicated the current status of the infrastructure in Costa Rica to be of mediocre quality. Especially the problems occurring with closed routes due to bad weather conditions, the lack of ring roads around the GAM and the absence of noteworthy multi modal alternatives attribute to this statement. Costa Rica's location in between drug producing countries in Latin America and customer countries in Northern America and Europe make the country vulnerable to drug trafficking. As was explained in paragraph 8.2 in more detail, current safety and security enforcement are insufficient to prevent drug trafficking practices that harm the reputation of Costa Rica.

Given the possibilities to develop the Caribbean coast into a regional hub, two major threats could cause negative impact on the gained advantages. Both the *future developments of the Panama ports* and *other and current Caribbean ports* can pose competitors that might offer similar activities and services to shipping lines.

An additional strength that distinguishes Costa Rica from its neighbouring countries is the *FTA with China.* As was discussed in paragraph 8.1 the FTA simplifies trading of import and export products between the two countries. China offers many products for the Costa Rican market. However, the FTA offers possibilities to increase the export of Costa Rican products to China and allows the exploitation of value adding businesses for both import and export products. For example, sell fresh fruits frozen or in pieces (Cadexco, 2016). Whereas on the import side raw materials and half fabricates could be processed and prepared for the Central America, U.S. and European market. Similar advantages could be gained from the FTAs with South Korea and Singapore.

14.3.1 Connecting the foreland

In order to make the most of the available opportunities that play a role for becoming a regional hub several supporting measures are defined. The benefits that can be derived from the new TCM in Moín (especially *accessibility of larger vessels* and *increase in container handling capacity*) in combination with the *Panama Canal expansion* and the growth of *global trade* provide additional cargo traffic for the region. It is important for Costa Rica to use its geographical location and gateway function in a way that provide more advantages to shipping lines and forwarders than other ports can. As such it is important to invest in especially a good foreland connection, which could be complemented with a good hinterland. Based on the port definitions of (Rodrigue & Ashar, 2015) as discussed in paragraph 12.2.1 the new Moín terminal can be defined as a gateway port given its prospected 10 per cent transhipment. Given this account 90 per cent of the 1.6 million TEU (phase one TCM) that is expected to be handled at Moín will have to travel through hinterland connections.

Hub-and-spoke network

As was discussed in paragraph 12.3, a hub port can offer a combination of short sea shipping and long haul destinations making use of a hub-and-spokes network that is supported by feeder lines. The new TCM offers accessibility to vessels up to 8,000-9,000 TEU on completion of the first construction phase and on finalising the complete project even up to New Panamax size. MAERSK looks into opportunities to hub from Ecuador via Colombia and Costa Rica to US East Coast and European destinations for their banana shipping (Madrigal, 2016). The two main shipping configurations that are expected to develop on the introduction of New-Panamax size vessels, as discussed in paragraph 12.3.1, Transhipment and Circum-Equatorial, will most likely affect the functions of several ports in the Caribbean region. Shipping lines are expected on operate large New-Panamax vessels that will only call a few ports. Taking into account the gateway function of the port and its suitable berthing depths TCM would especially be suitable for by-passing or tail cutting configurations. In the first case shipping lines pass through Moín as a main line to pick up mainly cargo from its hinterland and a small amount that is brought in via short sea shipping. In the second case Moín is at the end of a direct shipping line providing the same services to its hinterland and to a feeder port via short sea shipping. Given the depths of the berths at Moín its location near main shipping routes and the prospects for its import/export cargo, TCM will not likely turn into a mere feeder port for transhipment terminals in the Caribbean (Kingston, Freeport

or Mariel) as most cargo is perishable and can directly be forwarded to USEC and European ports. Additionally, more transhipment of containers will increase the cost of transportation. However, options exist to pass through any of the transhipment hubs to pick up cargo that was collected from other feeder services (Rodrigue J. , n.d.).

Competitive dry canal and transhipment

The possible development of the *AMEGA transhipment terminal* could bring another dimension to the regional hub. Especially in the rail connection to the Pacific in the final phase of the project, as discussed in paragraph 3.4, can provide a competitive dry canal for the transport of cargo from Pacific to Caribbean and vice versa. Opportunities to pursue transhipment in the Caribbean region of both Central American export products and import products from the U.S. and Europe can catch up on a new business plan, as shipping lines will not have to go via Miami in order to gather sufficient cargo to minimise costs. TCM and AMEGA will operate on different segments of the market (import/export and pure transhipment) leading to an addition of services in Moín rather than competition.

Figure 68: Map with overview foreland and hinterland measures. Blue = short-shipping, red = inland terminal, brown = road network, black = rail network

14.3.2 Serving the hinterland

As was discussed in paragraph 12.1 ports need to be well connected to the hinterland in order to increase and handle their freight volumes. Caribbean ports in Honduras could also serve contestable hinterlands like Nicaragua. Therefore it is important to facilitate an easy access to Costa Rica's ports to stay ahead of competition.

Taken measures: El Salvador – Costa Rica ferry & new road northern region

As mentioned in the analysis of the road infrastructure in chapter 4 currently a new road in the northern part of Costa Rica is under development which on completion is expected to improve the hinterland connection to the Moín port significantly. Even the new El Salvador ferry operational between Puerto La Union and Puerto Caldera can provide a possibility to expand the hinterland of TCM. Both taken measures are visualised in Figure 68. The El Salvador ferry is the left dotted line, while the new road in

the northern part of Costa Rica is the thick brown line from the red inland terminal till the approximately the dotted brown line.

Infrastructure measures for competitive dry canal

In order to provide a competitive dry canal it would be necessary to take different measures. Three measures are discussed below.

Road measures: new road Puerto Caldera – northern region & coordinate demand

Firstly, it would be necessary to improve the quality of roads and construct a road connection in the northern region to allow for a short passage between the two ports (from the current ten hour trip, reduced to a four hour trip). This is visualised in Figure 68 with the brown dotted line. Additionally, especially Route 32 poses a bottleneck in the current access routes to the Moín port area. Currently plans to expand the Limón part of Route 32 to four-lanes are discussed with Chinese contractors but so far no progress has been made. However, due to Costa Rica's mountainous landscape it is costly to expand existing roads or construct new ones. Opportunities to increase the efficiency of the infrastructure network lie therefore not only in increasing its supply, but also in coordinating its demand. Several measures as identified in paragraph 12.2.1 that could help structuring the demand include to only allow trucks on Route 32 that already have a reserved slot at the terminal or charge freight forwarders extra for delivering containers during certain rush hours. Besides measures to influence truckers to smooth the overall arrival times, the pressure on the transportation network in the port region itself could be reduced by decreasing the total number of trucks in the area.

Rail connection: inland terminal – TCM

One possibility to lower the pressure on the transportation network is to construct a rail connection to an inland terminal (Figure 68; red dot and black dotted line) where containers are collected and simultaneously transported to and from the port. Given its location near the origin of many agricultural products and the relatively flat terrain between TCM and the northern region of Costa Rica, this area would be most suitable. INCOFER is already looking into projects to construct a railroad in the northern region. The inclusion of a terminal near Puerto Viejo de Sarapiqui could reduce the number of trucks on Route 32. The inland terminal could even be developed into a mid-range dry port, paragraph 12.2.2, offering additional services that improve the attractiveness of the inland terminal. Examples of such services include customs clearance, storage facilities, consolidation and container maintenance and repair.

Value-adding businesses

The additional benefit for the region comes with the emerging of more value-added businesses near the inland terminal. These logistical centres can house an array of activities relating to transport, logistics and the distribution of goods. Similar logistics centres could be developed in the area around the port providing services that preferably are located close to the port (e.g. Activities related to short sea shipping, activities to result in reduction of transport volumes or activities related to adding value to transhipment products).

In order to ensure investments in hinterland improvements to be lucrative the approach needs to include participation of all (representatives) of its users. Earlier constructions in Singapore, Antwerp and Rotterdam that involved among others port authorities, freight forwarders, shipping lines, rail operators, governmental agencies have proven to be successful in realising a hinterland that matches the needs of its users.

Collaboration countries Central America

Additionally, the current developments in Central America on creating a *Central American Customs Union (CACU)* offer possibilities for Costa Rica to simplify border processes while providing high standards of safety and security.

Active role in CACU negotiations

Playing a role in the negotiations for the standards in the joined economic region could be very beneficial in simplifying doing trade with Central American countries and Costa Rica.

Integrated IT system and scanners

Furthermore, it is advised to equip every border post with IT systems and scanners. As such, people and cargo can be processed faster and checked more thoroughly. Advantages of the integrated border systems include for example a time reduction at all borders by only performing checks on import cargo (as will be introduced in the Costa Rica – Panama border) (Fonseca, 2016).

14.4 Summarising the attractive investment climate and regional hub strategies

The two strategies for Costa Rica focus on ways for the country to gain advantages of linking to the global maritime trade market. In some parts a slight overlap is found, e.g. the importance of hinterland connections, while in others the strategies focus on two distinct goals. Whereas in the first strategy the possibilities for Costa Rica to engage in the global trade by facilitating an *attractive investment climate* is centralised. The second strategy focuses on exploiting Costa Rica's central location in the network by offering reliable foreland and hinterland connects through a *regional hub*. A schematic overview of the two strategies can be found in Figure 69.

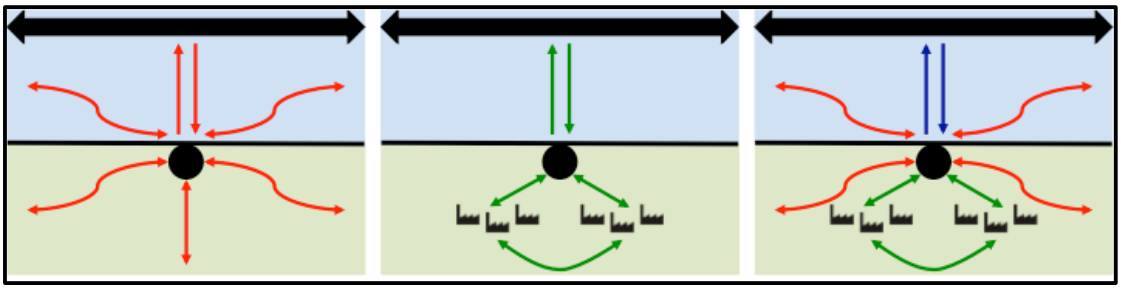

Figure 69: Schematic overview regional hub (l), attractive investment climate (m), combined strategies (r)

14.5 Robust strategies for defined scenarios

In order to determine the robustness of the proposed strategies, their application with the previously defined scenarios, see chapter 11, are discussed. For each scenario a set of measures is combined that can lean towards the exploitation of an *attractive investment climate,* the facilitation of a *regional hub,* or a combination of both. After matching the scenarios with the strategies a conclusion can be drawn on the robustness of the strategies and their measures and the expected advantages. Eventually, this will lead to a conclusion on the proposed strategies in different future situations.

14.5.1 Business as usual evaluation

In the business as usual scenario the current developments in Costa Rica and the region are being continued for the future. In this scenario it is likely that Costa Rica will succeed in becoming a regional hub, when they implement the strategy to become one. The

continued economic growth (4% per year) will lead to an increase in demand for goods in Costa Rica and the Caribbean region. Also, the continued improvement of the economic situation of the country can lead to a higher production. This higher production along with the increase in regional demand and the growing global trade increase the chances of Costa Rica successfully becoming a regional hub. In order to be able to distribute goods not only from Costa Rica but also from Nicaragua and other countries to the Caribbean, it is of importance that the hinterland measures are implemented. Implementation of these measures will ensure a quick and safe transfer to and from the port. If the measures have their expected effects, export by ship might also become more attractive for other products, such as electronics and medical equipment. These products are currently mainly being exported by air. The competition from the other developing ports will mostly be in the transhipment sector. Therefore it will not pose a large threat for the regional hub. However, the AMEGA terminal will gain some competition.

However, when becoming the regional hub, the on-going climate change will pose a serious threat for the agricultural sector. This sector will be mainly responsible for the production of the products being distributed when Costa Rica is a regional hub. In order to avoid this risk Costa Rica should take extra care in protecting the agricultural sector. This can be done by measures proposed in the description of the scenario in §11.2.1.

Costa Rica cannot only benefit from the regional hub strategy in this scenario, but also from the attractive investment climate strategy. This strategy can help make Costa Rica less dependent on the threatened agricultural sector. Also, the improvements made on the hinterland of the port can also benefit this strategy, since it is partially focused on improvement of the logistical situation. Therefore the infrastructural improvement serves two goals and the maximum profit from the investment is made. The climate change is unlikely to change the result of implementing this strategy since a lot of the potential production to be relocated to Costa Rica is not dependent on the climate.

In conclusion, both strategies and especially a combination of the two can be beneficial for Costa Rica in this scenario. Large investments will have to be made in infrastructure but these investments will serve multiple goals since they both help in Costa Rica becoming a regional hub and in attracting foreign companies to the country. Each of the strategies is likely to work when implemented on its own, but a combination would generate the most benefits. The least risky strategy (due to climate change) is the attractive investment climate strategy.

14.5.2 Growing sky high evaluation

This scenario is the most positive for Costa Rica. The climate change will be reduced, whereas the economy of Costa Rica will thrive (>4% growth per year). Also, the ports in Jamaica, Cuba, and Panama will not develop as much as currently expected. The decrease in climate change will be beneficial for the agricultural sector. The increase in economical growth of Costa Rica will increase the demand and production of goods and will make the regional hub strategy likely to succeed. The reduction of the climate change also reduces the risk of implementing this strategy, since the chance of the agricultural sector being negatively influenced by the climate will be lower. In this strategy the hinterland improvement is of equal importance as in the previous strategy to ensure fast and safe transportation of goods and create the possibility for new export products to be exported by sea. For the AMEGA terminal the growing economy and low development of other

ports will also be beneficial. It can ensure that they become a major player on the transhipment market.

The attractive investment climate strategy can also be applied without much risk in this scenario. The stable and growing economy can provide a basis for foreign investors. However, the thriving economy might also lead to higher labour costs. These labour costs can be a reason for companies to choose for another country to near-source their activities to. The good economical situation makes it more likely that resources are available for investment in both strategies.

Once again, implementation of both strategies would be the most beneficial for Costa Rica. Both strategies have a relatively low risk and would benefit from an improved logistical situation. However, when there is only room to invest in one strategy the regional hub strategy has the highest chance of succeeding, due to the labour cost risks of attractive investment climate strategy.

14.5.3 Storm is coming evaluation

This is the worst-case scenario for Costa Rica. In this scenario the economic growth stops or declines, while the other ports in the Caribbean region develop more than the Costa Rican ports. Also, the climate change in the future is getting worse than expected. The climate change will form a serious threat to the agricultural sector and the chances of large amounts of production being ruined are higher than in the other scenario's. Also, the bad economic situation can have effects on production of the goods in the country. Therefore, the regional hub strategy is likely to fail in this scenario, due to the inability to produce enough goods to distribute in the region. Also the AMEGA project will have more competition than in other scenarios. The transhipment however, is only in a small way connected to the economy of Costa Rica; therefore it still has a chance to be successful and even beneficial for Costa Rica.

The creation of an attractive investment climate is a more viable option in this scenario. The climate change will not influence this strategy as much as the regional hub option. Also, the possible decrease of labour cost due to the worsened economic position might benefit this strategy. Foreign companies might decide to relocate to Costa Rica if the labour costs are getting lower. Therefore it is important to focus on the quality of the labour force, since the combination of skilled and (relatively) cheap workers can be key in attracting these companies. Since it is likely that due to the economic state, not many resources are available to invest, the focus should primarily be on the cheaper options. These options include improving the ease of doing business and improving the labour force. Investments in the infrastructure are more expensive and less likely to be implemented, even though they would be functional.

In a worse situation, the focus should be on attracting foreign companies to Costa Rica, since the country can no longer rely on the production of goods to be exported. A regional hub is not a viable option because of this.

14.5.4 Booming business in the Caribbean evaluation

The improved economic situation is beneficial for the Costa Rican production, which on the other hand is threatened by the climate change. The effects of the climate change will determine if becoming a regional hub is a viable strategy. If they influence the agricultural sector too much, there is a chance not enough will be produced, leading to failure of the strategy. The AMEGA terminal will have serious competition but can still be a success when implemented correctly.

If the labour costs will not rise too much, improving the investment climate will be a better strategy. This strategy is much less vulnerable for climate change and competition from the other ports. Infrastructural improvements could help a combination of the two strategies becoming successful, since other products can then also be exported due to the shorter and safer transportation to the port.

14.6 Concluding on suitable strategies for Costa Rica

What can be concluded when the strategies are applied to the different future scenarios is that both strategies are viable in the different situations. The climate change in the future will be an important factor in the success of becoming a regional hub. This is mostly because the agricultural sector will be influenced by this climate change, and this agricultural sector produces the most important products to be exported in the region as a regional hub. The attractive investment climate is a viable option in each of the scenarios and therefore is the most robust strategy. It is not vulnerable for climate change and for the competition of other ports in the region. The only factor that can be a threat is the high labour cost, that might become higher when the economy grows even harder in the future. Since the unlikeliness that there are enough resources to implement both of the strategies, the advice is given to go for the attractive investment climate strategy.

15 Ease of measure implementation

This chapter will provide a direction for implementing the strategy for an attractive investment climate as proposed in chapter 14. It does not give a proposal in the order the measures should be executed, but it gives an indication in the difficulty of the implementation of the measures. This ranking is made based on two aspects, which are the estimated costs needed for implementation and the expected difficulty to gain stakeholder participation for implementation. These two aspects are chosen because costs are often one of the key variables in the decision making process of choosing measures, and expected stakeholder participation is chosen because the development of projects in Costa Rica in general is often restrained due to inadequate participation or approval of stakeholders (OECD, 2016). As this research is limited to the ease of implementation, furthermore research is needed to determine the effectiveness of each measure. Only then can one decide upon which measure to be executed (first) and which measures should be left behind.

First paragraph will focus on how the stakeholders mentioned in chapter 6 should be handled in order for the measures to be implemented. Then in paragraph 15.2 the ease of implementation of the measures of the advised strategy are discussed and for each factor (human resources, logistical system and ease of doing business) one or more measures are advised to perform further research on.

15.1 Stakeholder involvement

Chapter 6 mentioned the involved stakeholders and placed them in the different categories on the power-interest grid. When these stakeholders are not involved in the process in the right way it might lead to opposition or even inability to implement the measures. This paragraph provides a strategy to handle the different stakeholders per category during the implementation process. The four categories are; keep satisfied (high power, low interest), monitor (low power, low interest), keep informed (low power, high interest) and manage closely (high power, high interest).

Keep satisfied

The keep satisfied category contains stakeholders that have no specific interest in the project, but are needed to kept satisfied in order for them not to use the large amount of power they have. This means that each of the proposed measures will have to be in line with the rules from the World Trade Organization (the only actor in this category). The easiest way to do this is to let an expert review each measure to prevent problems from occurring at actual implementation. Also, informing them up front of the proposed measures can help detect possible problems up front. The only problems that might occur are with financial measures that are taken to relocate businesses. However, the problems are unlikely and easy to correct.

Monitor

The monitor category is the category with stakeholders that will not influence the strategy and measures very much. However, it is important that they are monitored. AMEGA can perform an important role for the country, however they act on their own and are not that much influenced by the strategy. They should be included in the process of implementing the measures and possibilities for collaboration should be explored. The two unions mentioned in the category; CANACAR and CANATRAC can be informed about the measures and their opinions should be taken seriously to make them feel

included in the process. This way they can be prevented to execute the (relatively small) political power they have over their members. Regarding the measures to be taken they will be most interested in the improvement of the infrastructure in the country. They might oppose against a railway if this will lead to a decrease in the cargo transported by trucks, since they represent the truckers. However, if these measures lead to a higher security and safety for the truckers the measures might be accepted. The port authority should be informed if anything will be changed at the Caldera port which is not included in the measures proposed in the attractive investment climate strategy.

Keep informed

A lot of actors are placed in this category, meaning that they have significant interest in the project but are not very powerful. Therefore, they should be kept informed in the project and their opinions and ideas should be taken seriously, to make them feel included in the process. CONAVI and INCOFER will be interested in very specific parts of the measures as they are the ones to execute the measures concerning the construction of roads and railways. This will be when implementing the improved connection between the TCM and the GAM. They are both part of the government and therefore it is very unlikely they will resist against the plans proposed, since the ministries will coordinate them. SP Caldera could oppose against the measures because they are mostly focused on the Limón region while they operate the Caldera port. Therefore, the possible benefits for them should be made clear to them from the start. Also, improved border procedures with have significant advantages for them. CINDE plays an important role in the implementation of the strategy since they can help provide contacts and facilitation for the foreign investors concerned by the strategy, they have expertise that should be used to improve the effects of the strategy. The SME's and the ZEEZN could profit from the new infrastructure. However, the strategy of attracting new companies is not entirely beneficial to them since these companies will mostly not be in the agricultural sector. JAPDEVA is still the landlord for the new TCM terminal and has a contract with APMT on the concession for 30 years. After this time, they will profit greatly since the terminal is handed over to them. They should be informed on the infrastructural improvements concerning the terminal. Moreover, JAPDEVA is tasked with the development of the region. Therefore, they are likely to support the strategy and should be included in the process. Their knowledge of the region should be used.

Managed closely

The most important stakeholder group is the group with high power and high interest. Both stakeholders that can prevent measures from being implemented and actors that can be great allies are present in this group. Both the ministries COMEX and MOPT will be very interested in the proposed strategy and the goals of both ministries are similar to the goal the strategy aims to achieve. The two ministries will have to take a leading role in the execution phase of the project. Also, important resources will have to come from the two ministries. APMT can be an important ally when managed correctly. The measures are aimed at increasing the business in the Limón and northern region, which will lead to more export for the new TCM terminal, which is in favour of APMT. When managed correctly they might even be able to help in the realisation of some measures if they believe it to be advantageous for them. The large companies will not be affected that much by the strategy, even though they might profit from the new infrastructure. They should be informed about the measures, but are unlikely to form a problem. Foreign investors in general are a though stakeholders to manage, since they have to decide if they want to invest in Costa Rica when the strategy is implemented. Other parties with possible foreign connections, such as APMT, PROCOMER and CINDE can form an

important role in attracting these investors. They should be actively involved in the process of attracting companies. The shippers can decide if they want to include the new terminal in their shipping routes. The strategy will increase the chance that they will do this when the hinterland performs better and there is more profit for them to be made in Costa Rica.

All the actors in this category could be pleased with the outcome of the strategy since there can be benefit for them all. In order for this to be true they will all have to comply. Therefore, they need to be included from the very beginning, before implementation and preferably even during the research phase. Furthermore, when a problem occurs it is important that the stakeholders feel that something is done to solve it.

15.2 Ease of implementation

The measures that have been derived from the strategy of making Costa Rica a more attractive investment climate, are being ranked based on the expected ease of implementation. The two aspects on which the ease of implementation is based are the costs and the stakeholder participation. Table 24 gives an overview of the measures distinguished on expected costs and stakeholder participation. Furthermore, the section of the strategy that the measure is part of, human resources (HR), logistical situation (L) or ease of doing business (E) is indicated.

Table 24: Overview of measures distinguished on costs and stakeholder participation

	Easy stakeholder participation	**Moderate stakeholder participation**	**Difficult stakeholder participation**
Low costs	Improving language proficiency (HR)	Education tailored to the needs of the market (HR) Collaboration Free Trade Zones & universities (HR)	Border procedures (L/E) CACU (L/E) Coordinating the demand (L)
Moderate costs		Location of industries (L) Matching businesses to right locations (HR) IT systems (E) Inland terminal (L)	
High costs			Improvement route 32 (L) Reinstating railway (L)

The measure where implementation is expected to be easiest, is improving the *language proficiency*. This is because for implementation of this measure a limited amount of stakeholders will be needed, and not a lot of resistance is expected. Furthermore, it will probably be one of the cheaper measures, since the majority of the measure is dependent on a change in policy (for example, start earlier with teaching English, more proactive usage of English) rather than a lot of new resources.

A measure, which is a bit more complicated to accomplish, is to *tailor the education to the needs of the market*. To do this, representative actors from the market should get together

with policy makers and the educational institutions. However, once they are all around the same table, it is not expected that they will face a lot of resistance. This is also more a policy measure than attaining more resources, making it a relatively cheap measure. These same two arguments hold for the *collaboration between the Free Trade Zones & universities* as well.

There are various measures that are expected to be moderately difficult in terms of stakeholder participation as well as moderately expensive. First of all, there is the *(re)location of industries*. This can be achieved by promoting the Free Trade Zone regime, which could make it financially difficult. Furthermore, the companies could be resistant against a relocation of their industries. Second of all there is the measure of *matching the businesses to the right locations*. This could be costly because the COMEX model that would be used is still under development. Also, the government would still need the participation of the companies. Thirdly, the *implementation of the IT systems* is expected to be both moderately costly as well as moderately difficult in terms of stakeholder participation. It would need quite a lot of investments in resources in order to be implemented, and various stakeholders need to integrate their procedures into one system, which can make it difficult as well. Finally, the last measure, which is expected to be moderately costly as well as moderately difficult in stakeholder participation, is the *construction of the inland terminal*. Participation of various stakeholders would be necessary (such as businesses, terminal operators, local land owners, local government) and the construction would take a considerable amount of financial resources to construct.

Measures, which have been identified as very difficult from a stakeholder participation perspective are the *improvement of border procedures* and the development of a Central American Customs Union. It is mainly the border procedures with Nicaragua which are prone to be difficult; negotiations of similar procedures have already been started with Panama. Due to the tense political relationship with Nicaragua, it would need a lot of effort in order to smoothen the border procedures, such as is planned on the other side of the country with Panama. The *development of a Central American Customs Union* is an extension of this and would require even more efforts to develop, since in that case even more radical decisions have to take place with even more stakeholders. Furthermore, the measure of *coordinating the demand* is also expected to be low in costs but difficult in stakeholder participation. A lot of participation would be needed from the transportation companies as well as the suppliers and the port operators. It is not expected that these will take on this measure lightly, since it increases the difficulty of transporting goods.

Improving the connection between the TCM and the GAM are probably the most expensive measures there are, combined with a difficulty in stakeholder participation. Both the *improvement of route 32* as well as the *development of the northern railway line* and *reinstating the old railway line* are expected to come across a lot of resistance, such as political resistance, local resistance, environmental resistance or resistance from political unions (truckers). Furthermore, the measures are expected to cost a lot of money, since it would probably involve a major infrastructural project.

This paragraph has provided an indication in which measures are easy to implement and which measures need more effort, financially and/or stakeholder participation wise. Concluding, the measure found to be easiest to implement for the three factors are the following:

Human resources

- Improving the language proficiency

Logistical situation

- (Re)locating the industries
- Construction of an inland terminal
- Improving the border procedures or
- Better coordination of the demand

However, to develop an inland terminal it would be logical to first improve the infrastructural connection between the TCM and the GAM.

Ease of doing business

- Installation of IT systems
- Improving border processes

Based on this ranking, it is advised to start researching the effectiveness of these easiest measures first. The combination of effectiveness and ease of implementation determines which measures should be implemented first. It must be noted that, additional information regarding the effectiveness of the measures can provide a different implementation order than the research order that is advised here.

16 Conclusion Part II

The second part of the report discussed several strategies to enhance the strengths and diminish the weaknesses of Costa Rica as were defined in the SWOT-analysis of Part I. To answer the sub question *How can Costa Rica exploit its strengths and diminish its weaknesses by seizing the identified opportunities in a robust way?* two strategies were designed that combined sets of measures to address the identified opportunities.

The first strategy focuses on enhancing the possibilities of Costa Rica to contribute to the international market, paragraph 14.2. With realising an *attractive investment climate* Costa Rica would be able to increase the number of export products and services. The benefits of the new TCM in Moín and the trend of near-sourcing pose the largest opportunities for Costa Rica to respond to. As was defined in paragraph 12.4, an attractive investment climate consists of three factors: human resources, logistical situation and ease of doing business. Costa Rica's population is generally well educated, however the size of the high skilled workforce is already insufficient at current date. Whereas other Latin American countries are also investing in near-sourcing it is of importance to dedicate education to English language proficiency and look into opportunities look draw closer connections between company needs and education supply per region. The logistical situation in Costa Rica was defined as having a deficient infrastructure, mainly due to problems with congestion on the road network. Especially Route 32 and the Grand Metropolitan Area (GAM) are important locations to relieve the pressure on the transportation network. Available measures include an expansion of the Route 32, reinstating of the railway and creating an inland terminal. An inland terminal can house several additional services (e.g. distribution centres) that could decrease the amount of trucks in the GAM. Furthermore, locating Free Trade Zones near such an inland terminal would increase the attractiveness for foreign investors due to good infrastructural connections for the transportation of cargo. The northern region is suggested as the best location for such developments. Finally, in order to improve foreign trade border processes need to be simplified. Integration of processes with neighbouring countries and installing IT systems and scanners provide large opportunities to decrease waiting times at borders. Finally, to promote ease of doing business in Costa Rica advantages are present in the reputation of a politically stable country and the present Free Trade Agreements (FTAs). Although the political stability of the county has slowly decreased in the past few years Costa Rica still remains more stable than its neighbouring countries. Furthermore, FTAs can lower import and export costs and simplify procedures in order to attract more foreign investors. The before mentioned border process improvements will also have positive effects on the ease of doing business.

Costa Rica's second strategy to be more involved in the international trade market, includes facilitating cargo flows, paragraph 14.3. By acting as a *regional hub* the country can pose itself as the *gateway to Central America.* The geographical location of Costa Rica near major shipping routes, with ports on both the Pacific and Atlantic and access to Central American countries can be combined with the benefits that can be derived from the new TCM in Moín (especially accessibility of larger vessels and increase in container handling capacity), the Panama Canal expansion and the growth of global trade. Next to location a good connection to its foreland and hinterland is important to compete with neighbouring ports. The deficient infrastructure of Costa Rica is a weakness that undermines the strength of its location. Measures available to deal with the poor performance of Route 32 include the construction of an inland terminal connected by

rail and the coordination of demand (e.g. dedicated slots for trucks on the road or charging trucks during rush hour). Additionally, to be a gateway to Central America it is important to have good connections to surrounding countries. The ferry to El Salvador could bring in more cargo. Moreover, by constructing a direct road connection between Puerto Caldera and the Moín region travel times will be significantly shorter. As such Costa Rica can even compete using this as a dry canal. Furthermore, the current gateway to Nicaragua will need to be expanded. As agricultural producers are slowly looking for business opportunities over the border it is of importance to improve the political relation with Nicaragua to be able to simplify border processes and guarantee a reliable hinterland connection. The construction of a Central American Customs Union (CACU) could help simplify border processes between all Central American countries. Finally, as transhipment in the Caribbean region is expected to increase, the construction of the AMEGA terminal could attract transhipment business to Costa Rica. Being a regional hub will offer Costa Rica the possibility to become in the centre of trade and might even be able steer towards short sea shipping towards Caribbean destinations.

The extreme positive, negative and current trend scenarios (chapter 11) based on Costa Rica's economic growth, the development of port in the Caribbean region and climate change have identified that especially the measures of the first strategy proof to be robust. The regional hub strategy is highly dependent on the production of goods in the hinterland. However as climate change has a large negative impact on the agriculture sector, the strategy might be a risk if production rates decline. On the other hand is the boosting of the own economy with a larger variety of export products and services through an attractive investment climate less dependent on the agriculture sector. Furthermore, the country will be less influenced by the competition of other ports in the region as it produces its own products rather than only offering transportation services. To conclude, pursuing an *attractive investment climate* poses more robust measures for Costa Rica to implement.

Next to determining possible measures it is of importance to make a distinction, which should be investigated in more detail. The effectiveness of a measure combined with its ease to implement will provide Costa Rica with the guidelines to gain economical advantages. As this research is limited to the ease of implementation, measures will need to be checked on effectiveness. To answer *'For what measures should Costa Rica start researching their effectiveness based on the ease of implementation?'* the ease of implementation is defined based on the expected costs and participation of stakeholders, paragraph 15.2. The easier a measure is to implement, the higher it is placed on the list of measures Costa Rica should look into. For each of the factors defined for the strategy, human resources, logistical situation and ease of doing business, a measure is chosen. To improve its human resources, the easiest measure to implement is to improve the *language proficiency*. For improvement of the logistical situation, several measures have been identified which are approximately equally hard to implement. These measures are the *(re)location of businesses*, improving the *border procedures* or better *coordination of the demand*. Both measures for improving the ease of doing business, *IT systems* and better *border procedures*, are expected to be equally difficult. Based on this ranking, it is advised to start researching these easiest measures first, because no objective ranking on the effectiveness of the measures could be conducted. However, if additional information regarding the effectiveness of the measures is available, a different order for implementing the measures is likely, based on the effectiveness and ease of implementation.

17 Answering research question and recommendations

This chapter will be the final conclusion of the research conducted for this report. Where the sub– questions were answered in the conclusion of part 1 and part 2, this chapter will answer the main question as stated in chapter 1. Also this chapter will provide recommendations for further research on some of the subjects addressed in this report.

17.1 Conclusions

The main question for this research is:

'In what way can Costa Rica improve its logistical system to gain additional economic advantages, while matching future development in maritime transportation?'

This question can be answered by a combination of the chosen strategy and the ease of implementation plan. The strategy provides the best measures for improvement and the implementation chapter provides the best starting point for Costa Rica to start researching these measures. The best strategy for Costa Rica is to create an attractive investment climate in the country, and especially in the area's surrounding the new to be built TCM terminal in Moín. This strategy will make use of the advantages the new terminal will provide and the trend of near-sourcing. In order to do this it is essential that improvements will be made on three different aspects. The exact measures belonging to the aspect mentioned underneath can be found in chapter 14, where the entire strategy is described. The first possibility for improvement lies in the *human resources* aspect, dealing with the quality of the available labour force. The second is the improvement of the logistical situation in the country, for which several improvements are proposed, e.g. improvement of Route 32 and the construction of an inland terminal. The last is the ease of doing business, concerning how easy it is to establish a company in the country and how easy business can be conducted. This currently is a problem due to bureaucratic procedures and inefficient border crossings.

Research will have to be done into how the measures are the most efficient and how they can be implemented the best. Advised is to start with the research into these measures with the following measures per earlier mentioned aspect, this advice is given based on how easy the possible implementation is estimated to be.

Human resources

- Improving the language proficiency

Logistical situation

- (re)Locating the industries
- Construction of an inland terminal
- Improving the border procedures or
- Better coordination of the demand

Ease of doing business

- Installation of IT systems
- Improving border processes

However, these measures are selected because they are easy to start with, if they prove to be ineffective or not effective enough, the other measures should still be considered.

17.2 Recommendations

The first recommendation is one that is already mentioned before. The measures proposed in the strategy should be further examined. The exact costs and effects of the different measures should be known before actual implementation can start. This research provided a strategy with broad measures and their possible effects; this is not enough to actually start implementing them. Also, the measures proposed to start with are the simplest ones to research; this does not mean that they are the most effective or the best. Therefore it is important that the other measures are also taken into consideration even if the ones advices to start with prove to be ineffective.

A recommendation coupled with the first one is the use of different state of the art tools to investigate the effect of different measures. The first one is the mapping of the current traffic flows on the congested roads. This way the most important places of the congestion can be found and a plan for them can be developed. Several tools and models for calculation of these flows are available. A second tool is the cost-benefit analysis. This is a much-used tool to calculate the effects of a certain project or measure. The tool can be used on various sorts of project and is a much-used tool for infrastructural projects. In the Netherlands it is a mandatory analysis for large infrastructural projects and the outcome is an important factor in the decision-making process. It is an objective way of determining effects since it uses predetermined numbers for calculations of effects.

Many interviewees mentioned that a problem in Costa Rica is the collaboration of the different ministries in the country. If a way can be found for the ministries to collaborate better with each other and with the non-governmental parties that hold important knowledge (universities, non-profit organizations) it would make a big difference in the efficiency of decision-making

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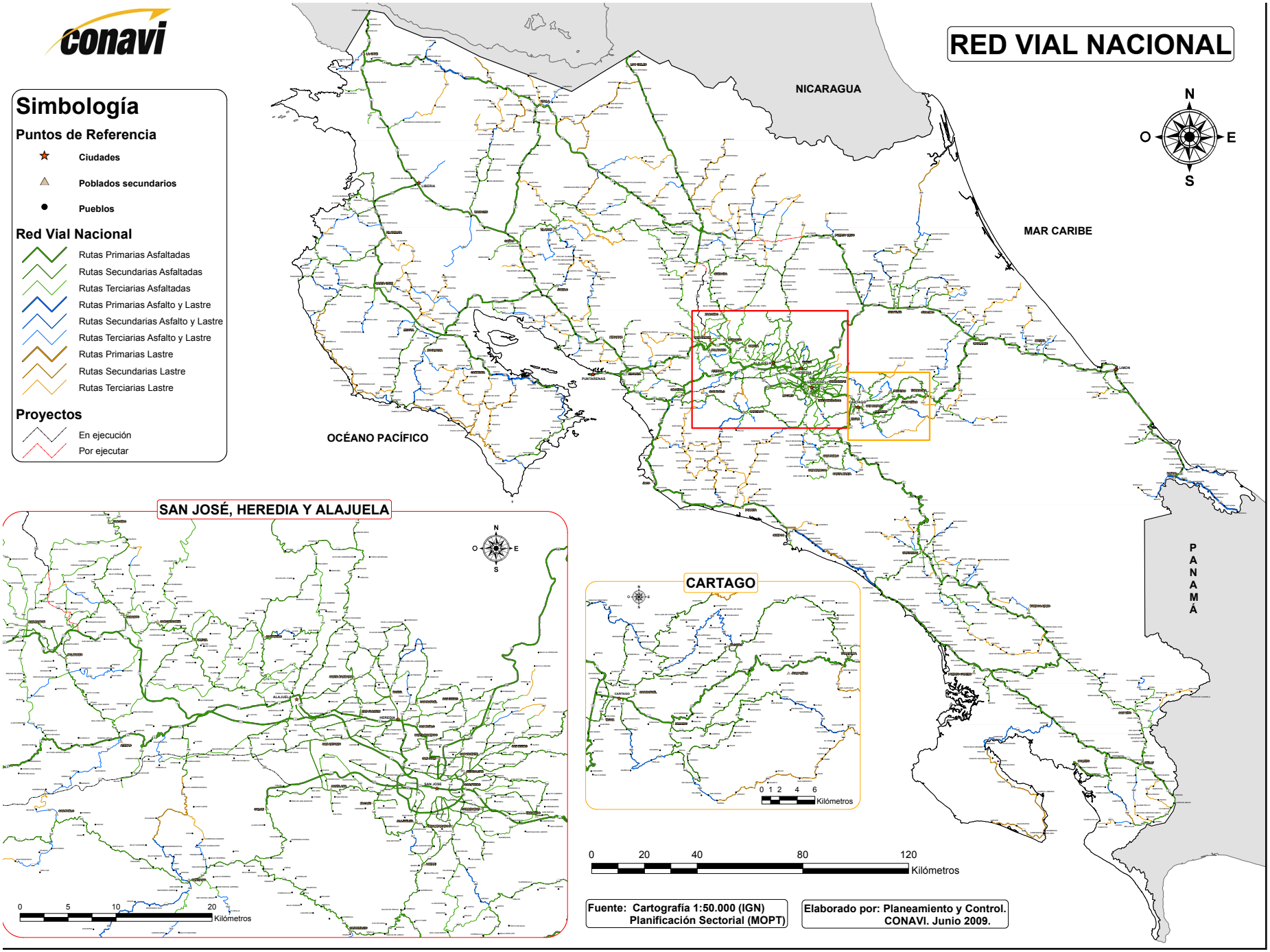
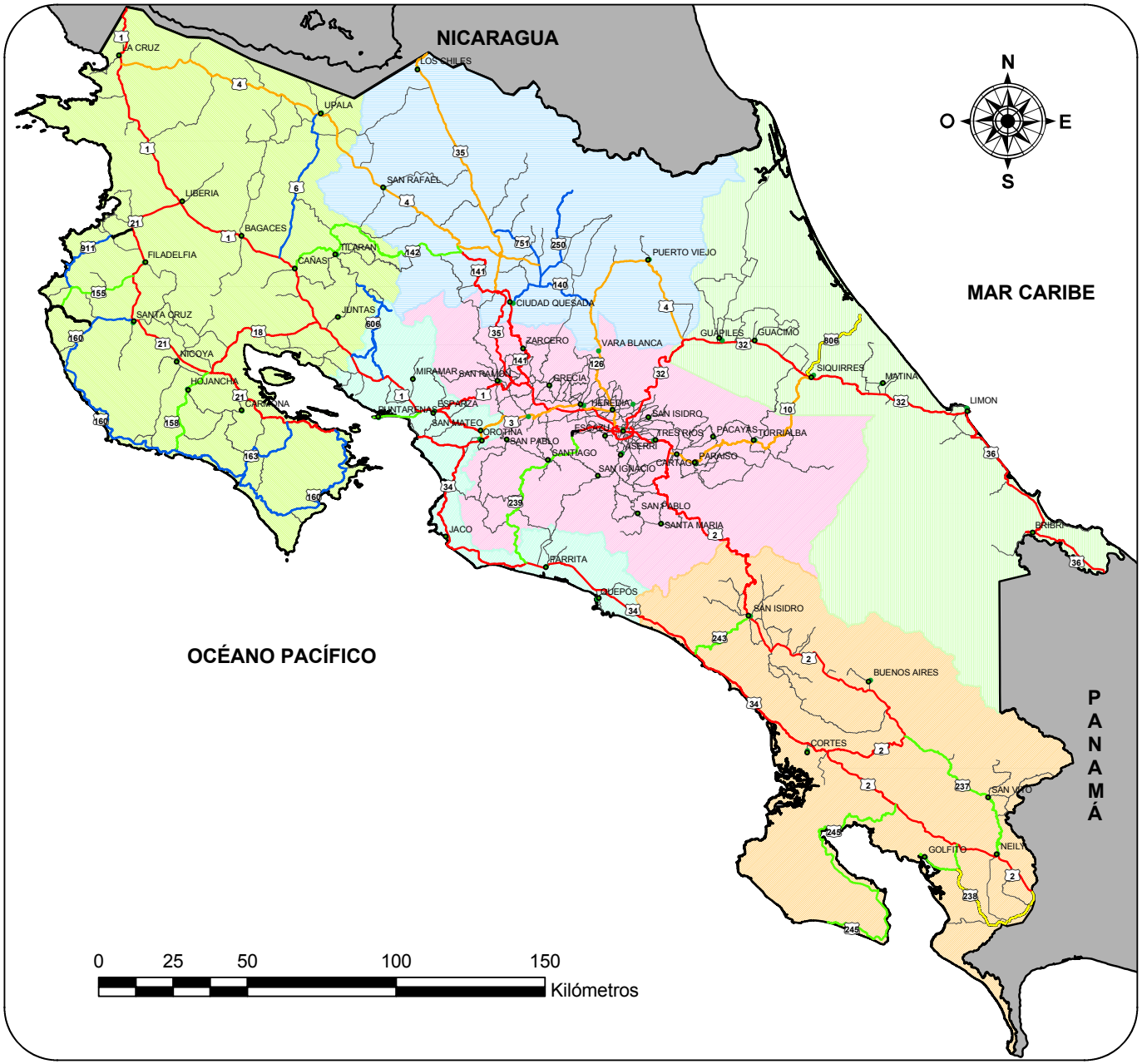
19 Appendices

19.1 Appendix 1: Overview of road surface of the national highways (CONAVI, 2009)


RED VIAL NACIONAL
Simbología
Puntos de Referencia
Ciudades
Poblados secundarios
Pueblos
Red Vial Nacional
Rutas Primarias Asfaltadas
Rutas Secundarias Asfaltadas
Rutas Terciarias Asfaltadas
Rutas Primarias Asfalto y Lastre
Rutas Secundarias Asfalto y Lastre
Rutas Terciarias Asfalto y Lastre
Rutas Primarias Lastre
Rutas Secundarias Lastre
Rutas Terciarias Lastre
Proyectos
En ejecución
Por ejecutar
NICARAGUA
MAR CARIBE
OCÉANO PACÍFICO
PANAMÁ
N
O
E
S
SAN JOSÉ, HEREDIA Y ALAJUELA
0 5 10 20
Kilómetros
CARTAGO
0 1 2 4 6
Kilómetros
0 20 40 80 120
Kilómetros
Fuente: Cartografía 1:50.000 (IGN)
Planificación Sectorial (MOPT)
Elaborado por: Planeamiento y Control.
CONAVI. Junio 2009.

19.2 Appendix 2: Overview of roads distinguished by their strategic relevance (CONAVI, 2010)



Red Vial Nacional Estratégica del País

Fuente:
- Taller N° 1. Red Vial Nacional Estratégica (Marzo, 2006)
- Regionalización del Territorio Nacional Conservación Vial, CONAVI

Elaborado por:
Unidad Asesora de Planeamiento y Control
Consejo Nacional de Vialidad.
Enero, 2010.

Simbología

Rutas Nacionales

Prioridades

- Red Estratégica Prioritaria: Conexión fronteras - Puertos
- Red Estratégica Prioritaria: Rutas Alternas
- Red de importancia Productiva - Turística (Grupo A)
- Red de importancia Productiva - Turística (Grupo B)
- Ejes de Interconexión
- Rutas incluidas para completar la conectividad
- Otras Rutas Nacionales

Regiones

- 1. Central
- 2. Chorotega
- 3. Pacífico Central
- 4. Brunca
- 5. Huetar Atlántico
- 6. Huetar Norte

19.3 Appendix 3: Interview overview

Table 25: Overview interviewees

Date	Meeting type	Interviewee(s)	Function at Company/ Institution
Mon, February 8th	Kick off meeting	Priscilla Morera Hans Buhrs Susana Wong Randall Arce Alvarado Felix Cañet-Prades Marieke Veeger Pablo Acuña Laura Moreira	*Economic Diplomacy Assistant* Dutch Embassy *Policy Officer Economic Diplomacy* Dutch Embassy *Coordinator Customs Administration and Foreign Trade* UCR *Director International Technical Cooperation* UNA *Director of Master programmes in health in food safety* UCI *Regional Coordinator Latin America* UCI *Consultant innovation & adding value* COMEX *Logistics Assistant* PROCOMER
Fri, February 19th	Interview	Mark Huiskamp	*Head of Project Integration* APMT
Tue, February 23rd	Interview	Pieter Hartog	*Representative Costa Rica, Colombia and Panama* Seatrade
Tue, March 1st	Interview	Laura Moreira Joseph Godínez	*Logistics Assistant* PROCOMER
Tue, March 1st	Presentation on Free Trade Zones	Randall Arce Alvarado	*Director International Technical Cooperation* UNA
Wed, March 2nd	Interview	Hans Buhrs	*Policy Officer Economic Diplomacy* Dutch Embassy
Tue, March 8th	Interview	Lander Román Gastón Arce Cordero Susana Wong	*Logistics Analyst* PROCOMER *General Manager* Asesores Aduanales y Comerciales *Coordinator Customs Administration and*

			Foreign Trade UCR
Fri, March 11th	Interview and tour Puerto Caldera	Juan Carlos Mora Pérez	*Operations Manager* SPC
Mon, March 14th	Interview	Ray Brooke José Dengo	*Executive Vice President* *Vice President Costa Rican Operations* AMEGA
Tue, March 15th	Interview	Alfredo Aguilar Calderón Carmen Rodriguez Pacheco Fabricio Ramírez Arce	*Executive Director* *Executive Vice Director* *Commissioner Road Infrastructure CIV-ZEE* ZEEZN
Tue, March 15th	Interview	Zimry Cordero Noriega	*Manager Export* Agromonte
Tue, March 15th	Interview	Olman Briceño	*Business Development Manager* La Paz
Tue, March 15th	Tour new road: Chilemate	Fabricio Ramírez Arce	*Commissioner Road Infrastructure CIV-ZEE* ZEEZN
Wed, March 16th	Interview	Roberto Madrigal	*General Manager* MAERSK
Fri, March 18th	Interview and tour Puerto Limón/Moín	Felix Pecou Johnson	*Marketing Director* JAPDEVA
Fri, March 18th	Tour construction site APMT Moín Terminal	Gilles Bresser	*Trainee Engineer – Superintendent Dredging & Reclamaion* Van Oord
Mon, April 4th	Interview	Jhon Fonseca	Vice-Minister COMEX
Fri, April 8th	Interview	Diana Rivera Soto Mónica Vásquez Vargas	Director of Institutional relations Technical assistant trade and export CADEXCO
Thu, April 14th	Final presentation		

UCR – Universidad de Costa Rica *Public University*
UNA – Universidad Nacional de Costa Rica *Public University*
UCI – Universidad para la Cooperacion Internacional *Private University*
COMEX – Ministerio de Comercio Exterior *Ministry of Foreign Trade*
PROCOMER – *Trading organisation*
APMT – APM Terminals *Terminal Operator*
Seatrade – *Shipping liner*
SPC – Sociedad Portuaria de Caldera *Terminal Operator*
AMEGA – Americas Gateway Development Corporation
Agromonte – *Pineapple producer and exporter*
La Paz – *Frozen fruit processor and exporter*
ZEEZN – Zona Económica Especial Huetar Norte *Regional Development Agency*
MAERSK – *Shipping liner*

JAPDEVA – Junta de Administración Portuaria y de Desarrollo Económico de la Vertiene Atlántica *Port Authority*
Van Oord – *Maritime Contractor*
CADEXCO – Costa Rican Chamber of Exporters