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SUSTAINABLE MOBILITY PLAN

NORTHERN DEVELOPMENT CORRIDOR – HAITI

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SUSTAINABLE MOBILITY PLAN

NORTHERN HAITI DEVELOPMENT CORRIDOR – HAITI

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The recommendations in this report need additional study before implementation and should not be used for construction purposes.

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Executive Summary

CONTEXT

In 2011, the Inter-American Development Bank (IDB) launched Emerging and Sustainable Cities Initiative (ESCI) to support emerging urban areas—cities with demographic and economic growth above national averages—in Latin America and the Caribbean (LAC). ESCI's work contributes to the betterment of quality of life in LAC's city-regions along environmental, urban, and fiscal dimensions, through its assessment methodology (identification, prioritization, and funding of specific actions conducive to sustainability). By 2016, ESCI will have partnered with over 50 fast-growing cities in the LAC.

In mid-2013, the IDB's ESCI launched the implementation of an adapted version of its methodology in Haiti's Northern Corridor, currently home to 650,000 residents in the country's Nord and Nord-Est departments. The Corridor includes the communes closest to the Caracol Industrial Park (PIC), a flagship economic development project that may bring up to 20,000 new jobs to the region in the next few years, unlocking rapid demographic and urban growth and adding pressure to the region's services and resources. Overall, rapid and significant growth in urbanization and demography, particularly after the rehabilitation of RN6 in 2006, have led to increased development and therefore induced traffic. Indeed, mobility will be a key component for sustainable urban development in Northern Haiti, as demand for an improved transportation network connecting strong urban cores will grow with the further success and growth of the PIC, and the implementation of other new commercial, agricultural and housing developments within the region. In partnership with strategic actors in Haiti, such as the Interministerial Committee for Territorial Planning (CIAT) and the Ministry of Economy and Finance, ESCI is working to help mitigate urban development impacts and catalyze interdisciplinary planning processes in Northern Haiti.

In this context, in 2014 the IDB appointed WSP, in collaboration with IBI (since renamed to DAA | Lemay), to produce a Sustainable Mobility Plan for the region which should define the principles that will guide the desired mobility in the region. The study area is focused on three overlapping geographies: the Caracol Industrial Park, the regional perimeter surrounding the PIC, and the entire region extending from Cap-Haïtien to Ouanaminthe. The Sustainable Mobility Plan is intended to establish a detailed understanding of existing mobility patterns within the region and how these will affect and be affected by future development within the region. This baseline understanding will in turn enable the identification of opportunities and constraints for increasing accessibility and affordability of alternative modes of transport, and ultimately strengthen the link between transportation and land use planning to inform the sustainable development of the PIC and the overall development of the Northern Development Corridor.

This plan builds on existing planning exercises, documents focused on the region, sets out a framework for development within the context of existing and future mobility patterns, and gives overall guidance for the region.

To formulate the Sustainable Mobility Plan, it was necessary to gain a clear understanding of the socio-economic context of the Northern Corridor and mobility patterns throughout the region. This document has therefore been based upon a series of detailed preliminary activities, consultations, interviews and empirical data collection exercises. The key piece of empirical data collection was the elaboration of an origin and destination (OD) survey and a traffic count campaign to establish a comprehensive picture of mobility patterns throughout the region—a task that had not yet been carried out in this particular region. Stakeholder consultations were undertaken in May-June 2014 and May 2015. Theses analyses are the basis for the elaboration of a comprehensive multimodal diagnosis of the region's transportation system. The plan is focused on all forms of land-based transportation modes carrying people and goods, whether by foot, bicycle, motorcycle, tap-tap, bus, truck or other modes. This multimodal diagnosis is then used as the basis for elaborating demographic and transportation scenarios for both short (5 year) and long term (25 year) horizons which are evaluated using a travel demand model.

The Sustainable Mobility Plan is a long-term road map to elaborate the development principles and policies, guide future transportation decisions and, as such, does not detail localized measures at the township level, i.e., street corner by street corner. Instead, the plan focuses on resolving key strategic issues within the Northern Development Corridor and presents plans of specific interventions. Most notably, three pre-investment projects are developed. It is also intended to be a living document which should be reviewed and if necessary, revised according to future developments.

INSTITUTIONAL AND LEGAL FRAMEWORK

This plan builds on existing planning exercises and documents, the most notable the Plan d'aménagement du Nord et du Nord-Est (CIAT, 2012), the Cap-Haïtien – Ouanaminthe Development Corridor Comprehensive Regional Plan (AIA, 2012) and a previous Urban Development and Climate Change Study (ERM, 2014). These studies laid the groundwork by laying out a framework for future development. A critical information was the location of future development and population projections. The Strategic Plan for the Development of Haiti also identified a framework for the development of a national road network.

Many organisations are involved in transportation and development, and many of these responsibilities are fragmented into multiple entities, none of which is actively managing land-use and transportation planning in the region. Haitian planning authorities are well aware of the challenges and opportunities tied to the PIC and other economic development projects. However, local administrative capacities face a common problem: a small tax base, dependence on national-level distribution of fiscal resources, no long-term funding, and limited technical capacity for planning, managing, building and operating the transportation system.

Concerning the legal framework, many land-use, traffic and environmental regulations do exist, but the main challenge is application since very few are usually followed or applied. In some cases, it is not clear who is responsible for their enforcement (e.g. the condition of tap-taps, etc.). There is a general disregard of most traffic regulations and land-use laws are also often not applied. Most communes do not have an urban plan and land-use controls to guide their development. Little guidance exists on transportation policy in the region.

CURRENT CONDITIONS

Overall, rapid and significant growth in urbanization and demography, particularly after the rehabilitation of RN6 in 2006, have led to increased development and therefore induced traffic. Indeed, mobility will be a key component for sustainable urban development in Northern Haiti, as demand for an improved transportation network connecting strong urban cores will grow with the further success and growth of the PIC, and the implementation of other new commercial, agricultural and housing developments within the region. This rapid growth has also strained some important natural features, notably a coast mangrove now partly protected by the Parc des Trois-Baies. The Cap-Haïtien-Ouanaminthe Corridor has a number of physical barriers with few links that cross them (hills, mountains, rivers). The region is vulnerable to natural events and the lack of alternative links reduces its resiliency. A large scale natural event would likely paralyze the region. The poor quality of most road infrastructure also reduces the completeness and connectivity of the network. Where national roads cross through built areas, the road design has not been adapted for its use: there are no sidewalks for pedestrians, merchants crowd the side of the road and there are no stops for buses and tap-taps. The region has little transport infrastructure for the size of its population (197 km/streets per 100,000 capita) and what little infrastructure is provided is skewed towards cars (just over 5% of streets have sidewalks and there is no cycling or transit infrastructure even though these modes are used by the vast majority of travellers).

Although improvements to the RN6 have enhanced the transportation of goods in the region, there are few alternative links for shipping goods as side roads are impracticable to trucks. There are no roads usable by trucks to and from the South of Haiti: the RN1 and the RN3 are impassable to larger trucks. In addition, all goods transport to the rest of the country and the port must go through the center of Cap-Haïtien, an increasingly congested sector since there are no alternative routes.

Cap-Haïtien is the most important generator in the region, partly due to its large population and its larger range of available services. Ouanaminthe also attracts a vast number of trips including Ouanaminthe/Dajabon Binational Market. The center of Cap-Haïtien is often heavily congested throughout the day from Monday to Saturday as well as the center of Ouanaminthe on market days. This congestion is due to high volumes, the lack of alternative routes, narrow streets where there are numerous deliveries and stopped tap-taps.

An origin-destination survey and a traffic count campaign were undertaken by WSP in May and June 2014 which were then used to quantify travel behavior and establish a comprehensive picture of longer-distance mobility patterns throughout the region. According to this survey, the PIC attracted roughly 5,000 trips per day in May 2014 when there were 2,500 employees (there were over 8,000 employees in early 2016). There are approximately 153,000 regional trips over a 15 hour period on an average weekday and 15,700 during the peak afternoon hour (4 to 5 PM). Since the peak hour is only 10% of the 15-hour travel, travel is relatively spread out throughout the hours of the day for most modes of travel, except for walking and buses. The tap-tap is the most widely used travel mode in the region accounting for over 55% of trips throughout the day. Moto-taxis and motorcycles, even with their low occupancy rate, account for 44,000 trips. Pedestrians and cyclists accounted for approximately 14,000 trips, although the survey locations were mostly in areas with less pedestrian activity and the actual figure is likely much higher. Some areas see upwards of 20,000 pedestrians and cyclists per day.

Trip purposes were widely distributed between all types. Work and business were the most prevalent trip purposes (37% combined). Personal business, shopping, visiting family/leisure and studies take up approximately 10% each. Travel times are much longer and travel costs much higher to reach communes south of the RN6 such as Sainte-Suzanne, Perches and Capotille. The shortest average travel times were for those in relation to the PIC, but this is partly due to the survey methodology. Travelling can be very expensive: a return tap-tap fare within Cap-Haïtien can represent over 30% of daily income for a household in the lowest quintile.

No information on fatalities was available, even though stakeholders mentioned that fatal injuries are common, a number of which occurred during the weeks when our staff was on-site. Considering that motorization rates are relatively low in the country, it can be expected that the number of accidents, including injuries and fatalities will increase further in the coming years. That said, numerous safety deficiencies were observed including: lack of pedestrian facilities, bad road conditions and lack of signage.

The analysis of current conditions was supplemented by consultations with stakeholders and surveys of transport users as part of the origin destination survey. The principal issues identified by the transportation consultation exercise relate to the poor condition of transport infrastructure, lack of coordinated land use planning and development control, and a lack of organized freight services. The construction of the RN6 in 2006 facilitated rapid, but uncoordinated, growth along the corridor. The absence of formal land use planning has resulted in many different developments being constructed directly on the roadside which has in turn created lots of pedestrian activity on an important arterial road. Given that there are no sidewalks or bicycle paths, inevitable conflicts were created between freight vehicles, general traffic, public transport boarding and alighting activities, cyclists and pedestrians, and free roaming cattle. The fragile socio-economic conditions within Haiti were also noted by many stakeholders. With the exception from the PIC, which enjoys comparatively good transport links within its walls, transport infrastructure of economically important industries such as agriculture, natural resources and tourism are lacking. In particular secondary roads are noted to be in poor condition and are prone to flooding and do not provide sufficient access to market for farmers. Transport users gave similar feedback: poor road conditions (most cited concern for all of modes used except for walking and cycling), the lack of infrastructure, security, the high cost of travel and long travel times.

TRANSPORT DEMAND SCENARIOS

The region's urban population is expected to increase by an additional 350,000 (+50%) to 700,000 (+110%) by 2040, up from the current 650,000. These population projections were refined in the Urban Growth Study (ERM, 2014, commissioned by the IDB's ESCI) and based on the American Institute of Architects *Cummulative Impact Assessment* and the CIAT's *Plan d'Aménagement du Nord et du Nord-Est* Master

Plans elaborated in 2012. The growth estimates assume a low institutional ability to control and direct urban development. The high growth scenario assumes that most planned development projects will be implemented (PIC, institutional reform, development of the transportation system, etc.). Also, original estimates showed that, should current growth patterns continue, the Caracol Industrial Park could to grow to 20,000 employees by 2020. The bulk of growth is expected in urban areas in the communes of Cap-Haïtien, Limonade, Trou-du-Nord, Fort-Liberté and Ouanaminthe; this will cause a significant strain on the region's road network.

The future travel demand was assessed using a regional transportation forecasting model that was developed with the VISUM software and calibrated and validated against the existing May-June 2014 conditions measured in the OD survey used to quantify travel behavior and mobility patterns throughout the region. This demand forecasting model was developed using the sequential four-step (trip generation, trip distribution, modal split and trip assignment) transportation planning methodology. Three development scenarios were modelled for both the 2020 and 2040 horizons: 1) high population growth (+700,000 residents by 2040), 2) low population growth (+350,000 residents) and 3) adjusted population growth (+700,000 residents). The adjusted growth scenario corresponds to the high growth scenario, except that a number of travel behaviors are modified linked to the PIC which will become one of the largest regional generators. The use of this type of model is based on a number of assumptions on demographics, economic activity and other factors. As such, it also comes with a number of limitations. It should also be reminded that this model is foremost a decision making tool and not a precise prediction of the future.

If these increases in demand occur without improving the transport network, general congestion can be expected in all of Cap-Haïtien and in Ouanaminthe. The centers of Limonade and Terrier-Rouge are also expected to be congested but on a lesser scale. This will lead to decreased travel conditions for all modes. A significant increase in the number of transport-related injuries and fatalities can also be expected based on the increase in vehicular travel. Most roadway capacity issues are expected in the long term, except for the center of Cap-Haïtien which is already heavily congested. The RN6 and the RN3 between the center of Cap-Haïtien and Terrier-Rouge would have very high transit passenger loads (5,000 to 10,000 passengers per hour in the peak direction). High capacity vehicles and transit priority measures will be required (especially between Limonade and the center of Cap-Haïtien) will be required along this corridor. Such measures could include implementing a Bus Rapid Transit (BRT) system, which would be an innovative and still plausible proposition in Haiti. This is expected for all three scenarios, although to a lesser extent in the minimal growth than the two other scenarios.

To alleviate this, a well-meshed network of streets will be required in urban areas. For Cap-Haïtien, a number of measures will be required: the construction of a BRT Corridor along the RN3, the widening of the RN3 and the creation of alternative major streets to better distribute traffic. That said, there are currently few opportunities to place east-west links except south of the airport. For Ouanaminthe, the widening of the RN6 would have major impacts on its center, but the city still has manageable size to immediately create a network of urban boulevards that will frame future development. For the centers of Limonade and Terrier-Rouge, solutions to reduce travel on the RN6 and new tap-tap stations should be examined as part of the development of their urban plans.

A second series of consultations was undertaken in May 2015 and some of the comments included: a need for an alternative link to the RN6 that can be used in cases of emergency and the futility of implementing bypass roads around towns since urban development usually follows any new road.

KEY MEASURES AND RECOMMENDATIONS

A sustainable mobility plan should not only be focused on mobility and accessibility, but its success is also dependent on the overall institutional and territorial development context. Non-transport measures are an integral part of solving existing and future transportation challenges since they are interrelated. The development of urban plans and social and economic development are essential, and intertwined, preconditions to ensure the success of the plan.

The measures and policies were based on the data collection, the evaluation of transport scenarios, document review, stakeholder consultations, best practices and firsthand observations by professionals.

ACTIVE TRANSPORTATION

Currently, a high proportion of adults have mobility impairments in Haiti, especially among women and people with lower-incomes, the study area has little functional facilities for pedestrians and cycling and when provided they are often inadequate.

Active transportation, mainly walking and cycling, is an integral part of the transportation system. Walking is the start and end point of any trip: either to access collective transportation services, a car or cover the entire distance by foot. Active transportation also has the advantage of being the least costly form of transportation (both for the infrastructures required and the user's costs) and is already widely used in the region. It is also the most sustainable and environmentally friendly mode of transport. The region, although surrounded by mountains, has a relatively level plateau where it could be easy to walk or cycle if appropriate infrastructure was available.

A wide-range of policies and actions are proposed, the most critical being:

- Improving the safety of pedestrians and cyclists by improving conditions for pedestrians and cyclists and accessible to all through the center of cities and towns along the RN6, especially: Cap-Haïtien, Quartier-Morin, Limonade, Terrier-Rouge and the west entrance of Ouanaminthe. Examples of safer pedestrian crossings and traffic calming devices were developed as one of the three pre-investment projects.
- Creating connected street grids in all developing urban areas and enforcing the right-of-way required to build these grids. This will be a key policy to implement as part of developing urban plans.
- Developing a walking and cycling network in the vicinity of the PIC to connect it to adjacent communes. A walking and cycling network was developed as one of the three pre-investment projects.
- Building appropriate active transport facilities as part of all new roads and anticipate urbanization. Any new major travel generator should have proper active transportation facilities connecting it to adjacent areas on opening day.

COLLECTIVE TRANSPORT

Bus and tap-tap services form the backbone of the region's transportation system and carry the majority of regional travel. The region's urban centers and important generators are all clustered along the RN6/RN3 corridor. For this reason, it is proposed to use this structure as the backbone of the region's transit system from Station Madeline in Cap-Haïtien to Ouanaminthe. Frequent bus routes would travel between a network major transit stations located in each urban center to serve the region with a number of local stops since this is where the bulk of demand is concentrated. A typical tap-tap and bus station was developed as one of the pre-investment projects. Local transit services serving urban areas (using a network of major urban streets) and rural areas would operate from these stations. Interregional transit services should also use the region's major transit stations to increase connectivity. Transit priority measures, including dedicated infrastructure such as a BRT, are recommended for the RN6 and the RN3 between station Madeline and Limonade due to the very high passenger volumes that are expected. A regional planning agency is required to plan and regulate transit services. Import duties for transit vehicles should be reviewed to favor the import of vehicles in better condition and the network of private operators should be consulted regularly to ensure the effectiveness of new measures and regulations.

ROAD NETWORK AND URBAN STREETS

The road network is underdeveloped, often heavily congested in Cap-Haïtien and Ouanaminthe and few alternative links exist.

A network of urban streets is required in urban centers, especially in Cap-Haïtien and Ouanaminthe to alleviate congestion, reduce travel times and reduce travel distances, especially by foot and bicycle. A secondary east-west road is proposed south of the RN6 to provide an alternative link to the RN6 in case of

an unforeseen closure while also avoiding cutting through the environmentally sensitive mangroves along the coast which are part of the Trois-Baies Park. A coastal road is not recommended due to its environmental impact, particularly from the potential impacts on the mangrove and likely urbanization of the corridor. This secondary road would also be beneficial to develop various industries such as farming and provide better all-weather access to isolated communes.

Safety improvements along the RN3 and the RN6 are required in urban areas, especially for pedestrians, cyclists and tap-tap users in urban areas, especially when considering that both the urban population and traffic levels are increasing. This can be done through providing proper facilities for pedestrians and cyclists, traffic calming measures and urban design in combination with proper access management guidelines. Careful consideration of merchants and motorcycles should also be undertaken. Areas with safety problems identified along the RN6 should be improved, but these do not require large-scale improvements. The development of National Roads to the rest of the country will improve access

A cultural shift is required to incorporate all road users into the design and construction process of all new roads, whether they are urban or rural. This recommendation is based on the lack of consideration of active transport as part of previous interventions.

INSTITUTIONS

The integration of urban planning with multimodal transportation planning is a key element to ensure the success of this plan. This requires a regional urban and transportation planning agency which mission would be to integrate multimodal transport planning, urban planning, monitor transit network, provide expertise to local communes and coordinate funding. This agency would bridge the capacity gaps of various existing institutions and clarify roles. The geographical scope could cover the study area and also communes to the west of Cap-Haïtien. This new authority would coordinate closely with existing communes and ministries.

The development of technical expertise at the communal level, fostering the development of Haitian engineering and construction capabilities and enforcement are also necessary.

The development of urban plans and reinforcing technical and financial resources of communes in the study area, especially the fastest growing ones, is a priority action. Establishing future street grids and identifying the location of key infrastructure such as bus stations is vital to providing sustainable mobility. After the adoption of these plans, ensuring that sufficient space for right-of-ways are protected and enforced will be an ongoing challenge.

NEXT STEPS AND IMPLEMENTATION

Most projects and policies contained in this Plan will require additional planning before they can advance. The development of the transportation system and the implementation of the Master Plan is a gradual and continual process. The measures and policies will need to be adapted over time according to successes, failures, economic and population growth.

Although the overall program is daunting, in excess of $US 365M over 25 years, the short-term focus should be on minor infrastructure improvements and planning such as: the development of urban plans for all communes in the study area, institutional measures, improvements to transit stations and, especially, safety improvements for pedestrians and cyclists along major roads. Improvements to the capacity of major roads are not required in the short-term, except in the centers of Cap-Haïtien and possibly Ouanaminthe.

A review of the Sustainable Mobility Plan should be undertaken every five to ten years or when there are significant changes to the Plan's underlying assumptions, such as accelerated urban growth or economic development. A monitoring program will also be required to monitor the implementation of measures.

1 INTRODUCTION

1.1 EMERGING AND SUSTAINABLE CITIES INITIATIVE (ESCI)

In 2011, the Inter-American Development Bank (IDB) launched ESCI to support emerging urban areas—cities with demographic and economic growth above national averages—in Latin America and the Caribbean (LAC)[1]. ESCI's work contributes to the betterment of quality of life in LAC's city-regions along environmental, urban, and fiscal dimensions, through its assessment methodology (identification, prioritization, and funding of specific actions conducive to sustainability). By 2016, ESCI will have partnered with over 50 fast-growing cities in the LAC.

1.1.1 ESCI IN THE NORTHERN CORRIDOR – HAITI

In mid-2013, ESCI launched the implementation of an adapted version of its methodology in Haiti's Northern Corridor, currently home to 650,000 residents in the country's Nord and Nord-Est departments. The Corridor includes the communes closest to the Caracol Industrial Park (PIC), a flagship economic development project that may bring up to 20,000 new jobs to the region in the next few years, unlocking rapid demographic and urban growth and putting pressure on the region's services and resources. In partnership with strategic actors in Haiti, such as the Interministerial Committee for Territorial Planning (CIAT) and the Ministry of Economy and Finance, ESCI is working to help mitigate urban development impacts and catalyze interdisciplinary planning processes in Northern Haiti.

ESCI's tailored approach in Haiti involves the implementation of four baseline studies. These are the foundation for the project's ultimate goal: to deliver site- and city-specific plans for urban and infrastructure development in the municipalities closest to the PIC—Limonade, Trou-du-Nord, Terrier Rouge, & Caracol.

While the studies and final plans keep a focus on these four communes, ESCI keeps an integrated approach to develop recommendations applicable to the Corridor along Route Nationale 6. The four studies include:

- → **1. Assessment of the region's vulnerability to risks and natural hazards**. The assessment focuses on four risk categories—flooding, seismicity, hurricanes, and drought—and, using a newly developed digital terrain model and applying downscaled climate models, includes a probabilistic analysis of hazards on the region and an estimation of impacts on existing infrastructure (e.g., road network, social services, etc.).
- → **2. Urban growth study**. This study presents multi-horizon projections of urban and demographic growth with two basic scenarios (rapid vs. slow) and their respective spatial distribution and impact on existing ecological and urban assets. The growth models include the potential spatial and growth impacts of new developments (e.g., port upgrades in Cap Haïtien) on the four communes' area of influence.
- → **3. Sustainable Mobility Plan (current report)**. The study will carry out unprecedented data collection exercises in Northern Haiti, including an origin-destination survey and counts. Based on this data, the Plan will include demand projections and draw recommendations for priority mobility projects, such as transport hub infrastructure,

[1] More details can be found at www.iadb.org/cities

multimodal options, and improved services for PIC workers. The geographic focus is threefold: the PIC, the surrounding communes, and Route Nationale 6.

→ **4. Living Conditions Survey**. There are considerable gaps in social and economic information. In order to develop planning strategies and instruments based on up-to-date and reliable information, and to establish a baseline of information for future economic impact analysis, ESCI will implement a complete household survey in the urban and rural areas of Limonade, Terrier Rouge, Trou-du-Nord, and Caracol. The survey's questionnaire includes living conditions modules such as access to infrastructure services, wages and labor, health and education, disaster preparedness, and perceptions about emblematic projects such as the PIC.

Building on the results, community feedback, and recommendations from each of these studies, ESCI will provide and socialize the four site- and city-specific urban development plans for Limonade, Terrier Rouge, Trou-du-Nord, and Caracol. The plans will also build on previous planning exercises by local partners such as the CIAT. This dual approach—to develop a foundation for planning based on detailed studies, as well as to build on relevant, past efforts—will ensure that the four urban plans help guide Haitian stakeholders and their domestic and international partners in key urban development areas for the Corridor.

ESCI's work will include proposed interventions at a pre-investment level, so as to facilitate swift action according to local priorities. These proposals touch on areas such as mixed-use development strategies, design-driven conservation of landscape and resources, more resilient siting proposals for housing, and recommendations for transportation infrastructure at both the commune and regional levels. Initial projects could include multi-modal hubs for transport, a pilot bike path network in areas near the Industrial Park, housing infrastructure, and, crucially, immediate water, sanitation, and drainage works.

1.2 SUSTAINABLE MOBILITY PLAN CONTEXT

Haiti has 10.9 million inhabitants, 1.8 million of whom live in the North and Northeast Departments, which represent one of the fastest-growing regions in the country. Given considerably high levels of unemployment (estimated at 39.5% in 2012), poverty (59% of the population lives under the national poverty line of US$2.44 per day and 24% on less than US$1.24 per day), and inequality (The Income Gini Coefficient for Haiti is 59.2) ,the development of the Northern region is one of the government's top priorities, particularly in the wake of the 2010 earthquake, which affected thousands of citizens and devastated important productive assets in the country's capital Port-au-Prince.

In order to promote economic growth, generate local jobs, and increase overall productivity, it is essential, as a first step, to provide favorable infrastructure and operational conditions to attract and retain private investment. The IDB has led in this regard through development of the Caracol Industrial Park (PIC), which is on target to generate 20,000 by 2020. The PIC has catalyzed regional investments, by the IDB and other actors, in key sectors and services, such as housing, power, transportation, environmental conservation, agriculture, and health and education infrastructure, among others. As a result, the PIC has effectively become an anchor for regional development in the North, and is quickly changing growth dynamics throughout the region's territory. According to CIAT, the region's population could reach 1,000,000 by 2040, of which a great majority will settle in the communes closest to the PIC—Limonade, Trou-du-Nord, Terrier Rouge, and Caracol—putting pressure on existing environmental resources and urban services in the North and Northeast departments.

Overall, rapid and significant growth in urbanization and demography, particularly after the rehabilitation of RN6 in 2006, have led to increased development and therefore induced traffic. Indeed, mobility will be a key component for sustainable urban development in Northern Haiti, as

demand for an improved transportation network connecting strong urban cores will grow with the further success and growth of the PIC, and the implementation of other new commercial, agricultural and housing developments within the region.

Haitian planning authorities are well aware of the challenges and opportunities tied to the PIC and other economic development projects in the region. However, local administrative capacities face a common problem: a small tax base, dependence on national-level distribution of fiscal resources, and limited technical capacity for regional planning.

Plans for future development must therefore empower each municipality while keeping a regional perspective, especially in light of overall growth scenarios and implicit infrastructure needs arising from increased activity, both formal and informal.

The PIC and other economic development projects in the North have already generated long-term job opportunities for local communities (close to 10,000 direct jobs by early 2016). However, these benefits will mean nothing if new, inequitable spatial divides arise in the region. Any development intervention in the Corridor is therefore inextricably linked to the right to sustainable cities—which will provide Haitians with the capacity to shape future urban growth.

1.3 THE SUSTAINABLE MOBILITY PLAN MANDATE

In this context, in 2014 the IDB appointed WSP, in collaboration with IBI (since renamed to DAA | Lemay), to produce a Sustainable Mobility Plan for the region. The Sustainable Mobility Plan is intended to establish a detailed understanding of existing mobility patterns within the region and how these will affect and be affected by future development within the region. This will in turn enable the identification of opportunities and constraints for increasing accessibility and affordability of alternative modes of transport, and ultimately strengthen the link between transportation and land use planning to inform the sustainable development of the PIC and the overall development of the north-east corridor.

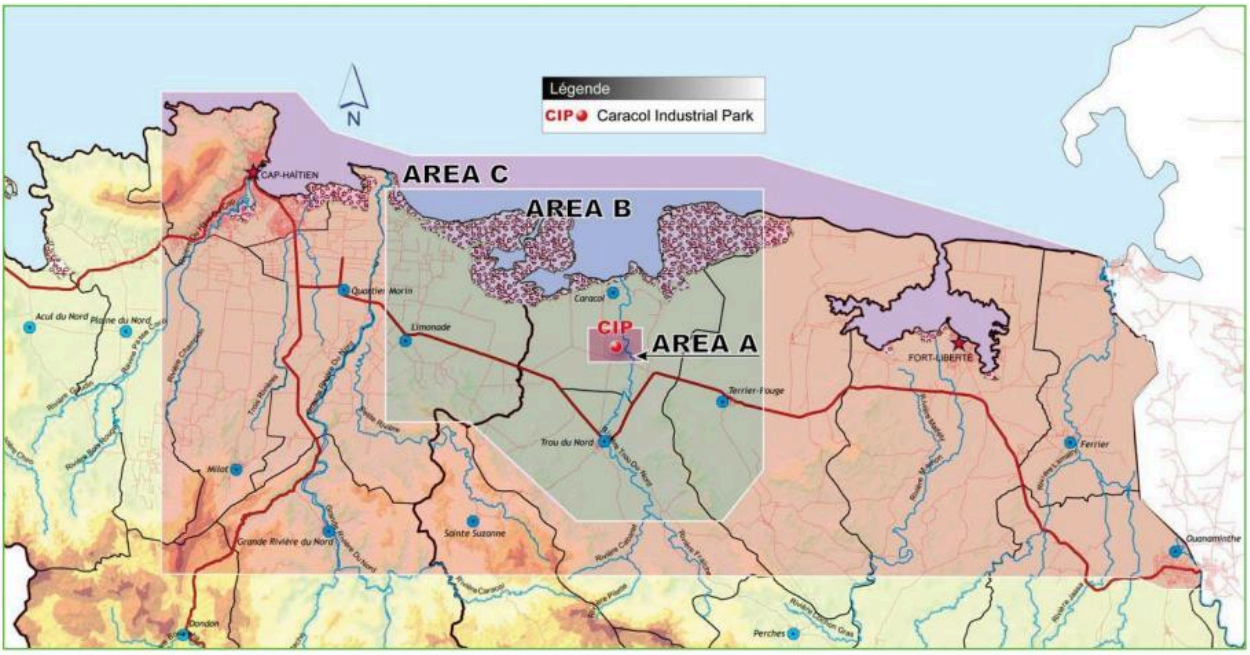
This plan builds on existing planning practices within the region, sets out a framework for development within the context of existing and future mobility patterns, and gives overall guidance to the regional government. The Sustainable Mobility Plan is a long-term road map to guide future transportation decisions and, as such, does not detail localized measures, street corner by street corner. Instead the plan focuses on resolving key strategic issues and within the study area or present plans of specific interventions. It is also intended to be a living document which should be reviewed and if necessary, revised according to future developments.

1.3.1 STUDY AREA

The study area is divided into the following three overlapping perimeters (see figure 1.1):

- → Area A:The local perimeter of the Parc Industriel de Caracol (PIC);
- → Area B: The regional perimeter of Caracol – Trou-du-Nord – Limonade – Terrier-Rouge; and
- → Area C: The overall perimeter of the Northern Corridor (Cap Haïtien – Ouanaminthe).

Figure 1.1 Northern Development Corridor – Study Area



1.3.2 OBJECTIVES

This Sustainable Mobility Plan will provide a comprehensive portrait of regional mobility of goods and people in the Northern Corridor, identify strengths and weaknesses of the study area, and assess the future demand for travel related to the development of the PIC and other urban development projects in the study area. This analysis will then be used to inform the derivation of a number of key strategic measures to facilitate residential and industrial development within the context of sustainable development.

The ultimate goals for the Sustainable mobility plan are to:

- → define the principles that will guide the desired mobility in the study corridor;
- → undertake a detailed multi-modal origin and destination survey to identify the existing mobility patterns within the Northern Corridor;
- → produce a complete and comprehensive multimodal diagnosis;
- → identify and evaluate transportation and development scenarios;
- → elaborate the development principles and policies within the Sustainable Mobility Plan for the region; and
- → identify potential pre-investment projects.

1.4 GENERAL METHODOLOGY

In order to formulate the Sustainable Mobility Plan, it was necessary to gain a clear understanding of the socio-economic context of the Northern Corridor and mobility patterns throughout the region. This document has therefore been based upon a series of detailed preliminary activities, consultations, interviews and empirical data collection exercises.

Given the importance of such data, an Initial Design Report was produced setting out full details of the methodology for the literature review, stakeholder interviews, social and institutional consultations and data collection activities.

The key piece of empirical data collection was the elaboration of an origin and destination (OD) survey, the methodology for which is detailed within the Initial Design Report and summarized within Chapter 3 of this document. The OD survey was used to quantify travel behavior and establish a comprehensive picture of mobility patterns throughout the region. This data is fundamental to the formulation of the Sustainable Mobility Plan as it enables the identification of opportunities and constraints and forms a basis from which the impact of future development scenarios can be tested, with the aim of resolving existing transportation issues within the region whilst facilitating sustainable urban development. This survey was preceded by an extensive traffic count campaign.

Future development scenarios were selected and tested using a travel demand forecasting model. This demand forecasting model was developed using the sequential four-step (trip generation, trip distribution, modal split and trip assignment) transportation planning methodology. Full details of the inputs and assumptions are provided within Chapter 6 of this document and in the appendices.

The results of the travel demand forecasting modelling have been assessed against the goals and objectives of the Sustainable Mobility Plan using carefully selected indicators, to inform the selection of potential pre-investment projects and to help define the recommended policies for inclusion within the Sustainable Mobility Plan.

1.5 OUTLINE OF REPORT

A summary of the report structure together with a description of the key tasks is set out in turn below:

- **Chapter 2**: reviews existing documentation and policies, and legal and institutional frameworks.
- **Chapter 3**: provides an analysis of the current conditions within the study area including summaries of the geographic, demographic and economic characteristics of the region, its transportation networks and most important trip generators. The methodology and results of the origin and destination survey are presented and used as a basis from which to forecast the impacts of planned and future projects within the region. Relevant indicators are detailed for Mobility and Transportation, Land Use, Economic, Social, Environmental and Governance. Details of initial stakeholders' consultations are also provided. Finally, analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT analysis) is undertaken to present the key findings.
- **Chapter 4**: sets out the goals and objectives of the Sustainable Mobility Plan within the context of the relevant indicators identified in chapter 4. Any notable regulatory, physical and economic constraints that could affect the achievement of the goals and objectives are also identified, where necessary.
- **Chapter 5**: assesses the future transportation scenarios and alternatives. It sets out the time horizons for the assessments; provides full details of the development and transport demand assumptions included within the transport model; and provides details and justification for the selection of the transport scenarios to be tested. Each transport scenario is then evaluated within the context of the relevant indicators and objectives identified.

→ **Chapter 6**: presents the measures and policies of the Sustainable Mobility for the region. The plan brings together the analysis within this document to formulate a number of strategic measures aimed at safeguarding sustainable development within the region by strengthening the relationship between transportation and urban development. First of all, supporting institutional building, improved land use planning and economic development are essential to ensuring the success of the Sustainable Mobility Plan. Four groups of measures are presented: Active Transportation, Collective Transportation, Roadway and Regulatory. Additionally, details of three potential pre-investment projects will also be provided to help address key strategic issues within the region and facilitate the move towards sustainable development.

Three pre-investment projects were selected for quick implementation and based on local priorities. The Pre-Investment Projects report-available in appendix H-describes three selected projects: safe pedestrian crossings, active transportation network around the PIC and a new tap-tap/bus station in Limonade.

1.6 TRANSPORTATION MODES IN THE NORTHERN CORRIDOR

The Sustainable Transportation Master Plan deals with all modes of transport, including: walking, cycling, formal and informal mass transit modes (tap-taps, buses, intercity buses and *raché-poils*), trucks, private vehicles, motorcycles, moto-taxis and other modes (horses, donkeys, tractors, etc.). The bulk of mass transit services are offered by tap-taps, an informal transit operation, which are small pick-up trucks converted to accommodate passengers.

More specific information on modes, travel and transportation can be found in the following chapters.

1.7 WHAT IS A SUSTAINABLE MOBILITY PLAN?

A sustainable mobility plan gives overall guidance to the region and this should not be confounded with the common usage of “plan” which, in contrast, refers to a drawing, a construction plan or a large-scale map. As such, this Sustainable Mobility Plan is a road map to guide future transportation decisions and does not detail measures street corner by street corner, nor does it present plans of specific interventions. This Sustainable Mobility Plan is also a living document that should be revised over time.

2 EXISTING DOCUMENTATION, LEGAL AND INSTITUTIONAL FRAMEWORK

This section outlines existing planning documents applicable to Haiti and the Northern Development Corridor. A review of institutions and the applicable legal framework follow. This section aims to present the study's context.

2.1 EXISTING DOCUMENTATION AND POLICIES

Several recent documents and plans have been developed that affect land use and transportation planning in the Northern Development Corridor.

2.1.1 PLAN D'AMÉNAGEMENT DU NORD ET DU NORD-EST (PANNE)

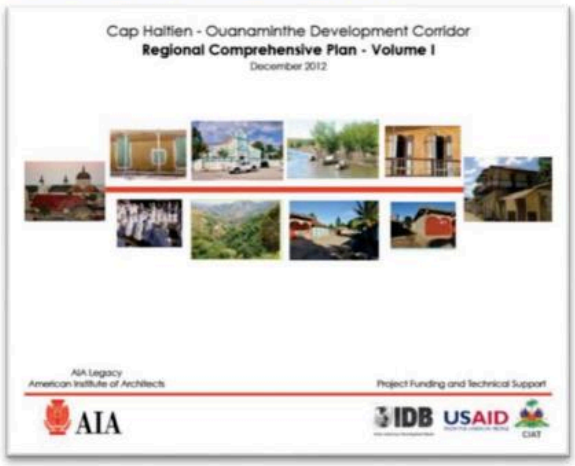
The "Plan d'Aménagement du Nord et du Nord-Est" (North and North-East Development Plan) was prepared by the CIAT in late 2012. The Plan presents seven challenges to be addressed by 2030: support population growth, structure existing urban areas, transform the economy, modernize agriculture, promote heritage features, reduce vulnerabilities to natural hazards and properly manage the whole system.



Many propositions and measures contained in this plan have an incidence on transportation, for example:

- → Urban development should be primarily directed into two new cities along the RN6: Champin (urban area between Trou-du-Nord and Caracol) and Chevry south of Fort-Liberté. These are located outside the two existing larger cities: Cap-Haïtien and Ouanaminthe to limit development in agriculturally productive areas;
- → Structuration of certain existing urban areas by improving the quality of infrastructure and the built form;
- → Development of a road along the bottom part of the mountain range to serve enclave communities such as Acul-Samedi, Perches and Sainte-Suzanne;
- → Protection of certain zones, including the "Parc des Trois Baies" and mangroves along the coast;
- → Concept of the "*route à deux vitesses*" (two-speed roadway) along the RN6 where local (slower and active modes) and through traffic have different dedicated parts of the roadway;
- → A new road leading towards the Dominican Republic from the RN6 at Carrefour Chevry to Pepillo Salcedo.

2.1.2 CAP-HAÏTIEN – OUANAMINTHE DEVELOPMENT CORRIDOR – REGIONAL COMPREHENSIVE PLAN – AMERICAN INSTITUTE OF ARCHITECTS



The Regional Comprehensive (Volume I) is a broad ranging plan that focuses on four policy goals: resource protection, economic growth, infrastructure support and capacity building. The plan assesses and recommends a number of measures and policies touching many fields: water, agriculture, history and heritage, transportation, economic development, solid waste, energy, risk management, zoning, land tenure and governance.

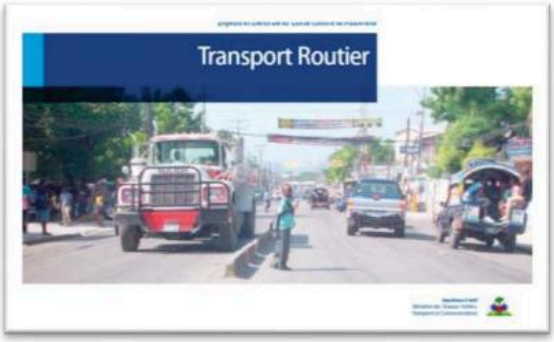
The four main goals of this plan are centered on: resource protection, economic growth, infrastructure support and capacity building.

Volume II presents local urban plans for eight urban centers along the RN6: Quartier Morin, Limonade, Caracol, Trou-du-Nord, Sainte-Suzanne, Terrier-Rouge, Fort-Liberté and Ferrier. Volume III presents the cumulative impact assessment and focus area studies, including one on transportation. The transportation plan contains a number of recommendations, including:

- → Public transit (creation of transit companies, new vehicles, infrastructures, new operational plans);
- → Non-motorized transport (active transport infrastructure, promote walking and cycling);
- → Goods movement (support private enterprise, new vehicles, logistical infrastructure);
- → Road safety (enforcement, driver training, behavior and education);
- → Development of infrastructure to improve access to local communities (improve port and airport facilities, development and maintenance of the RN6 and RN3, improve roads accessing agricultural resources).

The Regional Comprehensive Plan is generally in line with the PANNE (see previous plan), although the study area is slightly different: Cap-Haïtien and Ouanaminthe are outside the scope of study.

2.1.3 PLAN DE TRANSPORT NATIONAL 2009-2013 (HAITI NATIONAL TRANSPORT PLAN 2009-2013)



The Haiti National Transport Plan was prepared in 2008 and gives a general policy for maritime, air and land transport throughout the country. Urban and interurban transport is centered on three main orientations: ensure and recognize priority for public transport, economic development through cost savings for users and productivity gains for industry and coherence with the national urban policy.

The plan contains a number of goals and measures to improve transport, for example:

- → Reduce poverty, promote sustainable,

equitable and balanced development by the development of integrated, adapted and well-maintained infrastructure:

- Improve strategic planning: establish a road classification system, develop land-use plans for departments, establish a national infrastructure program (20 year horizon), etc.
- Establish a road maintenance program.
- Promote multimodality: development of airports and ports, promote coastal shipping, coordination of various transport modes.

→ Promote international trade, especially with the Caribbean:

- Develop an international maritime shipping sector in Haiti.
- Develop the air transport sector through encouraging additional airlines and airport development.
- Develop and improve road links with the Dominican Republic: new links to the Dominican Republic, Construction of a Bypass Road around Cap-Haïtien.

→ Mobilize financing for infrastructure projects.

→ Encourage the participation of the private sector by promoting the development of the construction and transportation industries.

→ Improve the management of infrastructure through a reorganization of the MTPTC.

2.1.4 STRATEGIC PLAN FOR THE DEVELOPMENT OF HAITI (PSDH) – AN EMERGING COUNTRY IN 2030

In New York on March 31, 2010, Haiti's international partners accepted the principle of long-term support for the reconstruction of the country, based on the *Action Plan for the Recovery and Development of Haiti* (*Plan d'action pour le relèvement et le développement d'Haiti – PARDH*). The focus of this plan was on the immediate reconstruction needs viewed in a long-term development perspective.



The *Strategic Plan for the Development of Haiti* (*Plan stratégique de développement d'Haiti – PSDH*), expands and details this long term perspective. A *Strategic Plan* is vital to the country for three reasons: to structure initiatives, to mobilize and bring actors together around a common strategy and to better coordinate and ensure coherence between the numerous initiatives in support of Haiti's development.

The *Strategic Plan for Development of Haiti* will address four major "action areas": **Territorial**, **Economic**, **Social** and **Institutional** Rebuilding. Each action area includes seven to nine programs and each program is broken down into sub-programs. In total, the *Strategic Plan* includes 32 programs and approximately 150 sub-programs.

One of the programs presented in the action plan for **Territorial Rebuilding** aims at **"building a nationwide transportation system (Program 1.5)"**: the intermodal connections, the quality and the maintenance of Haiti's transportation system, including roads, ports and airports, are weak, and thus hindering the movement of goods and people and trade activity, both internally and

externally. The national road network needs to be completed, better linked with local networks, and city and intercity traffic improved. Reliable connections must be established with the country's main islands and additional airport and port infrastructures developed.

This program is composed of six (6) sub-programs:

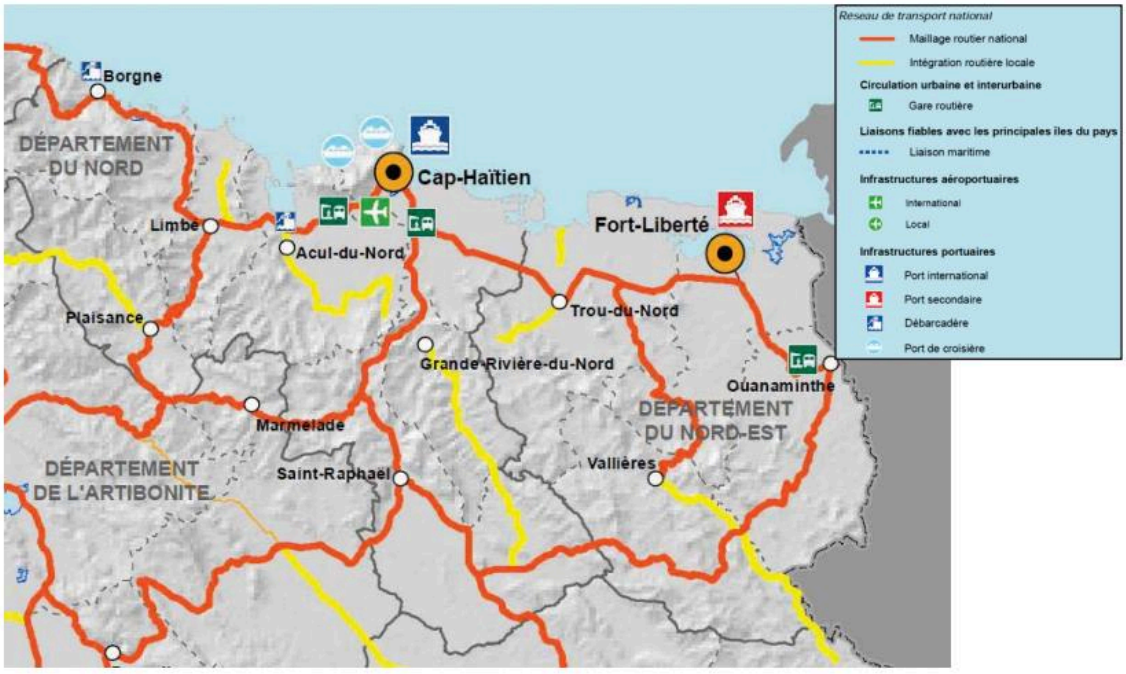
- → 1.5.1. Finalize the national road network.
- → 1.5.2. Ensure the local road integration.
- → 1.5.3. Improve urban and interurban traffic.
- → 1.5.4. Establish reliable connections to the main islands of the country.
- → 1.5.5. Rehabilitate and build airport infrastructures.
- → 1.5.6. Rehabilitate and build port infrastructures.

Sub-program 1.5.3 aims at improving/implementing transport networks to facilitate travel and to relieve the pressure on the roads. Construction/rehabilitation of a number of local roads and facilities will be required, including bus stations. Moreover, to improve the current and future operation of road infrastructure, regulatory actions (installation of traffic lights, new intersections design, horizontal and vertical signage, etc.) will be conducted. They will optimize the use of roads and ensure proper treatment of critical points of the network limiting the flow of traffic.

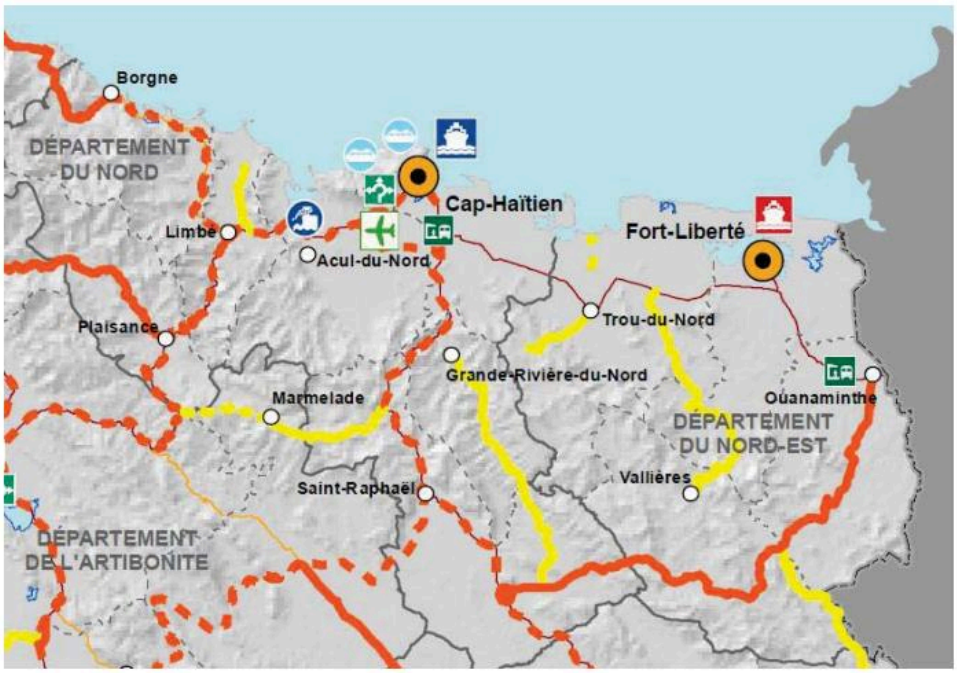
The specific projects presented in the PSDH for the Northern Development Corridor include the construction of two regional bus-stations, one in Cap-Haïtien and another in Ouanaminthe, the construction of several roundabouts, and improvements to national and local roads (see figure 2.1).

Figure 2.1 Vision for Transport in the North and North-East - PSDH

Vision for transport



Short-Term Projects



Source: PSDH (2012).

2.1.5 SCHÉMA D'ORIENTATIONS STRATÉGIQUES POUR LES INTERVENTIONS DU FED DANS LE NORD ET LE NORD-EST

This strategic planning document was prepared in 2006 for the European Development Fund (EDF) during the rehabilitation of the RN6 in the study area. This document presents interventions in multiple fields: social, infrastructure, urban planning, agriculture and the economy. On the infrastructure front, actions included:

- → A new bypass road around Cap-Haïtien and another around Ouanaminthe;
- → New bus terminals and markets at Carrefour La Mort and in Ouanaminthe;
- → A new port in the vicinity of Cap-Haïtien.



2.2 LEGAL AND INSTITUTIONAL FRAMEWORK

This section is intended to give an overview of the various institutions involved in transportation directly or indirectly.

2.2.1 INSTITUTIONS INVOLVED IN TRANSPORTATION

2.2.1.1 GOVERNMENTAL ORGANIZATIONS – HAITI

Haiti has a unitary type of government, although the central government devolves certain powers to its ten departments and communes. The national government has a number of ministries, inter-

ministerial units and agencies that are involved directly or indirectly in transportation. Haiti also has 10 departments, two of which are partly in the study area: North (Nord) and North-East (Nord-Est). These departments are not yet fully autonomous governments as stated in the Haitian constitution, but are rather administrated by a departmental delegation representing the region's central government (AIA, 2012). Below the departmental level, the next administrative units are the commune, followed by the most local form of government in Haiti, the communal section (however, since these sections have less technical and financial means than the communes, their relevance is more socio-spatial than administrative). Sections ultimately depend on the commune, which constitutes a municipal government that levies taxes and receives operating grants and, at certain times, investment on the part of the Central State.

Historically, most governmental institutions, both national and local, have not have the resources (financial, technical, human resources, governance or otherwise) to properly develop and maintain its infrastructure. These governance and capacity challenges are accentuated by the rapid urbanization of the region.

The following organizations deal with transportation in Haiti at the Central, Departmental and Communal level.

CENTRAL GOVERNMENT MINISTRIES AND AGENCIES

The following central government ministries agencies deal with transportation, directly or indirectly, in the region:

- → Comité Interministériel d'aménagement du territoire (CIAT), an interministerial committee on territorial development which depends on six ministries;
- → Ministry of the Interior and Local Authorities (MICT) and its agencies:
- → Ministry of Public Works, Transportation and Communications (MTPTC) and its agencies:
  - National Airport Authority (AAN);
  - Bureau of Mines and Energy (BME);
  - Central Execution Unit (UCE);
- → Ministry of Economics and Finance (MEF) and its agencies:
  - National Port Authority (APN);
  - National Industrial Park Corporation (SONAPI);
  - Technical Execution Unit (UTE).

MINISTRIES AND INTER-MINISTERIAL COMMITTEE

Comité Interministériel d'Aménagement du Territoire (CIAT)

The Comité Interministériel d'Aménagement du Territoire (Inter-Ministerial Committee for Territorial Development) mission "is to define the government's policy in what regards regional planning, protection and management of watersheds, sanitation, urban planning and equipment." (CIAT) It aims to coordinate the government's actions as it relates to regional planning and is constituted of six ministries: Interior and Local Authorities (MICT), Economics and Finance (MEF), Planning and External Cooperation (MPCE), Agriculture, Natural Resources and Rural Development (MARNDR), Public Works, Transportation and Communications (MTPTC) and the Environment (MDE). The CIAT was created in 2009 to better coordinate planning activities between the ministries mentioned above. Although interdepartmental councils chaired by the Prime Minister had almost never taken place, as provided for by the decree, the institution has conducted major global reflections on the national and regional levels and manages to transmit its recommendations through publications and during plenary sessions of the Council of Ministers.

Ministère de l'Intérieur et des Collectivités Territoriales (MICT)

The Ministère de l'intérieur et des collectivités territoriales (Ministry of the Interior and Local Authorities) has a number of responsibilities. Among its mandates, the following have an impact on the communal sections, communes, *arrondissements* and departments: oversee the distribution of competencies between the central government and local governments, oversee the preparation of departmental and communal budgets as well as the communal development plan. The MICT works closely with most communes, mostly for elements pertaining to the public domain (public lands, public facilities, etc.) but also empowers the communal institution by implementing ATLs (Agences Techniques Locales or Local Technical Agencies), consisting of technicians available to the municipality.

Ministère des Travaux Publics, Transports et Communications (MTPTC)

The Ministère des travaux publics, transports et communications (Ministry of Public Works, Transportation and Communications) is involved in many fields, from public works to transport to land-use planning to communications to water to energy and to natural resources. Its mission is to: study, plan, implement, maintain and control various physical infrastructures: urban and rural equipment, roads, ports and airports, communication systems and drinking water systems. It also establishes certain land-use and building regulations. It reviews construction permits and subdivision applications.

The Fonds d'entretien routier (FER), an agency under its control, is responsible for the maintenance of national roads including the RN6.

Although they are involved in the same territories, the two ministries (MICT and MTPTC) often acted in parallel without always exchanging information. To address this, the administration initiated weekly interdepartmental in 2009 and, at times, thematic consultation sessions, as well as "GOL (or Gouvènman Lakay)" sessions in neighborhoods, towns or villages, and it would seem that the communication is now more open between the different departments, especially between the MICT and the MTPTC. This results in enhanced collaboration at the local level. Indeed, the MICT often transmits the grievances of local officials to the MTPTC regarding the rehabilitation or construction of a particular section. "Special Plans" initiated by the Prime Minister for the benefit of certain cities or disadvantaged islands appear to have improved interdepartmental cooperation, as these specific meetings frequently include key players.

AGENCIES

Governed by an independent status, these entities (AAN, APN, BME, SONAPI) more or less function on a self-sufficient basis and participate in the council of ministers and government only through their responsible minister, except during thematic meetings where CEOs are convened. A weekly board of managing directors was recently (2015) organized by the Office of the Prime Minister to resolve the problem of lack of communication. The board meets once a month.

Autorité Aéroportuaire Nationale (AAN)

The Autorité Aéroportuaire Nationale (National Airport Authority) is a part of the Ministry of Public Works, Transportation and Communications (MTPTC). Its main responsibility is to plan, develop, maintain and operate airport installations in Haiti. It is responsible for Cap-Haitien International Airport and the Ouanaminthe Airport.

Autorité Portuaire Nationale (APN)

The Autorité Portuaire Nationale (National Port Authority) is a part of the Ministry of Economics and Finance (MEF). Its main responsibility is to develop, maintain and operate port installations in Haiti. It is responsible for the Port of Cap-Haïtien located in the center of the City.

Bureau des Mines et de l'Énergie (BME)

The Bureau des Mines et de l'Énergie (Bureau of Mines and Energy) is a part of the Ministry of Public Works, Transportation and Communications (MTPTC). It is involved in the promotion of exploration and exploitation of mineral and energy resources and that are environmentally sustainable and economically viable.

Société Nationale des Parcs Industriels (SONAPI)

The SONAPI (National Industrial Park Corporation) is responsible for the implementation, organization and management of industrial parks. It also seeks to attract tenants. The Caracol Industrial Park (PIC) is managed by SONAPI. It also currently organizes transportation for industrial park workers.

EXECUTION UNITS

Along with directorates and authorities, these two units (UTE and UCE) often work independently from each other. Since they work using a project-based approach, they do not necessarily have to apply collaborative measures.

Unité Technique d'Éxécution (UTE)

The Unité technique d'exécution (Technical Execution Unit) is an execution unit within the Ministry of Economy and Finance (MEF). The UTE is mainly involved in infrastructure projects: it receives and analyzes funding demands, follows projects, undertakes technical audits and provides assistance throughout the project's lifecycle. It is involved in transportation, drinking water and sanitation, electricity, agricultural infrastructure, rural infrastructure, urban infrastructure and flood prevention projects, many of which are financed by international organizations such as IDB, USAID or the World Bank. The UTE is also involved in infrastructure development for the Caracol Industrial Park.

Unité Centrale d'Éxécution (UCE)

The Unité Centrale d'Exécution (Central Execution Unit) is a part of the Ministry of Public Works, Transportation and Communications (MTPTC). The UCE is mainly involved in infrastructure projects financed by international organizations such as IDB, USAID or the World Bank that are under the MTPTC's responsibility.

DEPARTMENTS

As mentioned, Haiti is divided into ten departments. In theory, these are to be administered by an assembly (one member from each commune) and an executive committee (three elected members from the assembly), but currently (2015) there are no elected officials. Two departments are partly within the study area: the North (Nord) and the North-East (Nord-Est). They have the power to elaborate and implement departmental plans, but this has not yet been done.

Most national ministries and agencies have directions at the departmental level due to the decentralization and deconcentration of the national government. That being said, most of the decision-making is often made in the capital because of the slow process of implementing decentralization and deconcentration.

COMMUNES

Communes are a municipal form of government in Haiti and are divided into communal sections. They are responsible for developing and adopting land-use and environmental plans and regulations in accordance to national policies such as the protection against natural hazards. They also have the authority to place appropriate signage on streets and roads under their control.

Streets, public markets, water, electricity, construction permits, sanitation, hygiene, road/bus terminals generally fall under their responsibility. That being said, many communes do not offer all of these services because of limited resources and their role in transportation is often marginal. Each commune has three locally elected representatives, including the mayor.

Many communes form an "arrondissement" that more or less correspond to watersheds and also coincide with living areas, particularly because of the lack of river crossing structures, especially in the hinterland.

The following 13 communes are within the study area:

- → Département du Nord:
  - Cap-Haïtien;
  - Limonade;
  - Quartier Morin;
- → Département du Nord-Est:
  - Capotille;
  - Caracol;
  - Ferrier;
  - Fort-Liberté;
  - Mont-Organisé;
  - Ouanaminthe;
  - Perches;
  - Sainte-Suzanne;
  - Terrier-Rouge;
  - Trou-du-Nord.

Although the constitution of 1987 decentralized power, "little has been done to implement the decentralization process the law prescribed. Municipalities [communes] lack the capacity, funding, and authority to function. The complete local government structure is nonexistent and the selection and nomination of important democratic elements (such as municipal assemblies, departmental and interdepartmental bodies, a local judiciary, and permanent electoral bodies) that depend on local elections are in the hands of the central government." (Ramirez, Lafontant and Enders, 2006).

Moreover, communes and departments have very few means to raise funds through taxes for projects and technical knowledge to guide development, land-use decisions and projects, especially due to the generalization of the informal sector. Therefore, they are dependent on the central government and international agencies for financial and technical support. Communes also tend to have little institutional memory since staff is often changed after municipal elections for patronage reasons (Smucker, 2012) but also due to the low level of training of elected officials and their staff.

2.2.1.2 HAITIAN CIVIL SOCIETY ORGANIZATIONS AND ASSOCIATIONS

This section presents a few civil society organizations, some with direct links to transport representing transporters, transport workers and goods transport and others are less direct.

ASSOCIATION DE TRANSPORT DU NORD (ATN)

The Transport Association of the North (ATN) represents the majority of tap-tap and mini-bus owners (approximately 50) in the North and North-East Departments. In turn, these owners employ unionized workers to drive and collect fares.

ORGANISATION DE TRANSPORT DES SALARIÉS (OTSAGA)

This organization represents drivers and fare collectors working in the North and North-Easts tap-taps and minibuses.

FÉDÉRATION NATIONALE DES CONDUCTEURS DU TRANSPORT PUBLIC ET PRIVÉ (FENCTRAPP)

The FENCTRAPP (National Federation of Public and Private Transport Drivers) is a national association of transport owners/drivers. They are currently responsible for transporting workers to and from the Caracol Industrial Park through a mandate obtained from SONAPI.

CONSTRUCTION AND ENGINEERING FIRMS

There are very few Haitian construction firms capable of building medium and large-scale transport infrastructure projects. This lack of firms is problematic in many ways, resulting in little capacity to implement infrastructure projects, limited competition between existing firms, poor quality of some built infrastructure and lack of skilled construction labor. There are also few Haitian engineering and laboratory firms capable of designing projects and ensuring quality control during construction. International firms are often required to undertake specialized work.

The Haitian Nation Transport Plan identified the need to develop the construction sector.

GOODS TRANSPORTATION FIRMS

Similarly to the construction industry, there are few transportation firms. Most goods and people transport are not well organized: few transporters have insurance, vehicles in good working order, vehicles with sufficient capacity, well-trained drivers and have little access to financing to improve their services.

INTERCITY PASSENGER LINES

Intercity coach travel is offered to Port-au-Prince, Cap-Haïtien, Ouanaminthe and the Dominican Republic. These lines are operated by a few companies and have their own bus terminals in each city: Blue Sky, Transport Sans-Souci and Caribe Tours.

CHAMBRE DE COMMERCE ET DE L'INDUSTRIE D'HAITI (CCIH)

The Chambre de commerce et de l'industrie (Chamber of Commerce and Industry) is a national association of Haitian businesses and merchants with local organizations at the departmental level. They promote business development throughout Haiti. They represent the interests of many firms in the region for which goods movement and access to resources are among their pressing concerns.

2.2.1.3 INTERNATIONAL ORGANIZATIONS

A number of governmental, international and non-governmental organizations are involved in development projects in Haiti, including the study area. Many agencies work with Haitian governmental and non-governmental organizations, but most have a significant presence in the country. They are highly dependent on external organizations. The two following organizations are most involved in projects relating to transportation in the study area.

A number of other governmental (e.g. Fonds Européen de Développement [FED], International Development Canada), inter-governmental (e.g. World Bank) and not-for profit organizations are also involved on numerous development projects in the region.

INTER-AMERICAN DEVELOPMENT BANK (IDB)

The Inter-American Development Bank was established in 1959 to help accelerate economic and social development in Latin America and the Caribbean. Today, the Bank is a major catalyst in mobilizing resources for the region. The Bank is owned by its 48 member countries. The Bank provides loans, technical assistance and policy guidance to further its goals of poverty reduction and sustainable development in the Latin American and Caribbean regions. It has been involved in the Northern Development Corridor in Haiti, and especially in the development of the Caracol Industrial Park and associated infrastructure. The current study is part of IDB's Emerging and Sustainable Cities Initiative ("ESCI") which is a non-reimbursable technical assistance program providing direct support to local governments to address their challenges of rapid urbanization and climate change.

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT (USAID)

USAID is the Unites States government arm for international aid programs. USAID is involved in numerous initiatives that have incidences on transport including ports, agriculture and housing projects. They are also involved in governance, health and education.

2.2.1.4 KEY FINDINGS

- → Local communes and departments have little expertise and financial resources to plan, manage, build and operate the transportation system. The same can be said of urban development. There is no dedicated long-term funding available for projects.
- → Most major transportation and urban development projects are funded, at least in part, by international organizations and groups. They are often undertaken and managed by external organisations. In turn, this hinders the development of Haitian expertise in the private and public sectors.
- → There is a lack of coordination between communal, departmental, national and international organisations. Responsibilities linked to transportation and urban planning and its implementation are fragmented across multiple organisations.
- → No entity is actively managing land-use and transportation planning in the region.
- → Most past transport projects did not properly include active transportation and transit. There seems to be a limited focus of institutions on active transportation and transit.
- → There is a general lack of enforcement of existing rules and regulations.

2.2.2 LEGAL FRAMEWORK

This section outlines various land-use, environmental, transport and traffic laws and regulations. That said, few of these laws and regulations are enforced due to overall institutional weaknesses.

2.2.2.1 LAND-USE AND ENVIRONMENT

Land-use and environmental regulations are mostly those developed by the national government. These laws and regulations provide the framework for buildings, land-use, layout of public streets, lot subdivision, servitudes, heritage and the environment. These laws also provide the framework for master plans at various levels: cities, communes, watersheds and departments.

Most of these regulatory powers are found in various national laws and decrees adopted over the years. There is no general law outlining land use powers and certain texts are contradictory (CIAT, 2013).

Communes have the power to adopt land-use and building regulations in concordance with national policies and national government oversight. For example, the national government has the power to identify areas that are at risk of being affected by natural hazards and these should be accounted for in local land use regulations.

In addition to local regulatory powers, Haitian laws and decrees contain a number of dispositions pertaining to streets:

- → Along important roads (from CIAT, 2013):
  - Houses should be setback by a minimum of 5 meters and a 2 meter wide strip of land should be set aside for the construction of a sidewalk (50% of the cost to be borne by the landowner) – (Law of May 29, 1963);
  - Minimal sight triangles at intersections (60 meters);
  - The hierarchy of streets and their characteristics: local, collector, principal artery, industrial and freeways;
- → Obligation to install fences around pastures used by livestock and prohibition to allow animals to wander freely along streets (*Code rural*).

A number of environmental regulations have also been adopted including the protection of the coastal zone, rivers and streams, air quality (including vehicle emissions), water quality, disposal of waste water and residual matter, protected areas, etc.

Although many laws and regulations are in place and their application over the years could have hypothetically allowed for a more ordered development, many of these regulations are not enforced for a number of reasons, among which (CIAT, 2013):

- → they are often not known by the public and by certain government officials;
- → overlap of competencies by various agencies or lack of coordination;
- → little institutional capacity to enforce regulations;
- → no common orientation between communes and various ministries.

In conclusion, many land use controls and regulations exist, but very few are ever applied.

2.2.2.2 TRAFFIC AND VEHICLE REGULATIONS

The “Code de la route” decreed on June 1st, 2005 establishes general traffic regulations applicable to private vehicles, public transport vehicles, trucks, bicycles, pedestrians and others. This law presents the general rules of the road: signage (traffic signals, one-way, stops, parking, passing, etc.), priority, safety, stopping and others. Driver’s licenses, vehicle inspection, vehicle conditions and the loading of vehicles are also addressed. There are specific provisions for vehicles used for public transport, for example: all passengers must be seated inside the vehicle, an inspection is required every three months, maximal fares, etc. The Police Nationale d’Haiti (Haitian National Police) is responsible for its enforcement. The dispositions of this code are similar to what is found in many other jurisdictions.

Roadway signage is a mixture of Vienna Convention (European) and North American signs.

During site visits, there appeared to be a general disregard for many provisions contained within the “Code de la route” whether it be: signage and roadway markings, the condition of vehicles, number of passengers and overloaded vehicles. Many drivers never took the license exam and simply bought counterfeits, which explains their lack of knowledge regarding the traffic laws. Moreover, the public transportation system is an incentive to break those laws in itself: the vast majority of drivers do not own the vehicles they are using, merely renting it for the day, and their profit margin entirely depends on how many clients they will be able to service during that time.

Law enforcement is also an issue that should be addressed since the corruption prevents the aforementioned issue to be resolved like it should be according to the legal code in place.

2.2.2.3 KEY FINDINGS

- → Many land-use, traffic and environmental regulations exist, but few are applied. In some cases, it is not clear who is responsible for their enforcement (e.g. the condition of tap-taps, etc.).
- → There is a general disregard of most traffic regulations. Land-use laws are also not applied.
- → Most communes do not have an urban plan and land-use controls.
- → Certain traffic regulations need to be modified to improve pedestrians and cycling safety (e.g. clarify pedestrian priority at intersections).

3 ANALYSIS OF CURRENT AND PROJECTED CONDITIONS

This section outlines current conditions in the Northern Development Corridor as they were observed in 2014. This analysis was established based on existing documentation, field visits, observations and an extensive data collection mission. The project social, physical, economic and demographic environment and the various networks and systems that need to be taken into account in this Plan are described.

This establishes the baseline conditions and is the basis for defining the Plan's goals, objectives and proposed measures in the following chapters.

In order to establish a complete diagnosis, the following chapter will cover the 11 following subjects:

- → Physical geography, which includes such criteria as: natural barriers and links, natural hazards, land-use and environmental risks as this influence on the shape and structure of actual and future transportation systems.
- → Demography, which includes such criteria as: growth and density, as this will locate the zones with the most increase in population and the distinction between rural and urban population as this influence the future travel patterns and needs.
- → Economy and employment, which includes main actual trip generators.
- → Transportation networks, which includes such criteria as: modes, street networks characterisation, active transportation facilities, universal accessibility, collective transportation, air and maritime transport, to understand how actual transport services are organised.
- → Transportation patterns, which examine travel patterns (from and to) and the volume, based on traffic counts and origins/destinations surveys.
- → Freight transportation, which gives a picture of the travel volume of goods transport at specific locations, based on traffic counts.
- → Transportation Safety which examines observed transport safety risks for all transportation accidents.
- → Planned and potential economic development projects, which corresponds to any projects/commercial or industrial implantation that can have an impact on population location and transport networks in the future.
- → Planned and potential transport projects, which corresponds to any transport infrastructure or services that can have an impact on population location and transport patterns in the future.
- → Population and employment projection which corresponds to the projection of demographic characteristics of the population in the future, in order to evaluate future transportation demands.
- → Key findings of current and projected conditions in order to establish the appropriate objectives and vision.

3.1 GEOGRAPHY AND DEMOGRAPHY

This section examines the geography and land-use as it usually has an important influence on the shape and structure of the transportation system. Furthermore, it presents key information on the area's demography and major transportation generators as these have an influence on transportation demand.

3.1.1 GEOGRAPHY

The study area roughly stretches from Cap-Haïtien in the west to the Dominican Republic border in the east and from the Atlantic Ocean in the north to communes along the Mountain chain in the south. The study area is composed of the following 13 communes with a total area of approximately 1,460 square kilometers:

- → Département du Nord:
  - Cap-Haïtien;
  - Limonade;
  - Quartier Morin;
- → Département du Nord-Est:
  - Capotille;
  - Caracol;
  - Ferrier;
  - Fort-Liberté;
  - Mont-Organisé;
  - Ouanaminthe;
  - Perches;
  - Sainte-Suzanne;
  - Terrier-Rouge;
  - Trou-du-Nord.

Each commune is then into one or many communal sections.

The natural geography of the study area is highly varied ranging from coastal mangroves and beaches along the Atlantic Ocean, plains and mountains to the south (see figure 3.1). The study area is made of three types of natural environments that run east-west from the coast:

- → The low-lying coast along the Atlantic Ocean (approximate elevation 0 to 10m) is mostly characterized by beaches, mangroves and coral reefs. This area has been recognized as a biodiversity-rich area, although parts are threatened by urban development the production of charcoal. This area is mostly threatened by climate change due to rising sea levels (flooding and infiltration of sea water). This area has few through roads, although its topography is relatively flat;
- → The plains (approximate elevation 10 to 100m) are mostly used for agriculture and are lodged in between the coast and the mountains. These plains are relatively level and are well-served by road via the RN6. The plains closest to Cap-Haïtien and along the RN6 have urban development pressures due to the ease of mobility along the RN6;
- → The hillsides and mountains (approximate elevation 100m and above) to the south and surrounding Cap-Haïtien have relatively steep slopes that can hinder travel, especially active transportation (walking and cycling) and universal accessibility. These are used for agriculture and agro-forestry. These areas have a relatively low-access to travel means.

In addition to natural resources, there are also a number of cultural assets due to the study area's rich heritage, the most of all the island of Hispaniola, including the center of Cap-Haïtien, forts along the coast, Limonade and Bord-de-Mer and one of the first European settlements in the Americas.

DEVELOPMENT PATTERNS

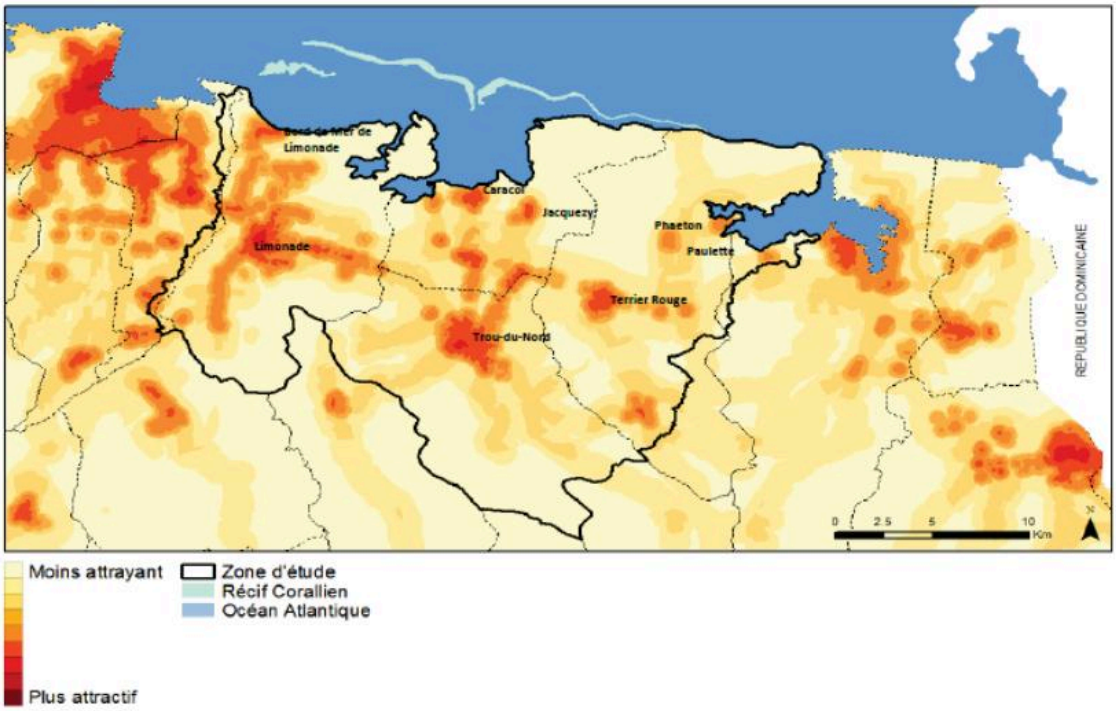
The area is predominantly rural since only 3% of the land mass is urbanized (cities, towns and villages). Most urban areas in the study are concentrated along the RN6 (National Road) between Cap-Haïtien and Ouanaminthe, but more than half of the urbanized area is located within the City of Cap-Haïtien (24 out of 45 sq. km). The rural areas are heavily used for agriculture as 30,000 hectares are used for this purpose.

Urban development in the study area, apart from the central part of Cap-Haïtien, is mostly organic in nature and largely unplanned. This has led to poorly connected street grids and a lack of transport infrastructure serving the center of neighborhoods. Outside of larger towns, development follows a linear pattern along major roads because of the greater accessibility created by the relative ease of travel along these roads. This type of linear development is problematic because of the long distances required and the lack of connectivity with subsequent development. Also, these linear developments are often built along roadways that were designed for high-speed through-traffic with little pedestrian activity, adjacent businesses and services. Therefore, a number of activity areas have been created along roads because of their higher accessibility. Low-income settlements have also been built in various rural areas, most of which are isolated and not well-connected to adjacent areas.

New major developments, although properly built and planned, are also often in isolated rural areas and not built adjacent to existing population centers. For example, the closest village to the Caracol Industrial Park's main gate is at least 2 kilometers away. The new university campus in Limonade is 4 kilometers outside the center of Limonade. This complicates access by active transportation and tap-tap, as usually few services connect them to adjacent areas.

Based on the location of public utilities, roads, economic activity and services, the most attractive areas for urban development patterns are around Cap-Haïtien and the RN6 corridor. Among undeveloped areas, the 1st communal sector of Quartier-Morin, Limonade and Trou-du-Nord are the most attractive for further urban development (see below).

Figure 3.2 presents the land use of the region.



Source : ERM (2014).

BARRIERS AND LINKS

The Cap-Haïtien-Ouanaminthe Corridor has a number of physical barriers with few links that cross them (see figure 3.1):

- The Atlantic Ocean is a barrier for land based transportation, although useful for navigation;
- The hills and mountains form a natural barrier to the south of the study area with relatively few links to access communities. Also, there are very few links between the communes in the mountains;
- The mountain range to the north and west of Cap-Haïtien are only crossed by one link. The steepness of this barrier creates a natural development barrier to the north and east of the City. The combination of the Haut-du-Cap River and the Airport also creates a major barrier, although in this case, both sides of these barriers are developed;
- There are six major rivers in the study area (Haut-du-Cap, Trois-Rivières, Grande-Rivière-du-Nord, Trou-du-Nord, Marrion and Massacre) that run from the south to the north, perpendicular to the major east-west transportation system. Most of these rivers have only one major link crossing them, the only major exception being the Trou-du-Nord River;
- The border with the Dominican Republic is another barrier, with only one legal crossing between Ouanaminthe and Dajabon;

- → Most recent urban development, especially on the outskirts of cities and villages, is in a linear pattern along major roads. In addition, many settlements have street grids with little connectivity (dead-ends, etc.) due to their informal nature or haphazard planning;
- → For many of the barriers mentioned above, there are very few links that are usable in all-weather conditions.



The combination of the airport and the river form a major barrier to enter Cap-Haïtien from the east.

NATURAL HAZARDS

The study area is susceptible to a number of natural hazards and risks, including:

- → Annual rainfall is lowest near the ocean and highest in the mountains. As such, coastal areas have a risk of drought;
- → Flooding near the coast and along rivers. Areas with steeper slopes could be susceptible to flash floods. Flooding can often isolate certain communities after major storm events, especially for areas not along the RN6. This is magnified by the wading crossings usually used to cross streams and some rivers along secondary roads. These can be impassible after major storms. Some storms can also wash out infrastructure that needs emergency repairs after storms and further isolate communities for days before normal travel is resumed. The lack of alternative links further compounds this isolation. This lack of passable roads and accessibility further hinders the development potential of areas south

of the RN6. Before improvements to the RN6, travel was even more impacted after important storms;

- → Hurricanes and tropical storms, accompanied by heavy rain and winds. Haiti has been hit by 6 major hurricanes over the last 30 years according to the World Bank;
- → The area has a medium earthquake risk. In addition to damage to structures, earthquakes can also be accompanied by tsunamis along the coast and landslides due to the high soil liquefaction risks in parts of the study area.

The NATHAT project created a compounded risk map (see figure 3.3) and a large part of major transportation infrastructure is located in these areas: parts of the RN6 and the Cap-Haïtien Airport.

According to ESCI's Climate Change Study (ERM, 2014), the region is most vulnerable to hurricanes and earthquakes, if measured by potential losses. That said, from a transportation standpoint, the lack of viable alternative infrastructures renders the region very vulnerable to natural hazards. A large scale event would likely paralyze the region thus not only having a direct significant effect on mobility within the region but most importantly making it very difficult, if not impossible, to access by land in order to provide emergency assistance.

Plan de mobilité durable – Corridor de développement du nord - Haïti (corridor Cap-Ouanaminthe)
Sustainable Mobility Plan - Northern Development Corridor - Haiti (Cap-Ouanaminthe Corridor)

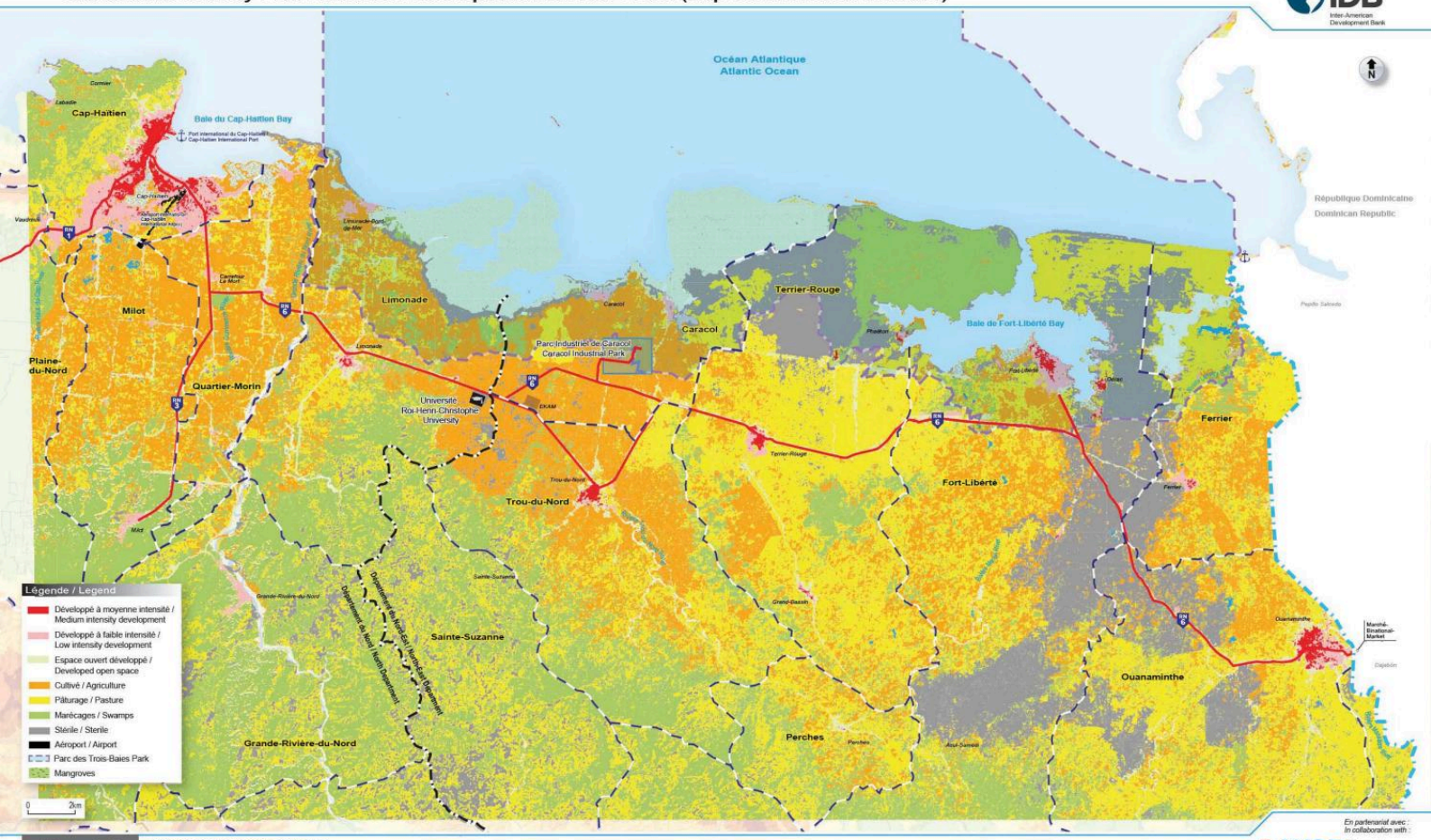


Figure 3.2 **Utilisation du sol / Land Use**

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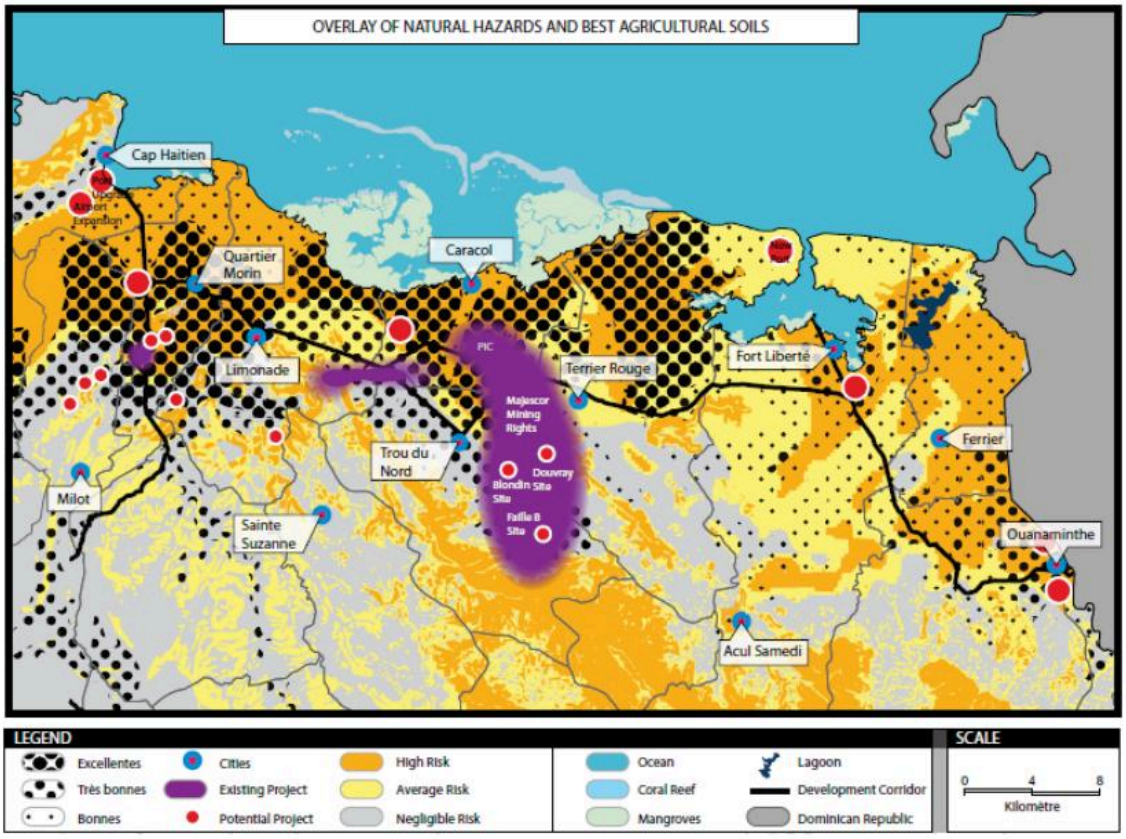
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Figure 3.1 **Géographie, barrières et liens / Geography, Barriers and Links**

141-15934-00_Fig3-1_GeoBarriersLinks_20150408.ai

Figure 3.3 Environmental Risks



Source: AIA based on NATHAT

KEY FINDINGS

- → The natural geography of the study area is highly varied ranging from coastal mangroves and beaches along the Atlantic Ocean, plains and mountains to the south;
- → The area is predominantly rural since only 3% of the land mass is urbanized. Urban development in the study area, apart from the central part of Cap-Haïtien, is mostly organic in nature and largely unplanned. That said, the region has been seen rapid urbanization over the past few decades;
- → The Cap-Haïtien-Ouanaminthe Corridor has a number of physical barriers with few links that cross them (hills, mountains, rivers);
- → The border with the Dominican Republic is another barrier, with only one formal legal crossing between Ouanaminthe and Dajabon;
- → The study area is susceptible to a number of natural hazards and risks. The region is most vulnerable to hurricanes, tsunamis and earthquakes;
- → The lack of viable alternative infrastructure renders the region very vulnerable to natural hazards. A large scale event would likely paralyze the region.

3.1.2 DEMOGRAPHY

According to estimates by the Haitian Statistics Institute (IHSI), the 13 communes forming the study area had a total estimated population of 647,996 in 2012. Although the land mass is mostly rural, the majority of residents (68%) live in urban areas (cities, towns and villages). Just over half of the population is concentrated in the urban centers of Cap-Haïtien (40% of the total population) and Ouanaminthe (16%). The population by commune in 2003 and 2012, the number of households and the proportion of residents living in urban areas is shown in table 3.1. The average population density is 443 persons per sq. km, although it can be in the 8,000 to 20,000 range in the urban areas of communes. Population density by communal section is presented in figure 3.4. The high population density is mostly due to the high number of persons per household (4.9) and the small size of most housing units. The area's residents are also young since 45% of the population is less than 18 years old.

The study area's population has also been growing at an extremely high rate since 2003 as there were an estimated 160,000 additional residents in 2012 (+33% or an annual growth rate of 3.2%), although this increase has been similar to Haiti as a whole. This substantial population increase creates a strain on existing transportation infrastructure, especially since most urban development is unplanned. Over 90% of new residents in the study area moved into the following seven communes (see table 3.1 for details):

- → Cap-Haïtien: +75,600 (+41% or 3.9% annually between 2003 and 2012);
- → Ouanaminthe: +24,000 (+31%);
- → Limonade: +17,400 (+49%);
- → Trou-du-Nord: +9,300 (+25%);
- → Terrier-Rouge: +7,600 (+36%);
- → Quartier-Morin: +6,900 (+36%);
- → Sainte-Suzanne: +5,100 (+24%).

Population growth seems to be centered on Cap-Haïtien, Ouanaminthe (where a new industrial park was built in the mid-2000s, CODEVI) and areas surrounding the Caracol Industrial Park. Population growth was not as important in Fort-Liberté and Ferrier. This is coherent with the analysis of urban footprints in 1986, 2010 and 2013 (ERM, 2014) where most newly developed areas are around Cap-Haïtien, Limonade, Caracol, Trou-du-Nord and Ouanaminthe.

Detailed data comparing urban and rural growth rates was not available, although most of the growth was likely in urban areas. For example, the annual population growth rate is estimated at 5.4% in urban areas and 1.4% in rural areas in the North Department between 2003 and 2012 (4.7 and 1.0% for the North-East Department, respectively). This seems coherent with the rapid urbanization the country has been facing over the past few decades. This high growth is due to natural growth (births) and to migration (10% of residents in the area were born in another commune).

Haiti has undergone a rapid urbanization rate since the 1950s when the first census was undertaken. As shown in figure 3.6, in the North and North-East Departments, the proportion of the population living in urban areas has risen from 17 and 13% to 48 and 46%, respectively. In addition, the study area is even more urbanized as the vast majority of residents in the study area live in cities, towns and villages (68% in 2012) even if the land is mostly rural.

Table 3-1 Population, Growth Rate, Urban Population and Households

Commune	Population (2003)	Population (2012)	Average Annual Growth Rate 2003 to 2012 (%)	Proportion of urban residents (%) (2012)	Households (2012)
Cap-Haïtien	186,251	261,864	3.9	98.1	50,773
Quartier-Morin	19,241	26,109	3.4	15.8	5,878
Cap-Haïtien Subsector	**205,492**	**287,973**	**3.3**	**90.6**	**56,651**
Limonade	35,216	52,625	4.6	35.9	10,840
Caracol	6,236	7,362	2.8	40.5	1,800
Sainte-Suzanne	21,617	26,750	2.4	8.3	5,560
Terrier-Rouge	21,328	28,938	3.5	76.9	6,326
Trou-du-Nord	37,405	46,695	2.5	51.7	9,204
PIC Subsector	**121,802**	**162,370**	**3.8**	**43.4**	**33,730**
Capotille	15,086	18,496	1.9	6.4	3,435
Ferrier	13,096	13,973	0.7	58.4	3,291
Fort-Liberté	30,110	32,861	1.0	74.6	7,306
Mont-Organisé	17,189	20,015	1.7	21.8	4,041
Ouanaminthe	77,319	101,280	3.0	63.7	20,449
Perches	8,344	11,028	3.2	55.5	2,181
Fort-Liberté – Ouanaminthe Subsector	**161,144**	**197,653**	**2.3**	**55.1**	**40,703**
Study Area	**488,438**	**647,996**	**3.2**	**67.9**	**131,084**
North Department	773,546	1,018,411	3.1	48.2	202,957
North-East Department	300,493	375,966	2.5	46.2	77,110
Haiti	7,929,048	10,413,211	3.1	49.5	2,260,092

Source: IHSI (2003, 2009 and 2012).
Note: 2003 data is from the 2003 Census, while 2012 data is a population projection.

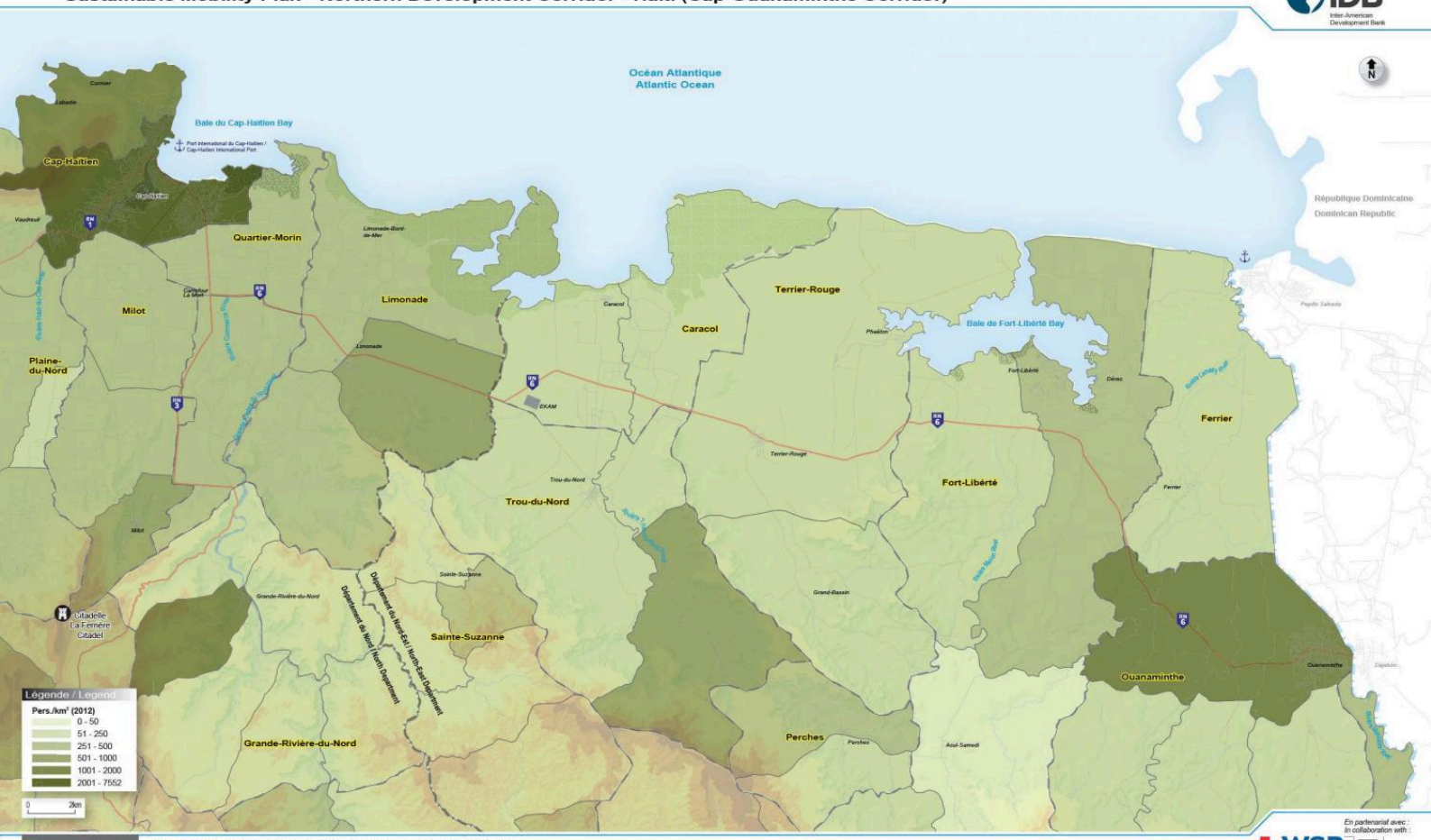
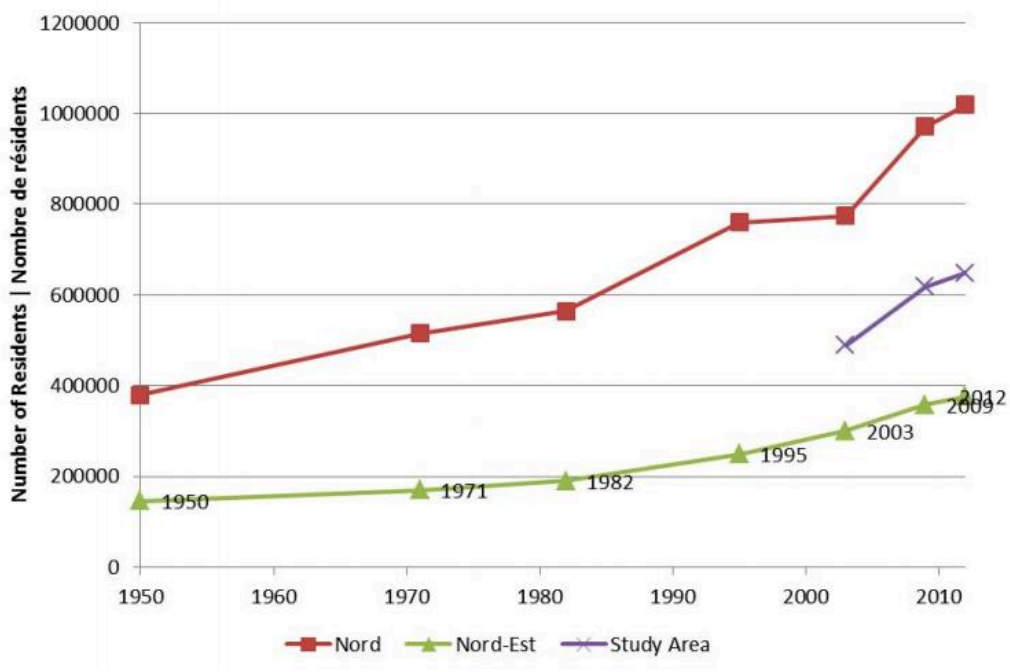


Figure 3.4 **Densité de population en 2012 / Population Density in 2012**

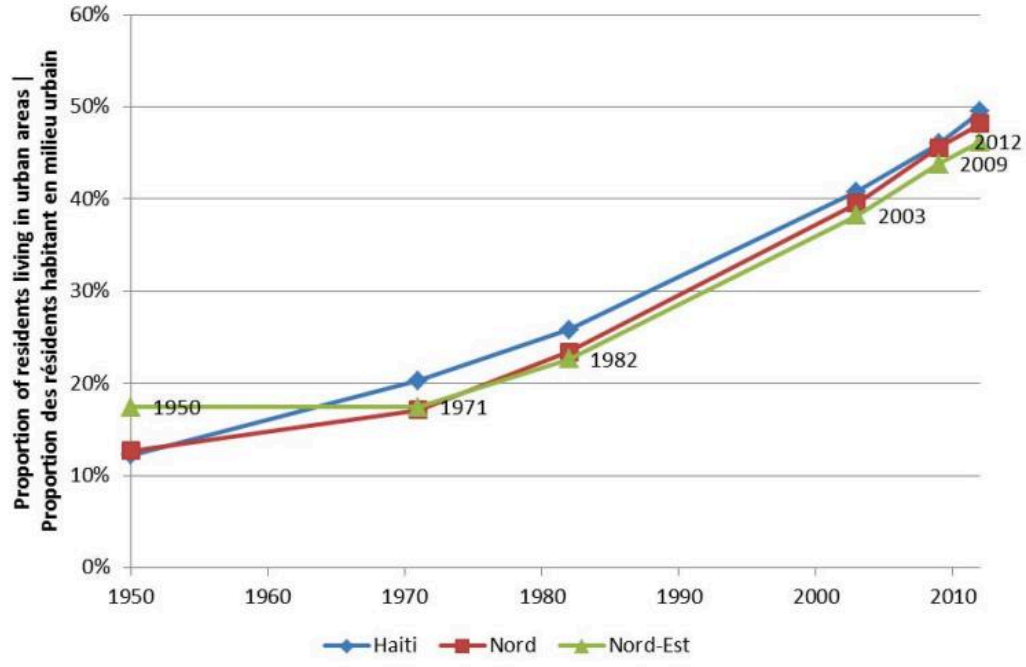
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Figure 3.5 Total Population – North and North-East Departments 1950 to 2012



Source: IHSI (2003, 2009 and 2012).

Figure 3.6 Percentage of Population Living in Urban Areas – North and North-East Departments 1950 to 2012



Source: IHSI (1950, 1971, 1982, 2003, 2009 and 2012).

KEY FINDINGS

Although the land mass is mostly rural, the majority of residents (68%) live in urban areas (cities, towns and villages), mainly in the urban centers of Cap-Haïtien and Ouanaminthe where most of the employment is located. 45% of the population is less than 18 years old.

The study area's population has also been growing at an extremely high rate since 2003 as there were an estimated 160,000 additional residents in 2012 (+33% or an annual growth rate of 3.2%), although this increase has been similar to Haiti as a whole.

This substantial population increase creates a strain on existing transportation infrastructure, especially since most urban development is unplanned.

3.1.3 ECONOMY AND EMPLOYMENT

The Northern Corridor has a diverse economy and the main activity sectors vary between each commune and between urban and rural areas. The economy in urban areas is reliant on commerce, trade, education, administration and industry. In rural areas, the economy is reliant on agriculture and fisheries, but the types of crops vary according to geography. Coastal areas are more dependent on fishing, salt, charcoal and rice. The plains are more reliant on bananas, maize, beans, sugar cane and livestock. Higher elevated areas are reliant on fruit, cocoa, coffee, cashews, corn, and agro-forestry (mango, bananas and lumber).

Employment rates are lower in urban areas than in rural ones. On the other hand, wages are generally higher in urban areas than in rural areas, although these figures do not account for subsistence farming and fishing in rural areas. Also, most workers in Haiti work in the informal private sector, and especially in urban areas (IHSI, 2010).

The area also has an important potential for mining and oil development, but few of these natural resources are currently tapped. Current mining sites are in the vicinity of Trou-du-Nord. Mineral potential is evaluated at approximately 20 billion dollars (AIA, 2012).

Two large industrial areas have been built recently in Caracol, the Caracol Industrial Park, and in Ouanaminthe, CODEVI. The Caracol Industrial Park had 8,000 employees as of December 2015.

Economic activity using point of interest data was used to estimate relative employment in the region.

3.1.4 IMPORTANT TRIP GENERATORS

This section presents important trip generators in the study area (see figure 3.7).

CARACOL INDUSTRIAL PARK (CIP)

The Caracol Industrial Park in the commune of Caracol opened in 2012 and is one of two national industrial parks operated by SONAPI. The park's infrastructure was financed through grants and loans from the IDB and USAID. Currently there are two major tenants in the 252 hectare industrial park: SAE-A specialized in textiles and Peintures Caraïbes which produces paint and stains. Approximately 8,000 employees worked in the park in December 2015. Ultimately the industrial park could accommodate between 20,000 and 65,000 employees.

STATE UNIVERSITY OF HAITI – ROI-HENRI-CHRISTOPHE CAMPUS IN LIMONADE

The State University of Haiti opened a campus outside Limonade in 2012. Currently, there are approximately 1,500 students and the site could ultimately house up to 10,000 students. The university is not adjacent to any existing urban areas and has no active transportation facilities.

CENTER OF CAP-HAITIEN

The center of Cap-Haïtien and the major roads leading to it houses many shops, services, businesses (both registered and informal), a large market named “marché de fer” (or iron market), administrative offices, schools (Notre-Dame College, Law and Economics Faculty – State University of Haiti, high schools and primary schools) and the Justinian Hospital.

CAP-HAITIEN INTERNATIONAL AIRPORT

The Cap-Haïtien International Airport offers regular flights to Port-au-Prince, the Turks and Caicos, Fort-Lauderdale and Miami. There are no flights in the evening and at night since the runway is not lighted. There are plans to build a new passenger terminal.

PORT OF CAP-HAÏTIEN

The Port of Cap-Haïtien is located in the heart of the historic core of the City. It is mostly used for the goods transport: bulk materials (cement and rice), oil, used vehicles and other goods (approximately 1,000 containers per month according to an interview with the private terminal operator).

DAJABON BINATIONAL MARKET

The Dajabon Binational Market is located in the Dominican Republic, just across the border crossing at Ouanaminthe. It attracts Haitian merchants to purchase and sell all types of goods from many parts of the country every Monday and Friday. The market also extends into the streets of Ouanaminthe leading to the border. Over 24,000 persons were seen crossing the border on a market day in both directions in May 2014 (see section 3.3.3).

CODEVI INDUSTRIAL PARK

A free trade zone, the CODEVI (Compagnie de développement industriel) Industrial Park, is also located between the Dominican Republic and the Massacre River to the north of Ouanaminthe. It houses an apparel and garment manufacturer and employs approximately 6,500 people, mostly Haitians, on this 5 acre site. Goods seem to be transported through the Dominican Republic.

SPECIAL EVENTS

There are a number of culturally significant sites in the study area for historical and religious reasons. Many sites related to the Haitian Independence War and the voodoo religion can be found. A number of large events are held each year which can attract many visitors, especially in the summer months from late-June to August. There are numerous “fêtes champêtres” that can attract thousands to over a hundred thousand festivalgoers according to some stakeholders. These are held successively. The largest events are in Cap-Haïtien, Ouanaminthe and Limonade-Bord-de-Mer.



Figure 3.7 **Principaux générateurs de déplacements / Major Trip Generators**

141-15934-00_Fig3-7_MajorTripGen_20150331.ai

3.2 TRANSPORTATION NETWORK – DESCRIPTION

The following sections describe the current transportation network within the study corridor as well as the different travel modes available and most commonly used. This chapter is based on available information taken from documentation, maps and GIS data and supplemented by field observations as well as information provided by the different stakeholders' interviews and consultations (see section 3.8 and Appendix B) with numerous stakeholders (ministries, communes, private and non-governmental organizations). These consultations were focused on supplementing the data collection and document review by gathering information about current and future projects as well as strengths and weaknesses of the transportation system.

3.2.1 TRANSPORTATION MODES

This section presents and defines the various modes of travel particular to Haiti and the study area. The north and north-east region within the Cap Haïtien - Ouanaminthe corridor is mostly travelled by the following modes of transportation:

- Walking – the most universal and affordable transportation mode. All users of the transportation system will walk at one point or another along their trip, even though it may be continued by bike, by transit, by car or by motorcycle;
- Bicycle – the second most prevalent form of non-motorized transportation;
- Tap-taps – they are the most common form of public transportation in the study area, although privately owned and operated. Typically these are used small pickup trucks imported from the United States. Benches are added to the box and the cover is raised to accommodate passengers. Many tap-taps are decorated with vivid colors. The name derives from the sound of tapping on the truck as passengers tap on the vehicle to request a stop. Certain tap-taps do not have a cover on the back and are called "*raché poil*" which literally means "tearing off your hair" due to its lack of comfort;
- Buses – Buses are typically former school buses imported from the United States. Exceptions are small 18 passenger buses and intercity coaches offering service to Port-au-Prince and the Dominican Republic. There are approximately 100,000 public transport vehicles in the country (including tap-taps) (OAVCT);
- Motorcycles – motorcycles are more and more prevalent in the study area and most are imported from China. There are approximately 31,000 motorcycles in the country as of 2011 (OAVCT), up from less than 10,000 in 1998 (AIA, 2012);
- Moto-taxis – moto-taxis are motorcycles that take one or many passengers to their destination. These are difficult to distinguish from other motorcycles since they do not have special markings;
- Private vehicles including pick-ups, vans and SUVs not used for public transport. Passenger automobiles are not very prevalent because of road conditions;
- Trucks – Trucks come in all shapes and sizes from pickups to tractor trailers. Although usually used to transport goods, they are referred to as "*brulé dos*" which means "sunburnt back" when transporting passengers;
- Other modes: a number of other modes can often be observed in the study area including: people pushing wheelbarrows or carts, or riding horses, mules, tractors and three wheeled vehicles.

The various transport modes are often both used for passengers and goods as can be observed in table 3.2.

Table 3-2 Transportation Modes

Transportation Mode	Typical Passenger Transportation Role	Goods Transportation Role
Walking	▪ Typically used for short to medium length trips or for accessing other modes	▪ Limited
Bicycle	▪ Typically used for short to medium length trips ▪ Typical capacity: sometimes carry 1 to 2 passengers	▪ Limited
Motorcycles	▪ Used for short to long distances ▪ Typical capacity: 1 to 3 passengers (including driver), up to 5	▪ Sometimes used to transport construction materials or goods to remote rural areas, even if their capacity is limited
Moto-Taxis	▪ Used for short to medium length distances due to the fare ▪ Typical capacity: 1 to 3 passengers (including driver), up to 5	▪ Same as for motorcycles
Tap-Taps	▪ Tap-taps are used for medium to long distances ▪ Typical capacity: 14 passengers, sometimes more on the roof	▪ Although usually used for passengers, they are often used to transport goods in the box or on the roof (often with passengers aboard)
Buses	▪ Typical capacity: 18 to 70 passengers depending on the size of the vehicle and the relative comfort	▪ Although usually used for passengers, they can also be used to transport goods (often with passengers aboard)
Private vehicles (cars, utility vehicles, etc.)	▪ Typical capacity: 4 to 10 passengers	▪ Limited
Trucks (single-unit and tractor-trailer)	▪ Some trucks also carry passengers in the back, often upwards of 30 passengers	▪ Predominantly used for goods transport, especially for long distances
Other	▪ Various capacities according to the type	▪ Some transportation of goods of short distances or in rural areas

Figure 3.8 Transportation Modes in the Northern Corridor



Students walking to school



Pedestrians



Cyclists



Moto-Taxi Stand



Tap-tap



Raché-Poil (Tap-Tap)



Bus



Intercity Bus



Truck



Other – Tractors

3.2.2 ROAD NETWORK

The road network is used by all modes of transportation, whether by private vehicle, motorcycle, truck, foot, bicycle, tap-tap, bus or by other means of transportation. As such, "road network" should not be interpreted as an infrastructure only used by motorized vehicles, but by all modes of transportation. Furthermore, it not only serves to allow people and goods to travel, but is also a space for social activities and trade. That said, the focus of this report is mostly on travel related elements.

The region's road network is comprised of a number of road types:

- National roads (*routes nationales* or RN) are built to connect most of Haiti's regions together. In theory, they are mostly meant for long-distance travel;
- Departmental roads – departmental roads are meant to connect the various communes to one another;
- Local streets and collectors are meant to serve local land uses and connect them to each other within an urban area or a commune.

Examples of Roadway Infrastructure are presented in figure 3.9.

The regional road network presented in figure 3.10 is centered around three national roads: the RN6 which connects the center of Cap-Haïtien to the Dominican Republic, the RN1 which connects the study area to the rest of the North, the North-West and the rest of the country and the RN3 connecting Cap-Haïtien to the southern part of the country (although not yet completed). From these national roads, there are numerous departmental and collector roads leading to communes not located along the major roads.

CONNECTIVITY

Although most of the study area is a large plain, there are a number of physical barriers that have influenced the urban development and the development of roadway links (see section 3.1.1 for more details). All communes in the study area are connected by road links, although some of the links apart from the RN6 are not useable in all weather conditions and are dangerous. Most of these roads branch from the RN6 and, therefore, there are very few alternative routes to the RN6. This is compounded during and after storms where parts of roads are flooded or damaged. Figure 3.11 presents the location of wading crossings which are difficult or impossible to cross during storms.

No practicable links exist between the study area and the Artibonite Department to the south and only one roadway leads to the Dominican Republic (and the border crossing is extremely congested on market days). The roads serving the study area and leading to other parts of the country converge in the center of Cap-Haïtien as there are no serviceable links. The center of Cap-Haïtien is also one of the biggest trip generators in the region and is therefore congested during most parts of the day as will be discussed in the following section.

At a local level, the street networks of many neighborhoods, both planned and informal, often converge on a national road and there are few internal continuous links linking these areas.

The poor quality of most road infrastructure also reduces the completeness and connectivity of the network. Many roads indicated on maps are not usable by all vehicles and require extremely low speeds.

ROADWAY INFRASTRUCTURE

Within the study area, the National Roads generally have one lane per direction, except in Cap-Haïtien where some segments are four lanes wide but are not marked and not always used as such, since the outmost right lane is used for parking, commercial activity or for tap-tap stops.

They are generally useable in all-weather conditions as they have drainage, bridges crossing rivers and culverts to bridge streams. These roads are also useable by larger trucks. This is not always the case on National Roads leading into the study area (the RN3 and the RN1).

Where national roads cross through built areas, the road design has not been adapted for its use: there are no sidewalks for pedestrians, merchants crowd the side of the road and there are no stops for buses and tap-taps. Sidewalks are only provided in parts of Cap-Haïtien, though these are not always continuous and are often occupied by parked vehicles. Rebuilt sections of the RN6 have been designed using rural cross-sections with no pedestrian facilities through urban areas, even if there is a significant level of activity. Some urban areas have been urbanized around the RN6 since its construction and these segments have not been retrofitted with appropriate facilities for pedestrians.

Speed humps or bumps have been installed at the entrance of most urban areas, except for Cap-Haïtien, to reduce vehicular speeds and increase safety. The use of speed bumps is not recommended in best practices, but these best practices usually assume that there is sufficient police enforcement. Some speed bumps, mostly on secondary roads, have also been built by local residents to slow down traffic and attract customers. The RN6 is lit in urban areas, but is often one of the only functioning lighting in the area. A few traffic signals have been installed as shown in figure 3.11, but none are currently in operation.

In rural areas, where vehicles usually travel at high speeds, narrow shoulders are provided, but pedestrians, cyclists, animals, tractors and other slower moving users have little room. As such, there are high differential speeds between many road users. No dedicated tap-tap stops are provided. Few fields and pastures are fenced, and animals wander along roads. This is especially a problematic in the early morning as animals can gather overnight on the road.

As can be noticed in figure 3.11, few other major roads are paved, although local streets in most cities and towns are often paved. Most roads in rural areas, often the only road connecting to a village with over a thousand residents, are dirt roads and streams are not crossed by culverts, but by wading crossings. In mountainous areas, some sections have been paved but are often impassable after storms; there are many blind curves, narrow sections with no shoulders and few safety guardrails. Travel speeds are also very slow (15 to 30 km/h depending on the segment).

Figure 3.9 Examples of Roadway Infrastructure



Typical rural cross-section of the RN6



The design of national roads is not adapted for urban areas



Road in rural areas



Wading crossing



Flooding along RN6



Flooding along RN6



Figure 3.10 **Réseau routier régional / Regional Road Network**

141-15934-00_Fig3-9_RegRoadNet_20141223.ai



Figure 3.11 **Infrastructures routières / Roadway Infrastructure**

141-15934-00_Fig3-10_RoadwayInfrastr_20141223.ai

3.2.3 ACTIVE TRANSPORTATION FACILITIES (WALKING, CYCLING AND UNIVERSAL ACCESSIBILITY)

Although the study area has many mountainous zones, most cities, towns and villages and destinations are located in relatively level areas which reduces the effort required to bike or walk to destinations. The relatively warm weather year-round is also conducive to walking and cycling. These modes also do not require direct out-of-pocket expenses on a regular basis.

ACTIVE TRANSPORTATION – WALKING

Walking is the most universal mode of transportation as all travelers will need to walk at one point in the trip. The weather and the relatively flat topography of parts of the study area make the area conducive to walking. In most urban areas, the street grid is often interconnected, although some informal settlements have poorly connected streets and physical barriers increase walking distances. Rural areas have very few crossing points for streams and rivers, thus increasing walking distances.

Few streets and roads have sidewalks or trails for pedestrians, except in the heart of Cap-Haïtien and Ouanaminthe as well as in recent developments such as the PIC and the University's Limonade Campus as shown in figure 3.12. Other roads usually have shoulders. Many shoulders and sidewalks can be used for parking, by merchants or other activities, thus forcing pedestrians to walk on the roadway. Crossing the street on major roads can be an especially hazardous experience as there are few crossing points, pedestrian priority is not respected and there are constant streams of vehicles in both directions including motorcycles in between vehicles. This is especially the case in Cap-Haïtien where pedestrians often need to wait for a long time before hurrying across, including tap-tap users.

In rural areas along the RN6 only a paved shoulder is provided, although it provides little protection from high-speed traffic travelling in adjacent lanes. This is especially problematic when trip generators are located outside of town.

The study area has little functional facilities for pedestrians, although it is a highly used mode of transportation.

ACTIVE TRANSPORTATION – CYCLING

The study area has numerous mountains, yet most major trip generators are in low-lying and flat areas. Cycling has the same connectivity issues as for walking (see previous section).

The study area has no dedicated cycling infrastructure, although cycling is permitted on all roads and streets. On the RN6, shoulders are provided, although they are too narrow and often shared by other users. In urban areas, cycling along major roads (the only option to cross many barriers) is difficult because of vehicles passing close-by and motorcycles also using the shoulder lane. Cycling can be difficult on some rural roads, apart from National Roads, because of the road conditions.





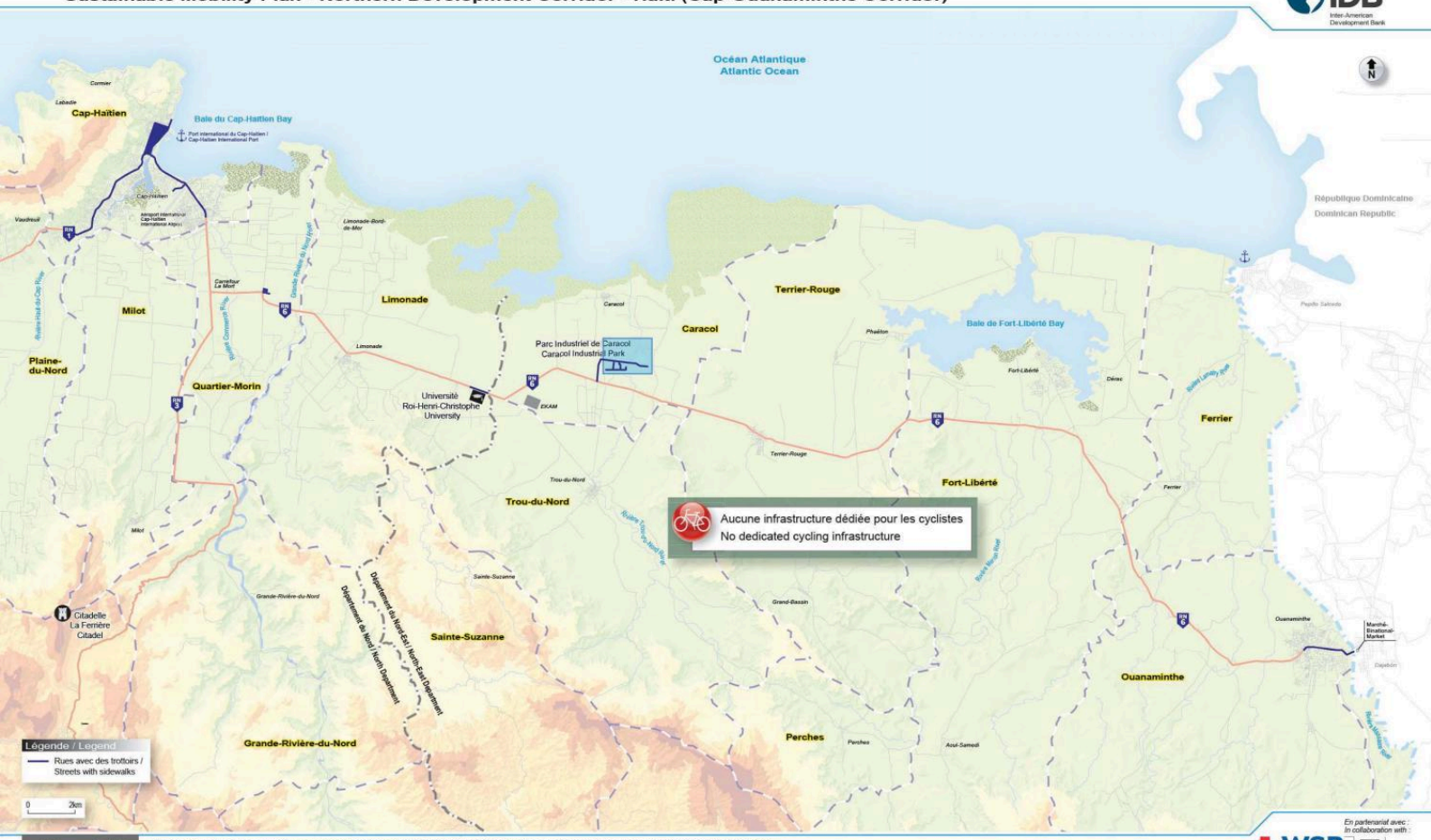


Figure 3.12 **Infrastructures pour le transport actif** *(pied et vélo)* **/ Active Transport Infrastructure** *(Walk and Bicycle)*

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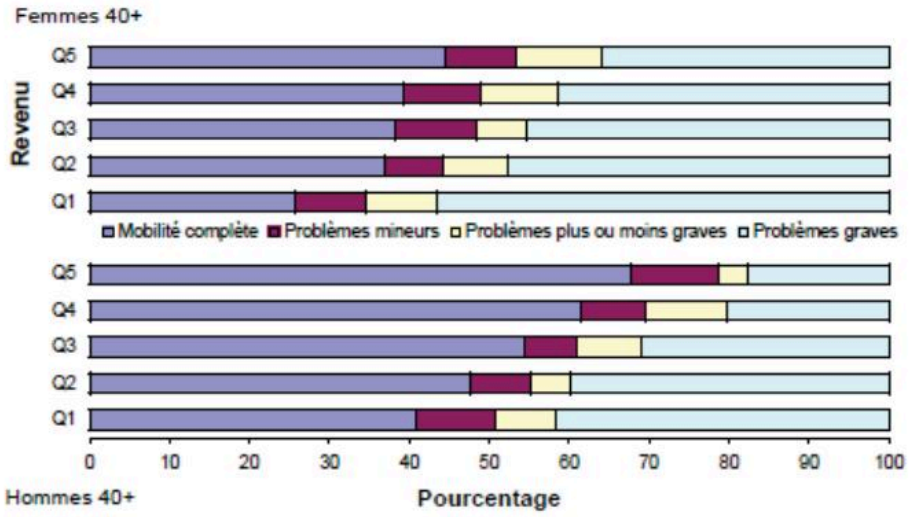
UNIVERSAL ACCESSIBILITY

Based on observations in the field, it appears that the vast majority of transportation infrastructure and vehicles are not adapted for persons with a physical disability or impairment. Few buildings are universally accessible. Most travel requires some form of assistance, as it would be difficult to travel alone for persons with a physical disability.

A high proportion of adults have mobility impairments in Haiti, especially among women and people with lower-incomes. According to a survey on living conditions undertaken by the Haitian National Institute of Statistics and Computers (IHSI, 2001), 10% of adults in Haiti have a physical disability that reduces their mobility significantly. Disability rates are higher for women than men, increase with age (start increasing drastically at age 40) and increase for people with lower incomes. For example, 57% of women above 40 in the lowest income quintile have significant mobility issues versus 36% in the highest income quintile (42% and 18% for men) as shown in the figure below. Many persons with disabilities likely do not travel regularly since the infrastructure and vehicles are not adapted to their needs.

This stresses the need for universally accessible facilities in Haiti.

Figure 3.13 Distribution of population 40 and above according to physical ability by household income and sex – Haiti



Source: IHSI (2001), p. 104.

3.2.4 COLLECTIVE TRANSPORTATION NETWORK (BUS, TAP-TAP AND MOTO-TAXI)

For the purposes of this report, collective transportation or transit refers to modes of transport that are publicly available to the public and shared. This mostly includes buses, tap-taps and moto-taxis.

BUS AND TAP-TAP SERVICES

Buses and tap-taps are usually operated along set routes serving routes within Cap-Haïtien and linking the various cities of the study area together as shown in figure 3.14. Few tap-taps and buses venture off from major roads because of the lack of vehicles and the quality of the infrastructure, which increases travel times and operating costs. Therefore, other areas are not as well served and travel times and costs are much longer. The main stations are in Cap-Haïtien (Madeline), Carrefour La Mort (intersection of RN3 and RN6), Limonade, Trou-du-Nord, Terrier-

Rouge, Fort-Liberté and Ouanaminthe. The highest frequencies of tap-taps are seen between Cap-Haïtien and Limonade.

Timetables are approximate as tap-taps usually wait until they are full before starting their trip. For this reason, it can be sometimes difficult to board a tap-tap near major stations since drivers do not know if there are waiting passengers further along their route. Users can board or alight anywhere along the route as most users prefer not walking to a formal stop. As such, many tap-taps and buses can stop a number of times over a short distance, regardless of other traffic behind. Some tap-tap and bus stops with signs and benches have recently been installed, but these do not appear to be widely used for their intended purpose.

The cost of a one-way tap-tap trip varies from 5 HTG for a local trip to around 150 HTG for a long distance trip between Cap Haïtien and Ouanaminthe. Travel between Limonade and Cap-Haïtien costs 15 HTG each way. Fares have increased considerably in the past decade, especially for long distance fares (the fare between Cap and Ouanaminthe was around 15-20 HTG in 2000 [Philippe Mathieu tap-tap owner interviews, 2014]). Transit fares can take up a large proportion of worker's wages as the monthly median wage in Haiti was 2,500 HTG in 2010 (IHSI), approximately 100-110 HTG per day. In rural areas, a higher proportion of wages is required to travel since wages are lower and trip distances are longer, thus increasing travel costs. During market days, users making short trips are sometimes refused access to vehicles unless they pay the higher fare since drivers prefer to take on the abundant number of higher paying riders. Fares are higher for the more comfortable mini-buses and coaches. Fares are also higher if users are transporting merchandise. Tap-taps also face competition from trucks on market days.

All vehicles are privately owned and operated. Most tap-tap and bus vehicle owners own between one and four vehicles and are represented by the ATN. Owners have little or no access to credit to finance the purchase of newer vehicles. Owners usually expand their fleet once they have all of the funds to purchase another vehicle since they do not have access to credit. According to information given by the owners, the purchase is approximately $US 10,000 for a used tap-tap and $US 25,000 for a mini-bus due to a limited supply and import duties. In turn, tap-tap owners rent their vehicles to a driver represented by the Organization of Transport Workers (OTSAGA) for a fixed fee (the fee depends on the day and, empirically, some drivers have said that it can reach up to $US 200 on certain days). Practically, the vehicles are rented for a fixed fee since it is impossible to verify fare receipts and is similar familiar arrangement used by taxi owners in many other jurisdictions throughout the world. In turn, the driver hires another employee responsible for collecting fees. The relatively high fees paid by drivers discourage them from accepting short-distance trips, unless they pay a higher fare, or leave before the vehicle is entirely full since the driver is unsure whether passengers are waiting downstream.

MOTO-TAXI

Moto-taxis serve two main purposes:

- → Providing traditional door-to-door taxi service for users willing to pay the higher fare. Users can walk to the nearest moto-taxi stand, call a driver or flag one down on the street;
- → Providing service to isolated areas not served by buses or tap-taps either because there is little demand, the roads are not useable by tap-taps or both. For example, travellers get dropped by a tap-tap along the RN6 and then ride a moto-taxi to destination. These routes are shown in figure 3.14.

Moto-taxis usually accommodate one or two passengers but it has been observed in some cases to handle up to 5 passengers, but in these case passengers were usually mostly comprised of small children. According to stakeholders, most of these services are owner operated. Trips cost approximately 50 HTG within an urban area. Taxi service by car is also available in Cap-Haïtien and Ouanaminthe.

CARACOL INDUSTRIAL PARK EMPLOYEE TRANSPORTATION

The SONAPI offers employee transport from adjacent villages at no cost to workers. As of December 2015, a fleet of 45 buses, although not yet certified, provides services to workers residing in the following villages, between 5:30 and 7:00 AM and from 4 to 5:30PM (see figure 3.14):

- Caracol;
- Ekam;
- Limonade;
- Terrier-Rouge;
- Trou-du-Nord.

The first trip in the morning and the last in the evening from Limonade also continue to Station Madeline in Cap-Haïtien for a cost of 10 HTG per trip (compared to the usual 15 HTG tap-tap fare between Limonade and Cap-Haïtien).

No standees are allowed on buses.

Sidewalks are provided on all streets inside the industrial park, but do not extend to adjacent communities. Parking for bicycles, motorcycles and cars is also available on-site. Moto-taxi services can also be used, although limited to one passenger per motorcycle and it is one of the only areas where the requirement to wear helmets is enforced.

INTERREGIONAL TRANSPORTATION

Interregional transportation by bus is provided by a number of carriers from Ouanaminthe and Cap-Haïtien using relatively new coaches and minibuses, usually air-conditioned, along the following routes:

- Ouanaminthe – Cap-Haïtien – Port-au-Prince (5-6 hours from Cap-Haïtien to Port-au-Prince via the RN1 with a fare of 650 HTG to Cap-Haïtien and 750 HTG to Ouanaminthe). This line is operated by Blue Sky (1 departure per day);
- Cap-Haïtien – Port-au-Prince (5-6 hours from Cap-Haïtien to Port-au-Prince via the RN1). This line is operated by a number of operators, including Sans-Souci Tours (6 departures per day for approximately 650 HTG);
- Cap-Haïtien – Ouanaminthe – Santo Domingo, Dominican Republic via the RN6. This line is operated by Tours Caraibes and the one-way fare is approximately 28 USD.

The number of companies, the number of departures and the comfort of the vehicles has all improved since banditry on rural roads has declined over the past few years according to stakeholders.

Daily flights are also available between Cap-Haïtien and Port-au-Prince for 80 USD for a one-way flight and the travel time is approximately 25 minutes.

3.2.5 AIR AND MARITIME TRANSPORTATION

Regular flights are provided from Cap-Haïtien International Airport to Port-au-Prince, the Turks and Caicos, Fort Lauderdale and Miami. The airport's runway has been extended recently, but is not yet lit to offer late evening flights. Also, there are small dirt runways in Phaeton (east of Terrier-Rouge along Fort-Liberté Bay) and Ouanaminthe for private aviation. International flights also offered in the Dominican Republic via the airport at Puerto Plata although it requires 3 hours travel time from the Haitian border.

The Port of Cap-Haïtien is located in the central part of the city, which needs to be crossed by trucks serving the port. The port mostly handles containers, oil and bulk material. A number of fishing villages are located along the coast and fishermen own small boats, but there are no port facilities.



Figure 3.14 **Circuits de transport collectif / Mass Transit Stops and routes**

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3.2.6 KEY FINDINGS

- → Many modes of travel are used in the Cap-Haïtien-Ouanaminthe corridor: walking, bicycle, tap-taps, buses, motorcycles, moto-taxis, private vehicles, trucks and others (horseback, tractors, etc.);
- → The road network is used by all modes of transportation. Furthermore, it not only serves to allow people and goods to travel, but is also used as a space for social activities and trade;
- → All communes are connected by road links, although some of the links, apart from the RN6, are not useable in all weather conditions and are dangerous. No practicable links exist between the study area and the Artibonite Department to the south and only one roadway leads to the Dominican Republic (and this only border crossing in the region is extremely congested on market days);
- → The poor quality of most road infrastructure also reduces the completeness and connectivity of the network. Many roads are not usable by all vehicles and require extremely low speeds;
- → Where national roads cross through built areas, the road design has not been adapted for its use: there are no sidewalks for pedestrians, merchants crowd the side of the road and there are no stops for buses and tap-taps;
- → Some speed bumps, mostly on secondary roads, have also been built by local residents to slow down traffic and attract customers. A few traffic signals have been installed but none are currently in operation;
- → In rural areas, where vehicles usually travel at high speeds, narrow shoulders are provided, but pedestrians, cyclists, animals and other slower moving users have little room. Shoulders and sidewalks are commonly used for parking, by merchants or other activities, thus forcing pedestrians to walk on the roadway;
- → Most cities, towns and villages and destinations are located in relatively level areas which reduces the effort required to bike or walk to destinations. But few streets and roads have sidewalks or trails for pedestrians, except in the heart of Cap-Haïtien and Ouanaminthe, as well as inside recent developments such as the PIC and the University of Limonade campus;
- → A high proportion of adults have mobility impairments in Haiti, especially among women and people with lower-incomes. Based on observations in the field, it appears that the vast majority of transportation infrastructure and vehicles are not adapted for persons with a physical disability or impairment;
- → Buses and tap-taps are usually operated along set routes serving routes within Cap-Haïtien and linking the various cities. Few tap-taps and buses venture off from major roads because of the lack of vehicles and the quality of the infrastructure, which increases travel times and operating costs;
- → The main collective transport stops are in Cap-Haïtien (Madeline), Carrefour La Mort (intersection of RN3 and RN6), Limonade, Trou-du-Nord, Terrier-Rouge, Fort-Liberté and

Ouanaminthe. The highest frequencies of tap-taps are seen between Cap-Haïtien and Limonade;

- → All collective transport vehicles are privately owned and operated. Most vehicle owners own between one and four vehicles. Many owners have little or no access to credit to finance the purchase of newer vehicles;
- → Moto-taxis usually accommodate one or two passengers but sometimes up to 5 passengers. These services are owner-operated or rented to drivers. Moto-taxis serve local trips in urban areas and remote rural areas;
- → Interregional transportation by bus is provided by three carriers from Ouanaminthe and Cap-Haïtien, notwithstanding tap-tap services;
- → Regular flights are provided from Cap-Haïtien International Airport to Port-au-Prince, the Turks and Caicos, Fort Lauderdale and Miami;
- → The Port of Cap-Haïtien is located in the central part of the city, which needs to be crossed by trucks serving the port. The port mostly handles containers, oil and bulk material.

3.3 TRAVEL PATTERNS AND TRANSPORTATION DEMAND

This section presents travel patterns in the study area as recorded in May and early June, 2014. Travel patterns are a vital indicator in a mobility plan, to understand the how, when, why and where the population travel. Empirical data collected for travel patterns and transportation demand will provide a detailed picture of the travel behaviors as well as understanding the future needs that will be projected and modeled.

The patterns presented in this section do not represent travel during special events, such as the numerous "*fêtes champêtres*" which are large festivals that can attract from thousands to over a hundred thousand festivalgoers, according to some stakeholders. These are held in most communes from late June to August and are held successively. The largest events are in Cap-Haïtien, Ouanaminthe, and LimonadeBord-de-Mer.

3.3.1 METHODOLOGY

An extensive data collection campaign was undertaken in order to obtain a clear understanding of the movements of people and goods in the region. Traffic counts including all modes of transport as well as a regional origin and destination (O-D) survey at the roadside and on board public transit were among the data collected.

Survey staff with proper knowledge of Haitian Creole was recruited from the local population and provided with a series of detailed training seminars and practice sessions to ensure proper training on safety issues and accurate data and survey recording.



Staff Training Sessions (Source: WSP and IBI-DAA)

3.3.1.1 MULTIMODAL TRAFFIC COUNTS

Multimodal traffic count data is essential to the study in order to develop the analysis of travel volumes for the diagnosis and calibrate the O-D surveys and establish the relevant sample size. Two types of counts were undertaken: automatic 24-hour classified traffic counts on major road sections and manual turning movement classified traffic counts at major intersections. Manual road section and intersection turning movement counts were performed from 5 AM to 8 PM during 3 weekdays each between May 19th and June 4th. In order to evaluate the influence the Ouanaminthe Market/Dajabon Binational Market held on Mondays and Fridays, one of the counts was performed on a "market" day (Monday or Friday). The other two counts were performed on a "normal" day (Tuesday, Wednesday or Thursday). The manual counts distinguished between the following modes of travel: private vehicles, trucks, motorcycles, moto-taxis, minibuses/tap-taps, buses, bicycles, pedestrians and other modes (animals, tractors, etc.).

In addition, automatic traffic counts (ATC) were undertaken using pneumatic road tubes at the following two locations: RN6 between Trou-du-Nord and Limonade; and RN6 east of Jesus.

All traffic count detailed results are provided in Appendix C.



Manual Traffic Counts along the RN6 (Source: WSP)

3.3.1.2 ORIGIN-DESTINATION SURVEYS

Essential to the current characterization of movements of people and goods as well as to predict travel patterns due to foreseen developments or proposed solutions, a roadside origin-destination survey was conducted at key points in the study area. More specifically, three different types of surveys were held to represent the main types of travel patterns observed in the region: general traffic (private vehicles, pedestrians, cyclists, motorcycles and trucks), official and unofficial stations mass transport modes (tap-taps, moto-taxis, buses) and specific locations (Caracol Industrial Park and Roi Henri-Christophe University). Specific locations are shown in figure 3.15.

Given that the O-D surveys are being undertaken for a regional transportation model, the survey primarily focused on the users' (residents / workers / students / visitors) travel characteristics for trips between communes and major generators (industries, institutions, major businesses and commercial developments) and throughout the region at a macro regional level, rather than at a micro one which would focus on travel characteristics of trips made within the communes themselves. For travel patterns, intersection movements counts paired with OD results provide information to assess travel patterns between these communes.

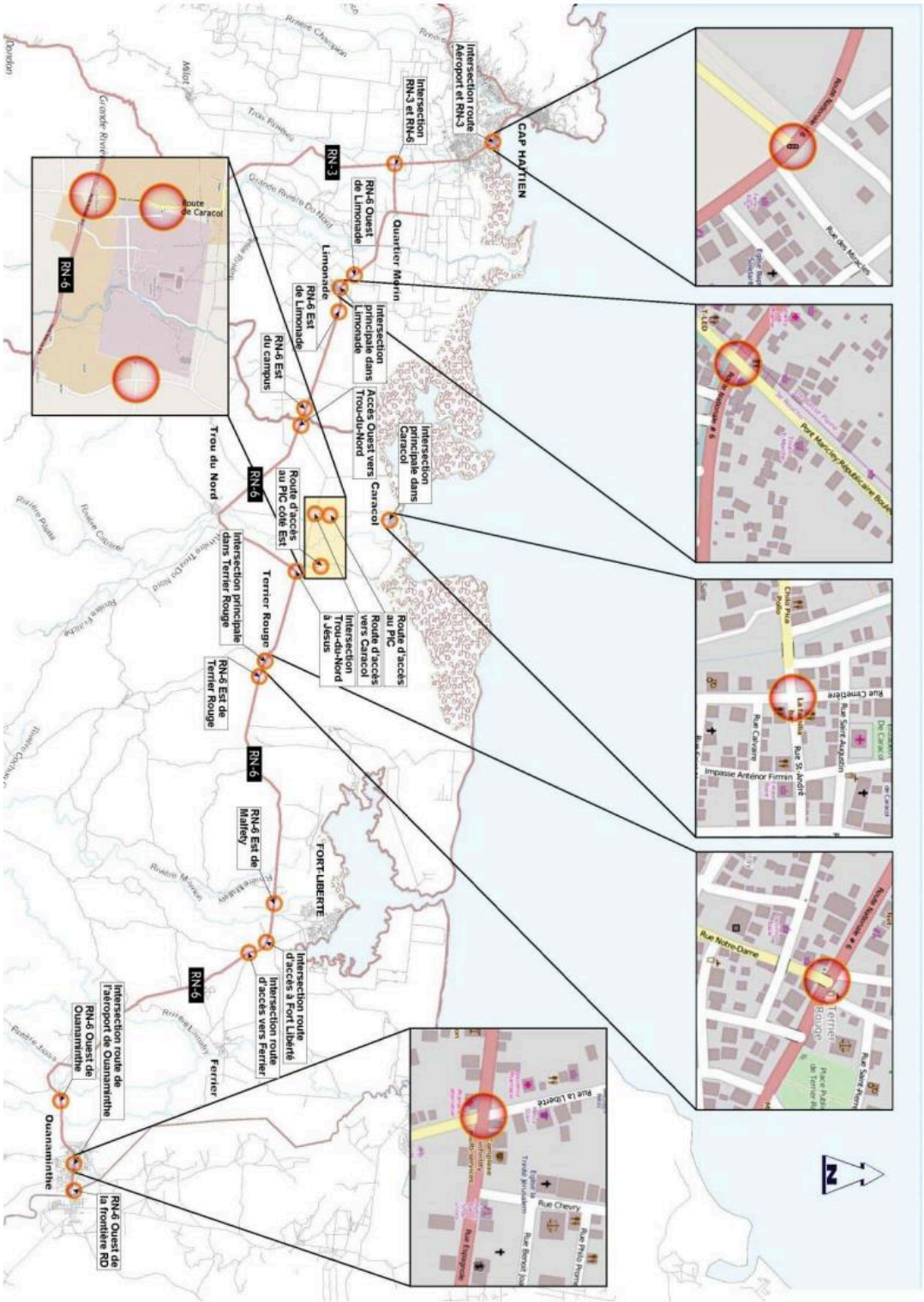
Expansion factors were calculated based on observed traffic volumes and on average occupancy at each of the seven roadside points for all types of surveys: roadside, public transit, University of Limonade and the PIC. It should be noted that these do not represent all travel in the region, but regional trips passing through these seven points. The chosen survey methodology did not allow expanding tap-tap and bus trips outside of these areas since the total population was unknown. Therefore, this data represents regional travel patterns and does not represent internal travel within a commune.





O-D Surveys Performed Along RN-6 (Source: WSP and IBI-DAA)

Figure 3.15 Manual and Automatic Traffic Counts and O-D Surveys Locations



3.3.2 TRAVEL PATTERNS

Travel patterns are examined to understand where and how regional travel is currently made, more specifically:

- → Where are people travelling to and from?
- → What modes of travel do they use?
- → Why are they travelling (business, work, personal, etc.)?
- → What are their trip times and the cost?

The information in this section is based on the regional origin-destination survey and traffic counts.

MAJOR ORIGINS AND DESTINATIONS

There are approximately 153,000 regional trips over a 15 hour period on an average weekday[2] and 15,700 during the peak afternoon hour (4 to 5 PM). Since the peak hour is only 10% of the 15-hour travel[3], travel is relatively spread out throughout the hours of the day.

The number of trips over 15 hours, in origin and in destination alike, is shown in figure 3.16a and the most important regional trip generators in the region are[4]:

- → The City of Cap-Haïtien: 51,000 trips;
- → Ouanaminthe (including the market): 70,000 trips (but most are internal to the area);
- → Quartier-Morin: 25,000 trips;
- → Limonade: 19,000 trips;
- → Fort-Liberté: 18,000 trips;
- → Trou-du-Nord: 16,000 trips;
- → Terrier-Rouge: 10,000 trips;
- → Caracol Industrial Park: 5,000 trips;
- → Caracol: 5,000 trips;
- → Milot: 4,000 trips.

There are few trips external to the study area: approximately 6,000 trips. Around 4,000 of these trips are in exchange with the rest of the Nord and Nord-Est departments and another 1,000 with the Dominican Republic outside of the Dajabon Binational Market. There are approximately 6,500 trips to the communes in the south of the study area (Sainte-Suzanne, Perches, Capotille, etc.).

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[2] The location of the survey points did not allow surveying the vast majority of internal trips (within a commune). Also, travel between certain communes did not require travel via the survey locations along the RN6 (e.g. Terrier-Rouge to Perches, Milot to Limonade-Bord-de-Mer, from areas west of Cap-Haïtien to Cap-Haïtien [which complicates assessing the impacts of completing the RN3 towards the south], Ouanaminthe to Acul-Samedi, etc.). The travel patterns are a combination of travel on market and non-market days in Ouanaminthe (Monday and Friday). As will be seen in the following section, the market had little influence on travel west of Ferrier/Fort-Liberté.

[3] 24 hour traffic counts, found that there was little travel outside the counting period (5AM to 8PM).

[4] Note: The location of the survey points vs. the location of the communes has an impact on the number of estimated trips.

When examining intercommunal trips (see figure 3.16b), we can notice that Cap-Haïtien is the most important generator in the region, partly due to its large population and its larger range of available services. This pattern is also coherent with observed travel traffic volumes which increase in the vicinity of Cap-Haïtien (see section 3.3.3). Ouanaminthe also attracts a vast number of trips, but many are from adjoining communes such as Ferrier and Fort-Liberté, although it also attracts many trips from the rest of Haiti (1,200).

Overall travel patterns also follow the structure of the region's road network: east-west travel along the RN6 and north-south along the RN3. This is mostly due to the fact that the region's largest towns and cities are located along these corridors and that National Roads converge towards Cap-Haïtien.

Additional information, including trips between each traffic analysis zone and commune are found in appendix D.

TRAVEL MODES

Modal shares of person trips are shown in table 3.3 and the modal shares by origin and destination are available in figure 3.16. The main findings are the following:

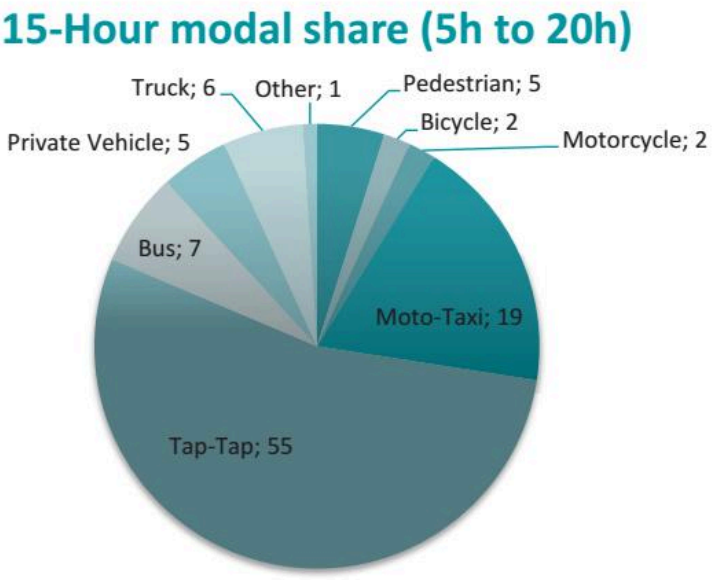
- → The tap-tap is the most widely used travel mode in the region accounting for over 55% of trips and 120,000 trips over 15 hours. In many areas, tap-taps account for more than 50% of regional trips such as the Cap-Haïtien, Quartier Morin, Limonade, Trou-du-Nord, and the Ouanaminthe Market. Buses account for around 7% of trips; the highest bus modal shares are to and from the PIC.
- → Moto-taxis and motorcycles, even with their low occupancy rate, account for 44,000 trips. Motorcycle use is highest in the vicinity of Ouanaminthe.
- → Pedestrians and cyclists accounted for approximately 7% of trips, although the survey locations were mostly in areas with less pedestrian activity. The actual proportion is likely higher since pedestrian activity is much higher in the center of cities, towns and communes.
- → Trips external to the region are mostly by bus, tap-tap, private vehicle and truck.

Additional information, including estimated trips between each traffic analysis zone and commune by travel mode, is available in appendix D.

Table 3-3 Trips by Mode and Modal Shares

Transportation Mode	15-Hour Trips by Mode	%	PM Peak Hour Trips by Mode	%
Pedestrian	10,500	5	1,300	7
Bicycle	3,500	2	200	1
Motorcycle	4,000	2	300	1
Moto-Taxi	41,000	19	3,000	15
Tap-Tap	121,000	55	11,200	57
Bus	15,000	7	1,600	8
Private vehicles (cars, utility vehicles, etc.)	10,000	5	1,000	5
Truck[5]	12,000	6	1,200	6
Other	1,000	1	100	1
Total	218,000	100	19,800	100
Total Non-Motorized	14,000	7	1,500	8
Total Transit	136,000	63	12,700	65

Note: Numbers are rounded.



[5] Note: Travel surveys and roadside occupation surveys found high occupation rates on many trucks.

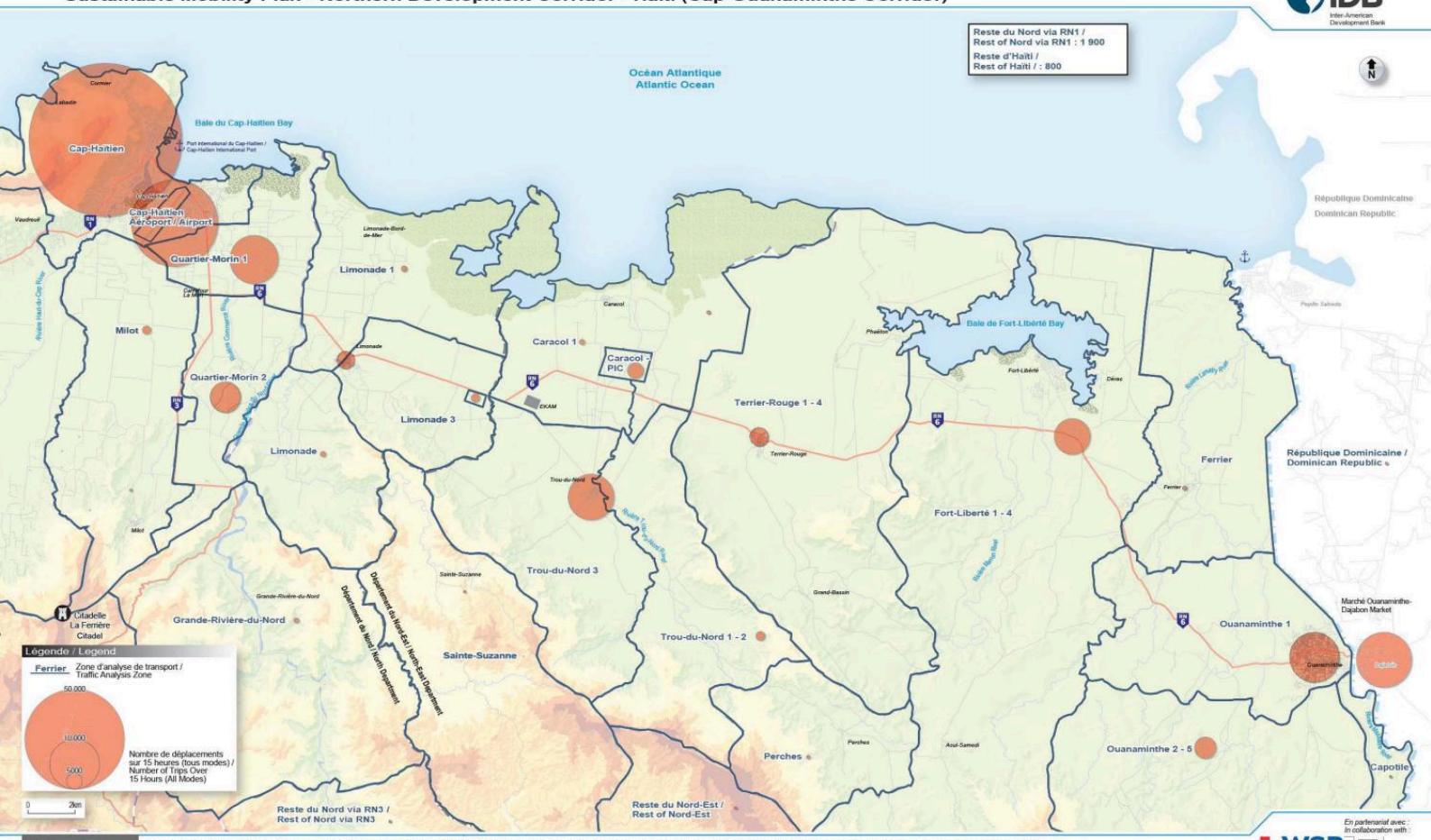
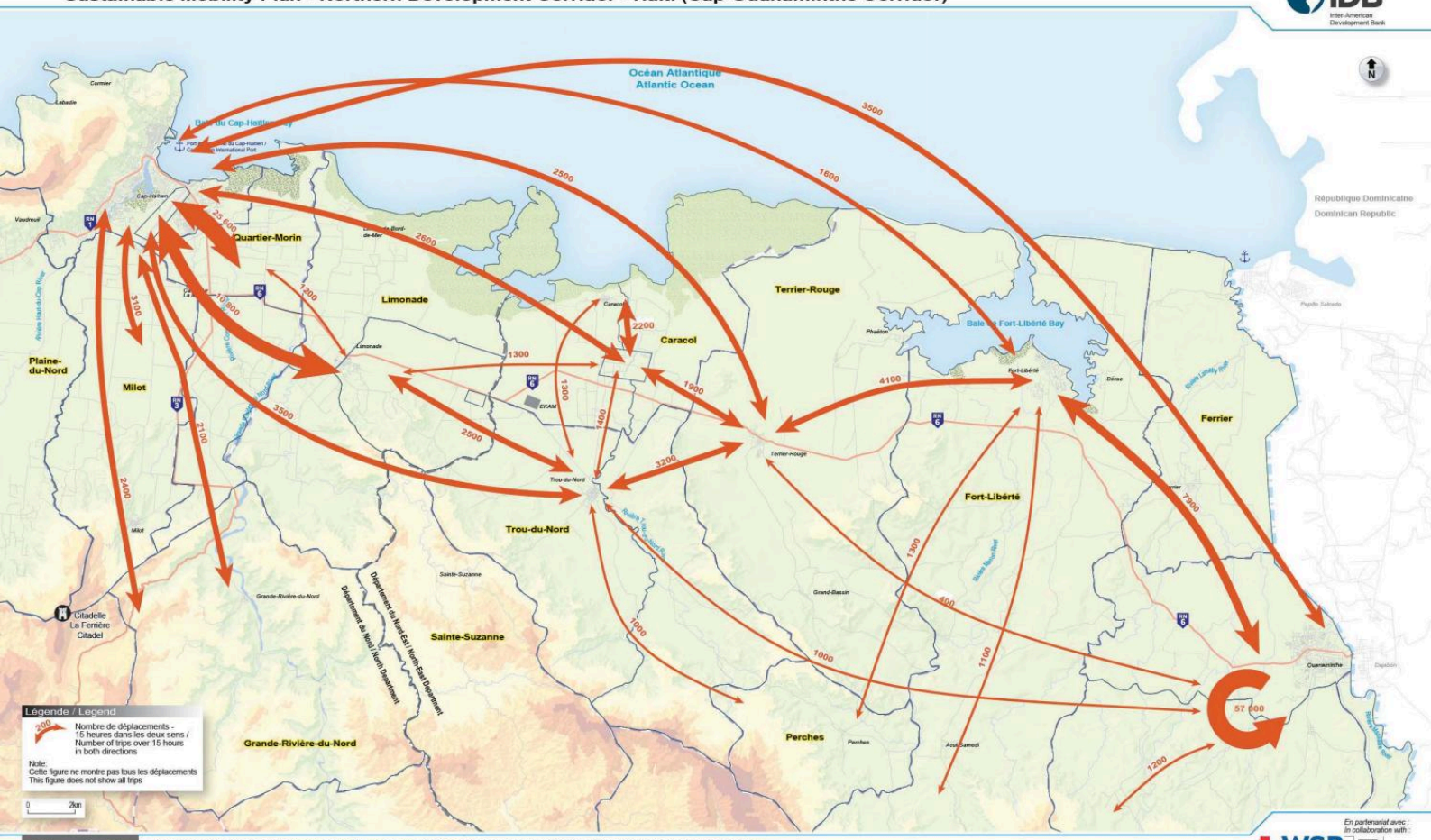


Figure 3.16a **Volumes de déplacements en origine sur 15 heures pour un jour de semaine typique / Average Originating Weekday Travel Pattern Over 15 Hours**

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Légende / Legend

Nombre de déplacements - 15 heures dans les deux sens / Number of trips over 15 hours in both directions

Note:
Cette figure ne montre pas tous les déplacements
This figure does not show all trips

0 2km

Figure 3.15b **Flux de déplacements intercommunaux les plus importants / Most Important Intercommunal Travel**

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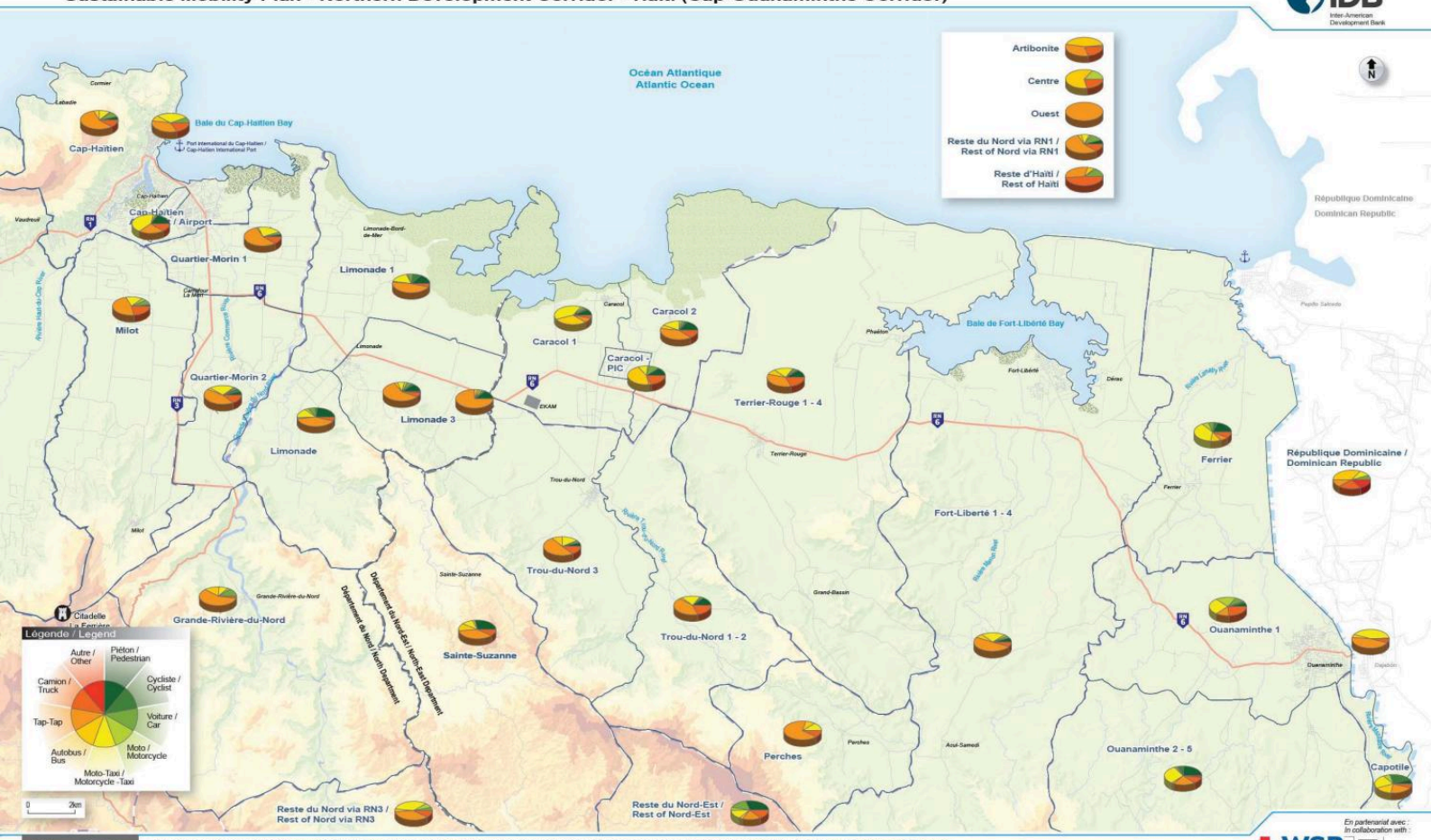


Figure 3.17 **Parts modales par commune sur 15 heures pour un jour de semaine typique / Weekday Modal Shares by Commune Over 15 Hours**

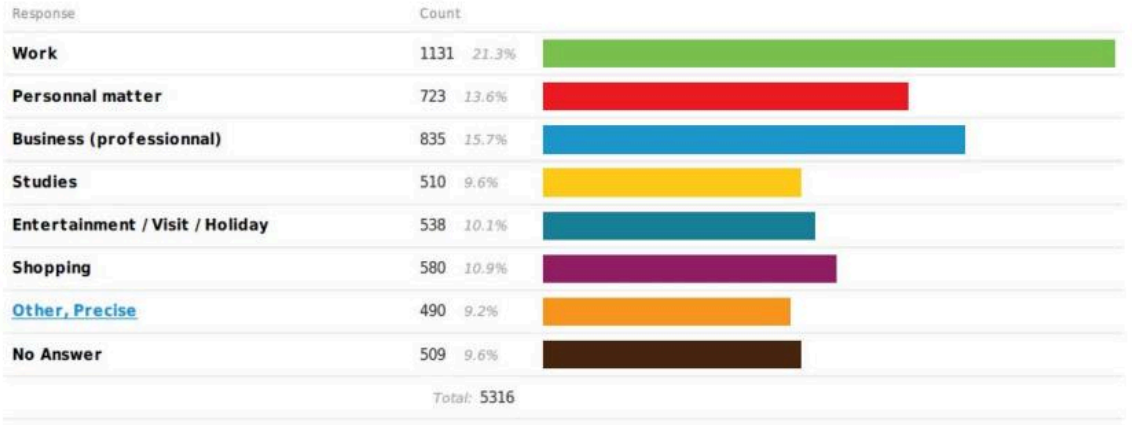
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TRIP PURPOSES

Overall, trip purposes were widely distributed between all types. Work and business were the most prevalent trip purpose (37% of respondents). Personal business, shopping, visiting family/leisure and studies take up approximately 10% each as observed in figure 3.18.

Additional information can be found in appendix D.

Figure 3.18 Trip Purposes



Note: personal business was added as a purpose since in Creole the word "business" can be used to characterize most purposes.

TRAVEL TIMES AND COSTS

Due to the nature of the survey, stated average travel times and travel costs are much higher for trips in relation with the areas in the periphery of the study area as can be observed in figures 3.19 and 3.21. The shortest travel times are for trips to and from the PIC, even including trucks. In contrast, areas to the south of the RN6 have much longer travel times such as Grande-Rivière-du-Nord (78 minutes) and Perches (61 minutes), likely because of their poor accessibility.

Travel costs are much lower by foot, bike and tap-tap (67 Gourdes). The highest travel costs are by trucks and private vehicles as seen in figure 3.22. In contrast, although tap-taps are less expensive, their users travel for longer times than most other users (44 minutes), except for trucks.

By examining specific origin-destination pairs, travel times to Cap-Haïtien, the only center in the region with a hospital and many services, are much longer as we move further east, not surprisingly. That said, travel times are much longer to reach communes south of the RN6 such as Sainte-Suzanne, Perches and Capotille.

Additional information can be found in appendix D.

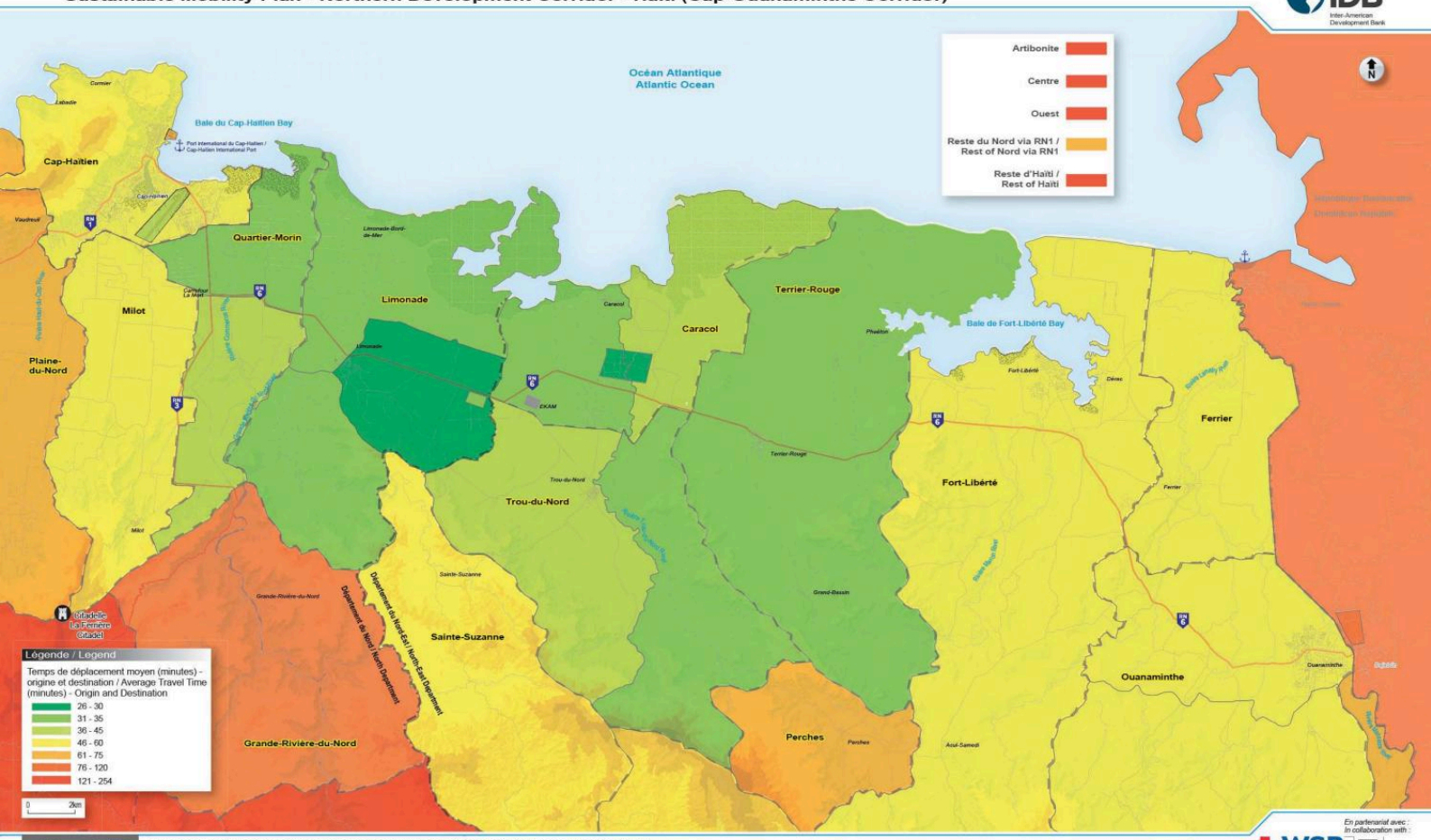
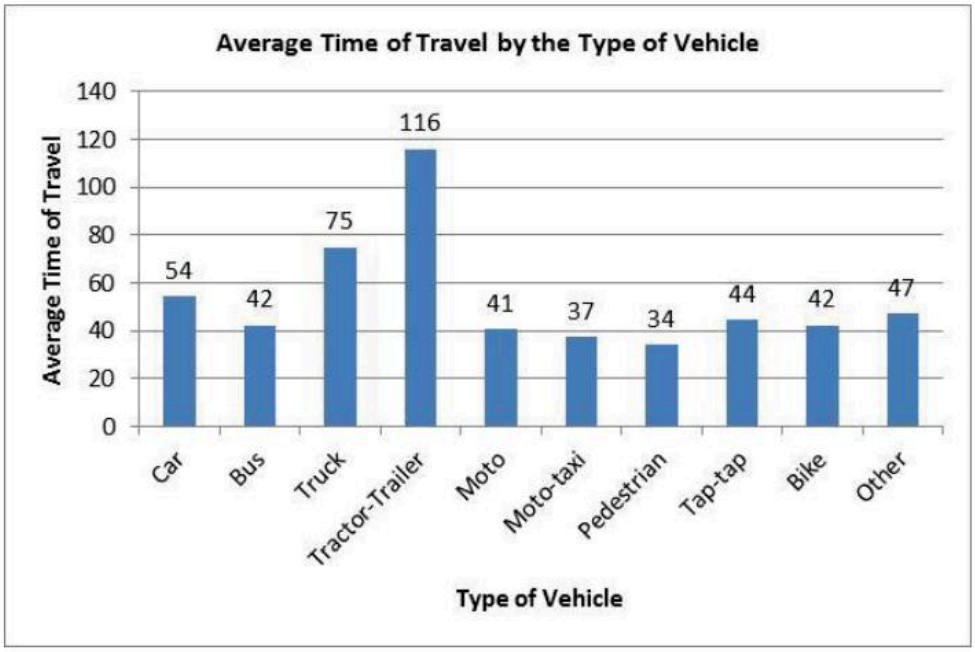


Figure 3.19 **Temps de déplacement moyen par commune / Average Travel Time by Commune**

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Figure 3.20 Average Travel Time by Mode



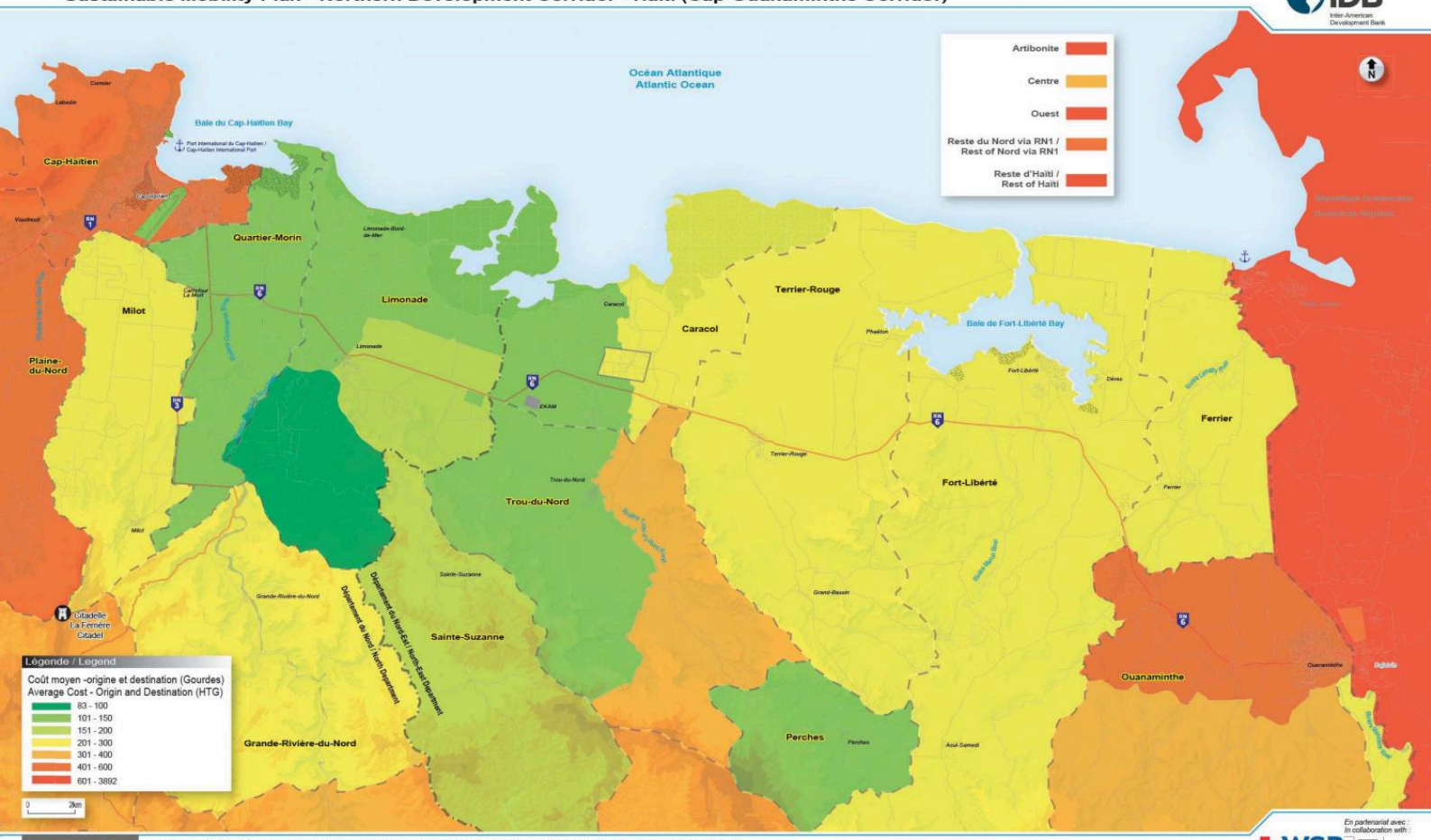
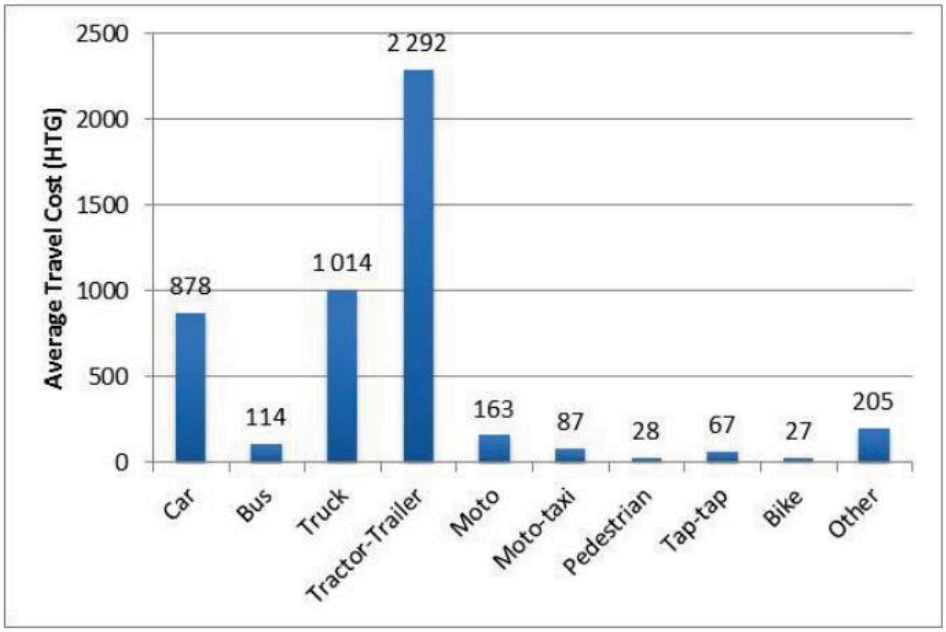


Figure 3.21 Coût de déplacement moyen par commune (Gourdes) / Average Travel Cost by Commune (HTG)

141-15934-00_Fig3-20_AvrTravelCost_20150401.ai

Figure 3.22 Average Travel Cost by Mode



All trips by mode of travel at point of survey, for sample sizes see appendix. Some pedestrians and cyclists reported higher costs since they used other modes along their trip.

Distribution of Trip Costs by Mode

Cost (Gourdes)	Type of Vehicle										General Total
	Car	Bus	Truck	Tractor-Trailer	Moto	Moto-taxi	Pedestrian	Tap-tap	Bike	Other	
0	33	21	41	2	14	19	70	34	67	20	321
1-10	1	6	2		2	17	31	146	6	14	225
11-20	1	7			11	60	22	187	8	7	303
21-30	4	82	1		21	133	61	186	19	9	516
31-40	1	11	1		5	18	11	61	2	3	113
41-50	9	28	9		62	216	33	282	7	9	655
51-60	1				8	13	6	4			32
61-70						3		6			9
71-80	4	15	1		12	36	16	183		2	269
81-90								1	1		2
91-100	28	70	5		66	135	6	107	3	3	423
101-150	15	10	2		53	48	4	50	1	1	184
151-200	38	6	13		37	27		15	2	2	140
201-250	30	2	6		28	22	1	13	1		103
251-300	14	2	4	1	11	9		4			45
301-400	18	3	11	1	12	7		7	1		60
401-500	69	9	7		12	7		6		2	112
501-1000	119	10	26		16	7	1	12	1	1	193
1001-5000	101	2	42	15		3		5		5	173
5001-60000	6		9	2	1						18
General Total	492	284	180	21	371	780	262	1309	119	78	3896

KEY FINDINGS

- There are approximately 153,000 regional trips over a 15 hour period on an average weekday and 15,700 during the peak afternoon hour (4 to 5 PM). Since the peak hour is only 10% of the 15-hour travel, travel is relatively spread out throughout the hours of the day.
- Cap-Haïtien is the most important generator in the region, partly due to its large population and its larger range of available services. Ouanaminthe also attracts a vast number of trips, but mostly from adjacent communes such as Ferrier and Fort-Liberté, although it also attracts many trips from the rest of Haiti.
- Travel patterns follow the structure of the region's road network: east-west travel along the RN6 and north-south along the RN3. This is mostly due to the fact that the region's largest towns and cities are located along these corridors and that National Roads converge towards Cap-Haïtien.
- The tap-tap is the most widely used travel mode in the region accounting for over 55% of trips.
- Moto-taxis and motorcycles, even with their low occupancy rate, account for 44,000 trips. Motorcycle use is highest in the vicinity of Ouanaminthe.
- Pedestrians and cyclists accounted for approximately 7% of trips, although the survey locations were mostly in areas with less pedestrian activity. The actual proportion is likely much higher since pedestrian activity is much higher in the center of cities, towns and communes where origin-destination surveys were not undertaken, except for certain transit stations.
- Trip purposes were widely distributed between all types. Work and business were the most prevalent trip purpose (37%). Personal business, shopping, visiting family/leisure and studies take up approximately 10% each.

3.3.3 VEHICULAR VOLUMES AND MODAL SHARES

After the description of the network, this section examines the use of the existing transportation network, both temporal (hourly and type of day) and geographically. As mentioned previously, there is a great variety of transport modes and therefore 9 categories were used for traffic counts. Traffic counts were undertaken on either Monday or Friday when the Dajabon Binational Market is active ("market days") and on two days between Tuesday and Thursday ("non-market days").

Traffic volumes for most modes do not vary much between the early morning (around 7) to the late afternoon (around 5 PM) as identified in figure 3.23 (non-market day) and figure 3.24 (market days). The main exceptions to this trend are pedestrians and moto-taxis which peak in the morning and the afternoon. Tap-tap volumes also increase during the afternoon, but only on market days. Although not shown in these figures, traffic volumes fall drastically when it is dark (8 PM to 5 AM), as confirmed by 24 hour counts provided in appendix D.

Traffic volumes are highly variable throughout the study area, ranging from a few hundred vehicles to 24,000 in Cap-Haïtien daily[6] (see figure 3.25). Traffic volumes are even higher on

[6] These volumes are based on counts between 5 AM and 8 PM. Traffic volumes are much lower at night based on the results of 24 hour counts, but the term "daily" is used to allege the text. The expression "24 hours" is used to refer to the entire day.

market days in Ouanaminthe (see figure 3.26), but there are only 500 to 1,000 additional vehicles from Ferrier and westwards (mostly small trucks and tap-taps). Traffic was higher on market days in Cap-Haïtien, but this does not seem related to the market. Most traffic is local and does not cross the entire study area from end to end as traffic volumes diminish considerably outside the two largest cities, especially between Limonade and Ferrier.

Motorcycles, whether private or used as moto-taxis, are extremely prevalent throughout the study area, even though they have less capacity, as they comprise between 24 to 74 % of total volumes. The proportion of motorcycles is highest on secondary roads leading to smaller communes (Milot, Ferrier, etc.) and on the RN6 leading into Ouanaminthe.

CARACOL INDUSTRIAL PARK (PIC)

The Industrial Park generated approximately 5,000 trips on an average weekday; approximately half of these are by bus (2,400), 600 by car and 600 by motorcycle in May 2014. Approximately, one-thousand vehicles per day enter and exit the Caracol Industrial Park, without the 250 to 300 pedestrians and cyclists per day. Between 250 to 300 trucks come in and out of the park every day and the proportion of buses is the highest throughout the study area. Also, there are more private vehicles and fewer motorcycles than elsewhere in the study area. There is little variation during Ouanaminthe market days. Most vehicles access via the south and there are more vehicles coming from the east than to the west. This is mostly because of trucks carrying construction materials from Terrier-Rouge and other trucks travelling to/from the Dominican Republic (less than 20 trucks per day)[7]. Volumes accessing the Industrial Park can be observed in figures 3.24 to 3.27.

ACTIVE TRANSPORT

Pedestrian volumes are highly variable throughout the day (as observed in figures 3.17 and 3.18) and peak in the morning (around 7 am) and in the early afternoon (2 to 3 pm). Along with moto-taxis, this mode is the most variable throughout the day because there are no capacity limits like other types of vehicles. Cycling volumes are not as variable throughout the day. Pedestrian volumes are much higher in the center of towns and close to tap-tap stops.

On market days, outside of Ouanaminthe there is little variation throughout the study area. The border crossing leading to the Dominican Republic sees the most drastic increase in volumes as close to 24,000 pedestrians cross it on market days; still 4,000 pedestrians crossed it daily when the market is closed. Pedestrians and cyclists account for 3 to 57 percent of total vehicle volumes based on the area. Of course, urban areas have much higher travel activity by foot.

COLLECTIVE TRANSPORTATION

Tap-tap volumes are high in Cap-Haïtien along the RN6 where there are close to 6,000 per day north of the airport access. These volumes diminish considerably towards the east: 1,200 in Limonade, 500 in Trou-du-Nord, 800 in Terrier-Rouge and 200 east of Ferrier on non-market days. These volumes are higher on market days (500 east of Ferrier vs. 200). There are fewer tap-taps using non-improved secondary roads such as the accesses to Caracol, Sainte-Suzanne, etc. Since tap-tap and bus volumes are relatively constant throughout the day, there seems to be an insufficient supply of mass transit vehicles during peak periods. Peak hour transit volumes are given in figure 3.29.

CONGESTION POINTS

The center of Cap-Haïtien and roads leading to it are often congested throughout the day from Monday to Saturday. This is due to high volumes, the largest trip generator in the region and the

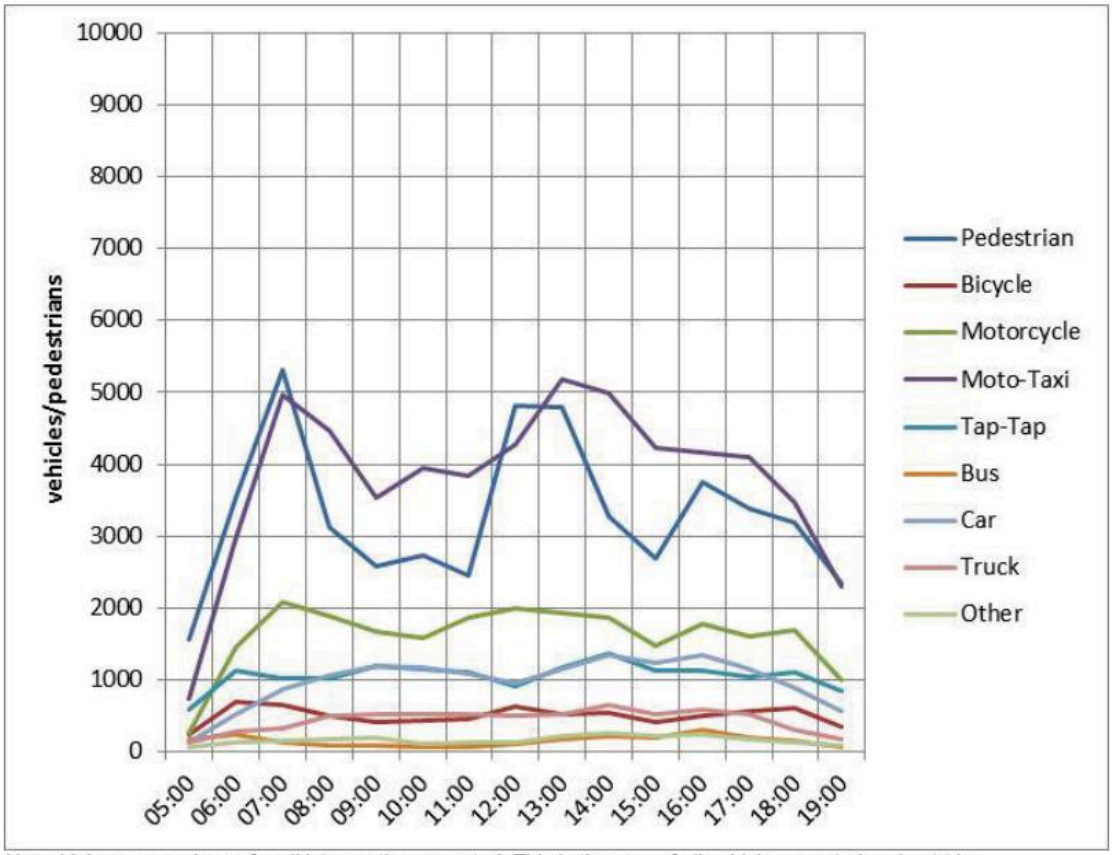
[7] Trucks from the Dominican Republic travel in convoys and it was impractical to survey all of these due to the length of the survey. They only stopped at stations with police assistance.

lack of alternative routes. Narrow streets where there are numerous deliveries and tap-taps that stop multiple times to allow passengers to board or alight further reduce capacity and increase congestion. Also, the center of Ouanaminthe is congested on market days due to the activity of the Dajabon Binational Market. Traffic is also slowed in some urban areas built along the RN6 like Limonade and Terrier-Rouge, but traffic volumes are much lower there and delays are much lower than the larger urban centers of Ouanaminthe and Cap-Haïtien. This was confirmed by the VISUM model of current conditions where the road networks in the centers of Cap-Haïtien and Ouanaminthe are at or close to capacity (see appendix E and figure 3.30).



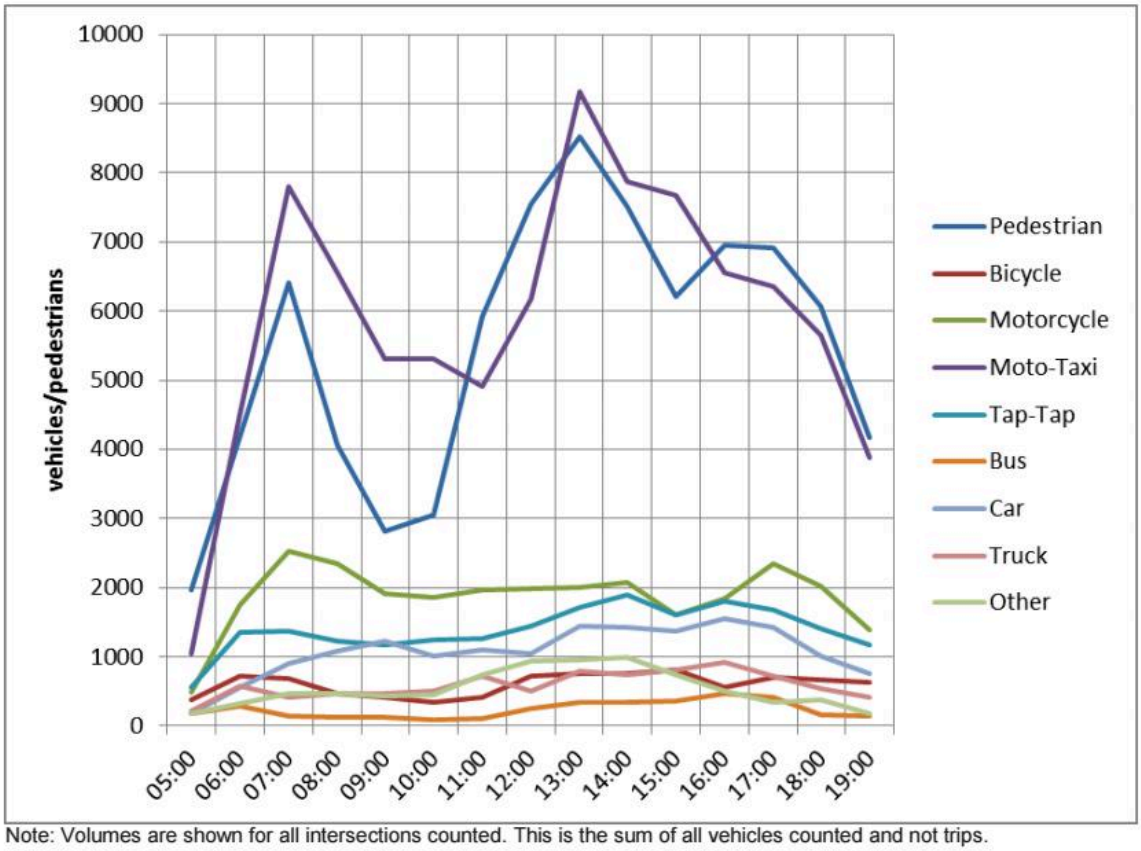
Congestion in Cap-Haïtien

Figure 3.23 Hourly Traffic Variation by Mode – Non-Market Day



Note: Volumes are shown for all intersections counted. This is the sum of all vehicles counted and not trips.

Figure 3.24 Hourly Traffic Variation by Mode – Market Day



Note: Volumes are shown for all intersections counted. This is the sum of all vehicles counted and not trips.

Plan de mobilité durable – Corridor de développement du nord - Haïti (corridor Cap-Ouanaminthe)
Sustainable Mobility Plan - Northern Development Corridor - Haiti (Cap-Ouanaminthe Corridor)

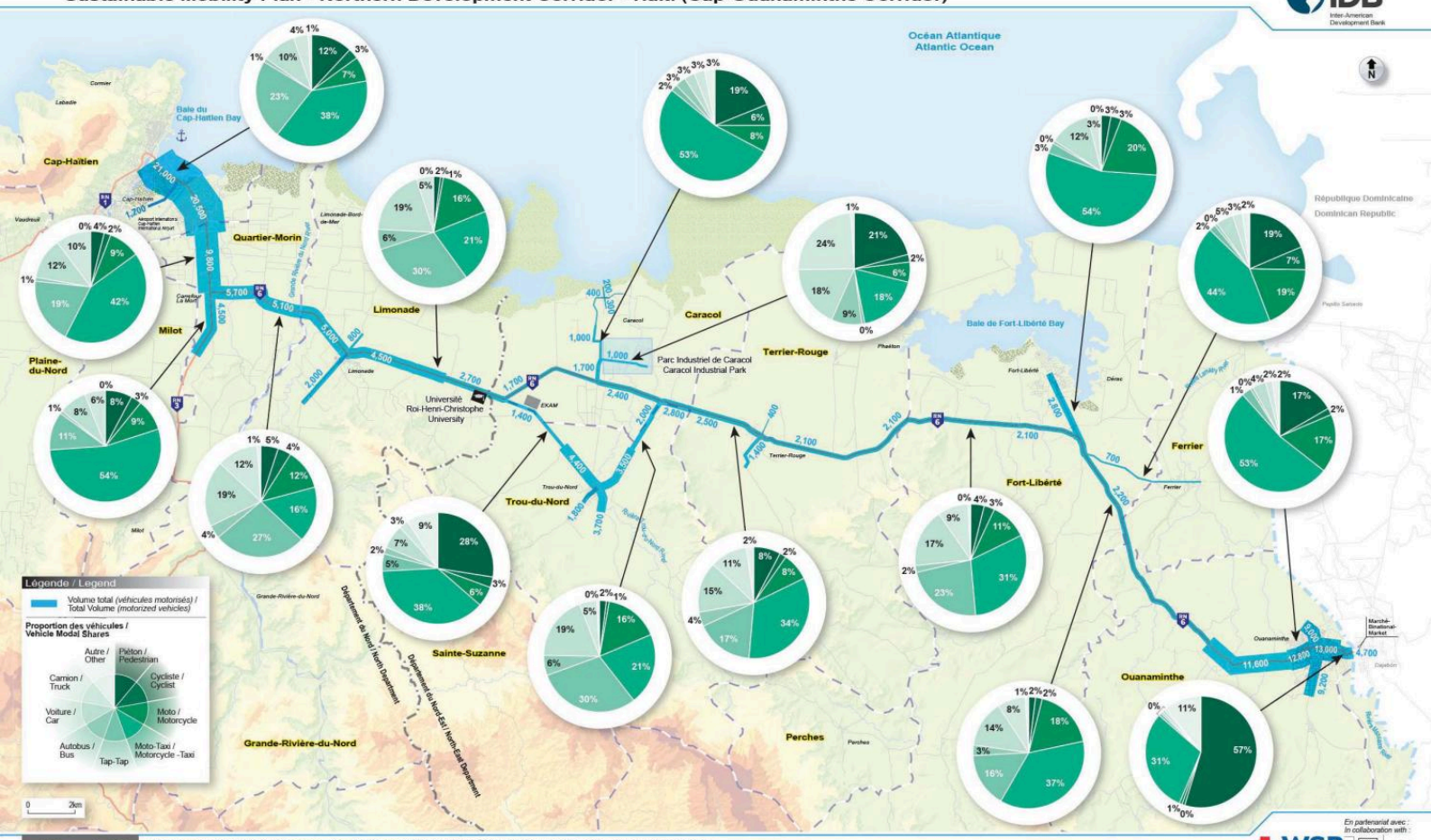


Figure 3.25 **Volumes de trafic quotidien - journée sans-marché / Daily Traffic Volumes - Non-Market Day**

141-15934-00_Fig3-24_DailyVolNonMarche_20141223.ai

En partenariat avec : / In collaboration with : WSP IBI DAA



Figure 3.28 Volume de piéton et cycliste - journée de marché / Pedestrian and Cycling Volumes - Market Day

141-15934-00_Fig3-22_PedCycleVolMarche_20150408.ai



Figure 3.27 Volume de piéton et cycliste - journée sans-marché / Pedestrian and Cycling Volumes - Non-Market Day

141-15934-00_Fig3-26_PedCycleVolNonMarche_20150408.ai

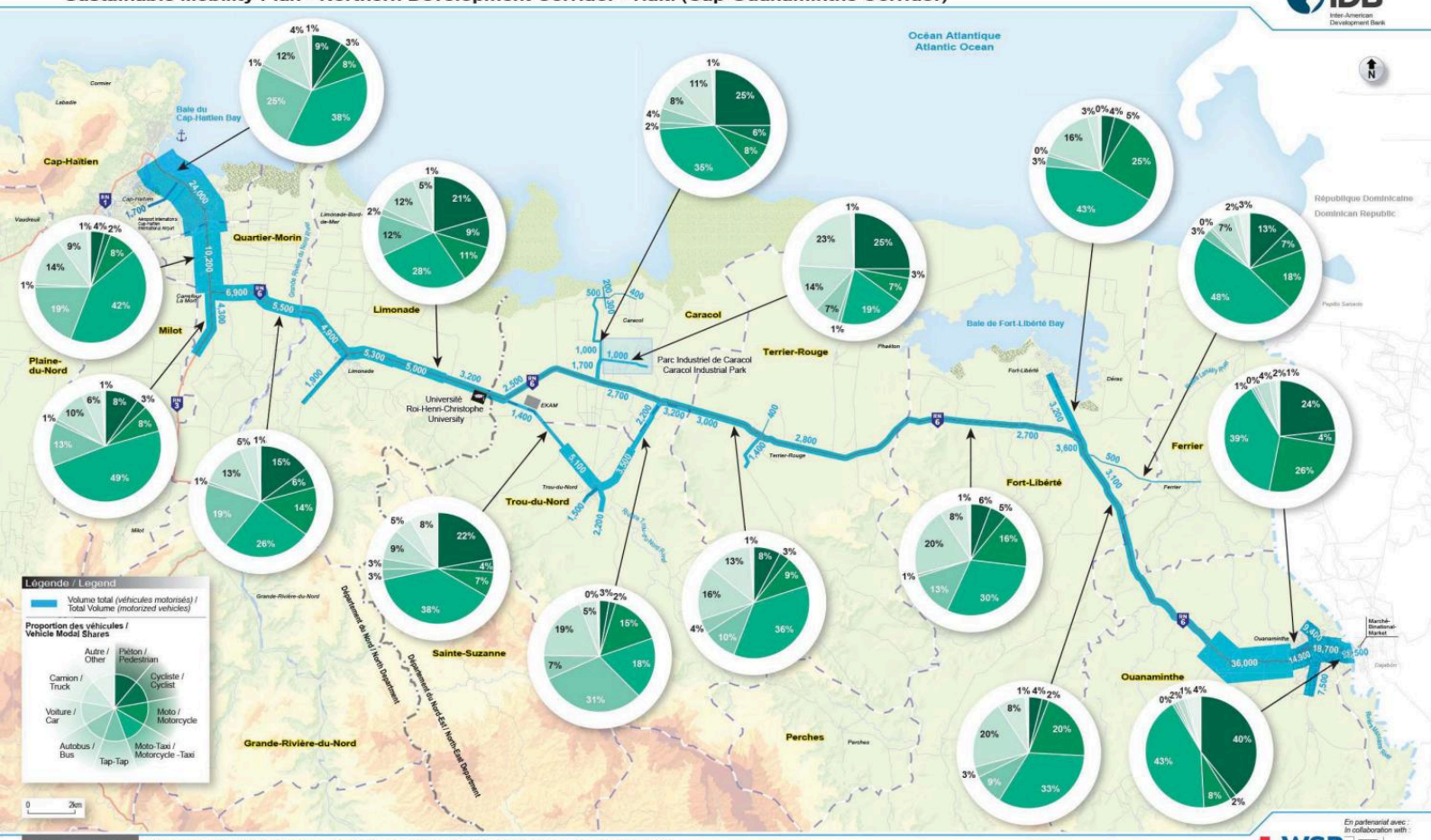


Figure 3.26 **Volumes de trafic quotidien - journée de marché / Daily Traffic Volumes - Market Day**

141-15934-00_Fig3-25_DailyVolMarche_20150408.ai

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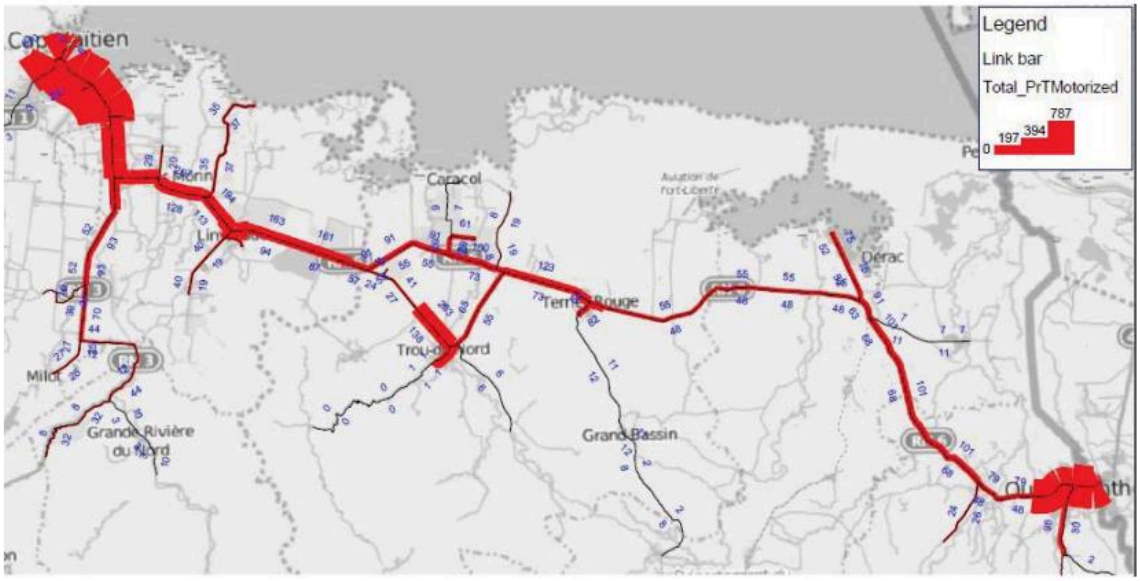
Figure 3.29 Transit Person Volumes on the Regional Road Network for the Weekday Peak Hour (4 to 5 PM)



Note: Volumes west of the Airport do not include any traffic generated after this intersection.

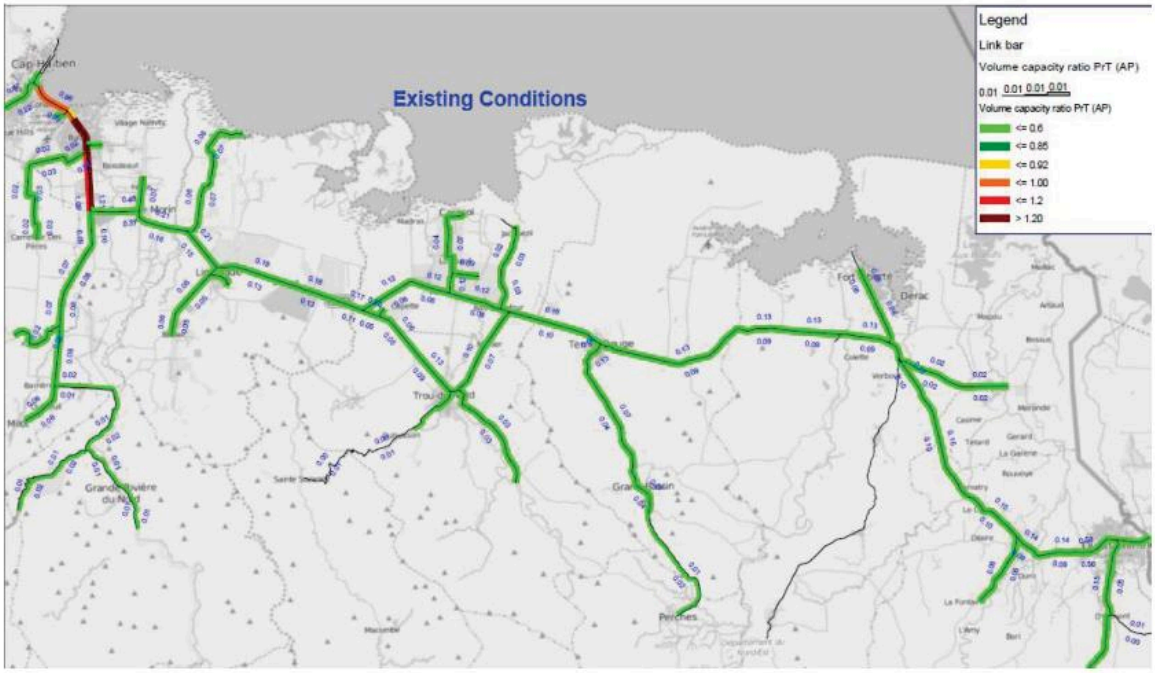
Figure 3.30 Motorized Vehicle Volumes and to Volume to Capacity Ratios on the Regional Road Network for the Weekday Peak Hour (4 to 5 PM)

Motorized Vehicle Volumes



Note: Volumes west of the Airport do not include any traffic generated after this intersection.

Volume to Capacity Ratio



3.4 FREIGHT TRANSPORTATION

The transport of goods is essential to the region's economy. With recent developments and investment, such as the Caracol Industrial Park, there is an increasing demand for freight transportation. The development of the RN6 has facilitated the transport of goods within the region and to the Dominican Republic. Important freight generators include (see figure 3.31):

- → The Caracol Industrial Park (320 to 375 trucks per day in both directions, most of which transported construction material);
- → The Port of Cap-Haïtien (no data collection at the entrance);
- → The Dominican Republic and the Dajabon Binational Market (110 to 150 trucks per day in both directions, not including goods carried by cart or by motorcycle across the border on market days). Many consumer goods are imported through this border crossing;
- → The CODEVI free-trade zone, although goods seem to be exported via direct access to the Dominican Republic;
- → Agricultural production and fisheries dispersed throughout the region;
- → Communal markets held in each individual commune;
- → Various small industries and construction companies spread throughout the region.

Truck volumes are higher on market days than non-market days due to a stream of vehicles from the Dajabon Market, although the number of trucks crossing the border is lower during these days. That said the transportation of goods is not done exclusively by truck. Most transported goods included food and agricultural products, construction material and consumer goods for communal markets. Many goods also travel by bus, tap-tap or other means. Many of these vehicles carry unsafe loads, often combined with passengers. There are no organized transportation companies with insurance and well-maintained trucks operating out of the region. Many business owners need to organize their own transportation.

Although improvements to the RN6 have enhanced the transportation of goods in the region, there are few alternative links for shipping goods as side roads are impracticable to trucks. The region is well connected to the Dominican Republic via Ouanaminthe, although Ouanaminthe is extremely difficult to cross on market days due to the congestion at the border and in the city and border hours are limited. Travel times to the south of Haiti, including Port-au-Prince and its port, via the RN1 are very long (four to six hours to Port-au-Prince which is 220 km away) and many sections are not designed for large trucks transporting shipping containers. In addition, all goods transport to the rest of the country and the port must go through the center of Cap-Haïtien, an increasingly congested sector since there are no alternative routes. The RN3 has also not yet been completed, which would facilitate goods movement to the south of the country by providing an alternative and quicker connection to the rest of the country.

The poor quality of roads in rural areas can require additional handling to transfer goods from large trucks to smaller vehicles, therefore increasing travel time and shipping costs. This is especially problematic for the development of agricultural and mineral resources. Some warehouses are located in areas where roads are not adapted to trucks, which can block traffic partly or even entirely on major while delivering goods. Furthermore, travel of goods at night (after sunset) is basically non-existent for safety reasons, even though faster travel times could be more cost effective. Even though the RN6 is lit in urban areas and along some rural sections, free ranging of livestock increases the risk of accidents and there is an increased risk of theft in rural areas to consider transporting goods at night.

Plan de mobilité durable – Corridor de développement du nord - Haïti (corridor Cap-Ouanaminthe)
Sustainable Mobility Plan - Northern Development Corridor - Haiti (Cap-Ouanaminthe Corridor)

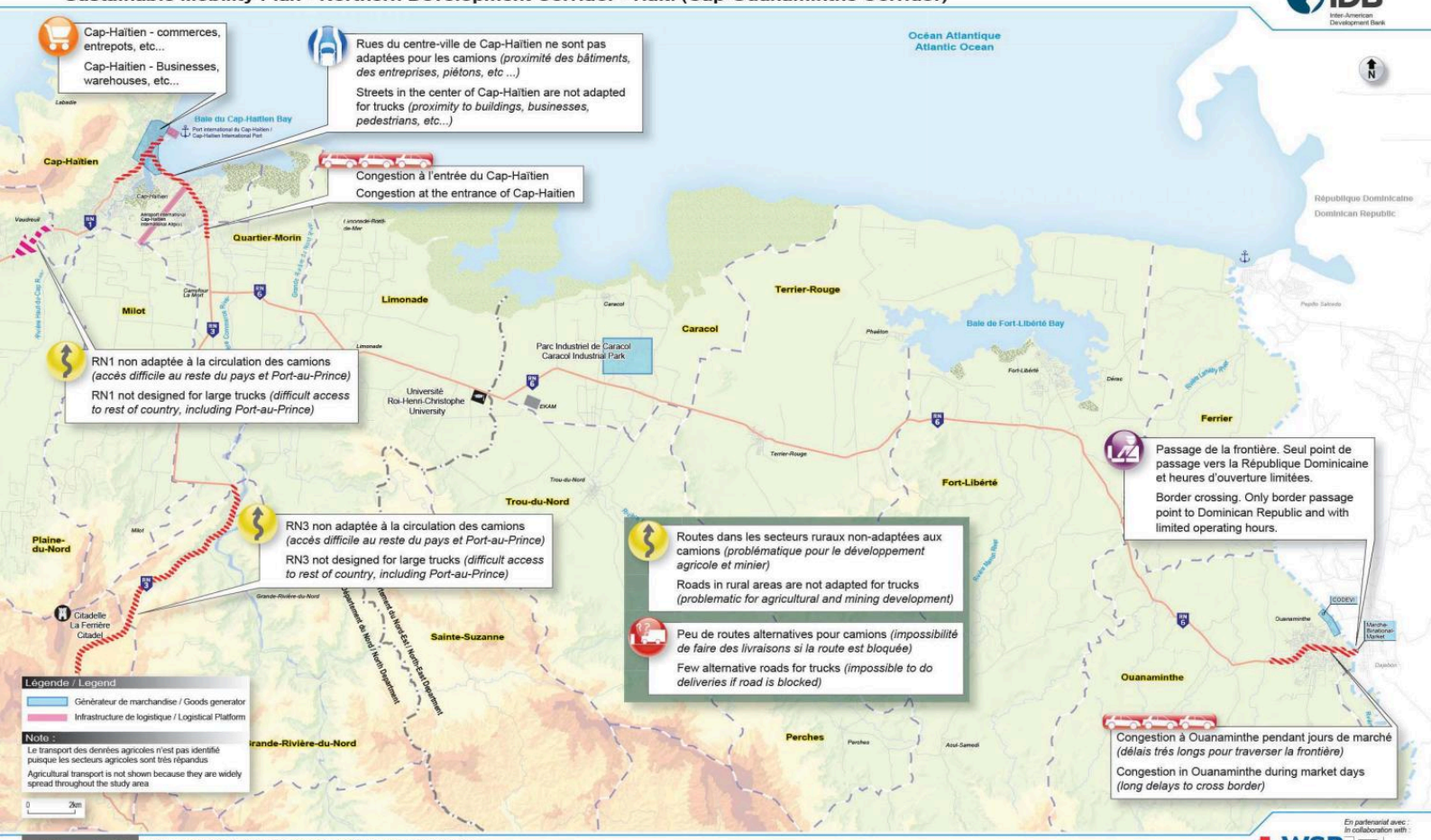


Figure 3.31 **Transport des marchandises / Goods Transportation**

141-15934-00_Fig3-31_FreightTransport_20150408.ai

En partenariat avec : / In collaboration with : WSP IBI DAA

3.5 TRANSPORTATION SAFETY

Reliable accident data is not readily available as Haiti is one of the only countries that do not provide accident data to the World Bank. That said, the number of injuries treated at emergencies was available and 8,838 injuries were treated at emergencies in the North and North-East departments in 2013 (the rate of emergency admissions per 100,000, at 624, is much higher than for the entire country: 355). Using the same assumption as the AIA Master Plan, the study area would have approximately 195 deaths per year using the average rate of 30 road-related deaths per 100,000 for low-income countries.

Table 3-4 Emergency Room Admissions Due to Accidents – 2013

Area	Total Emergency Visits (All Reasons)	Total Emergency Visits (Road-related)	Road-Related Emergency Visits per 100,000
North	31,653	6,894	666
North-East	8,242	1,944	509
North and North-East	39,895	8,838	624
Haiti	224,216	37,534	355

Source: MSPP, 2013 MSPP Annual Report, 2014

No information on fatalities was available, even though stakeholders mentioned that fatal injuries are common, a number of which occurred during the weeks when our staff was on-site. Considering that motorization rates are relatively low in the country, it can be expected that the number of accidents, including injuries and fatalities will increase further in the coming years.

Based on our work in the field a number of qualitative safety concerns were identified related to infrastructure (engineering/planning), user behavior and enforcement.

INFRASTRUCTURE AND SIGNAGE

- A general lack of infrastructure for pedestrians and cyclists leaves them vulnerable to adjacent vehicles, especially on heavily travelled roads. Even in the few areas where sidewalks are provided, these can be used for parking or by roadside merchants;
- Very few dedicated stops are provided for buses and tap-taps. Therefore, transit vehicles often stop in the middle of the street/road. Alighting passengers are also vulnerable to passing traffic. In addition, many passengers expect to board and alight as close as possible to their destination which complicates the location and design of facilities;
- Many trip generators and infrastructure that attract pedestrians are located next to the RN6, often outside of the village, and no dedicated pedestrian path is provided. Schools and bus/tap-tap stations are often the most problematic since they attract the most foot traffic. The foot traffic, in turn, attracts various merchants (food, lottery, services, telephone, moto-taxi, etc.) which attract even more activity. This lack of infrastructure forces many pedestrians to walk along high-speed roads with little or in most cases no protection, apart from a few speed bumps. The construction of the RN6 and the rise in tap-tap services has increased commercial activity along this road;
- The RN6 does not have a sufficiently wide shoulder considering the development located along it, stopping tap-taps/buses and the volumes of pedestrians and cyclists;

- The RN6 is mostly lighted from Cap-Haïtien to Ouanaminthe. In some villages, this is one of the only areas that is lighted at night and a number of schoolchildren read on the side of the road in the evenings and early mornings which leaves vulnerable to passing traffic;
- In rural areas, and even in urban areas, animals are left to graze freely, even though the law requires the installation of fences, and poses a safety risk at night and the early morning when some animals move onto the road as there is little vehicular traffic;
- Major intersections are not properly managed by appropriate traffic control (traffic signals, police officer, stop signs, etc.). At some intersections, traffic signals were installed, but none of them are functional. Pedestrians are especially vulnerable at these high volume intersections;
- Regulatory or warning traffic signs are rare and often not installed appropriately. These include for the most part speed limit signs (often approaching and leaving communes) and no-passing zones.
- Some roads can be damaged after storms and dangerous to use (e.g. washed out shoulder with no guard rail, etc.).



Road signage is limited and often not properly installed

STREET/ROAD USER BEHAVIOR

- There is little respect of traffic regulations by street users (unsafe passing, high speeds of vehicles in urban areas, little priority given to pedestrians, unsafe loads, driving without headlights at night, etc.);
- The lack of pedestrian priority is especially problematic in urban areas and wider streets as it can take a considerable amount of time to cross a street due to the constant stream of vehicles in both directions;
- Many vehicles are overloaded with passengers and/or goods. Many passengers will often ride on the roof or the bumper of vehicles which leaves them extremely vulnerable to injury in case of an accident;
- Many vehicles are in very poor condition due to their age and improper maintenance. For example, a survey in 2004/2005 (MEF and IHSI) found that 76% of private vehicles and 46% of motorcycles are more than 15 years old. Many vehicles are abandoned on the side of the road once they are no longer operational, until the scrap metal is sold;
- There is very little education for road user safety for drivers, mass transit users, cyclists and pedestrians.

ENFORCEMENT

- Enforcement of traffic regulations is very sparse (vehicle conditions, overcrowding, speeds, general traffic rules, etc.);
- The driver licensing system is weak and is not enforced. Driver education is also severely lacking;
- Land-use and agricultural regulations impacting transport are also sparsely enforced (obligation to keep animals in fenced fields, location of vehicular accesses along main roads).



Transportation of people and goods on overloaded vehicles

Figure 3.32 Examples of Safety Issues



Lack of pedestrian infrastructure along the RN6 – Photo shown: Terrier-Rouge



The location of generators force users to walk along high-speed roads



No dedicated cycling infrastructure is provided in the study area



Overloaded vehicles



The RN6 is not properly built for its use, especially in villages

3.6 ENVIRONMENTAL EXTERNALITIES

Transportation has some negative externalities on the natural environment. The cumulative effects on air quality, noise and greenhouse gas emissions are dependent on the types of vehicle used, modal shares and travelled distances. Non-motorized travel is high in the study area and is even used for some longer distance trips. The condition and age of vehicles is the main problem in terms of air quality and noise, although there are many people aboard which reduce the impacts on a per trip basis. Many older vehicles have very high air emissions, including particulate matter, carbon monoxide, ozone, toxic substances and other pollutants. The use of motorcycles is increasing, which have a lower capacity than other vehicles, but fewer emissions than private vehicles. Most private vehicles are all-terrain vehicles that have much higher emissions than private cars. Vehicle emission standards do not seem to be enforced.

Air quality and noise are most problematic in the centers of Cap-Haïtien and Ouanaminthe due to the concentration of vehicles.

Greenhouse gas emissions per trip are estimated at 27 kg of CO2 per capita per year for private vehicle trips including motorcycle trips and 26 for collective transport trips. Collective transport is much less energy intensive on a per trip basis since it comprises a larger modal share than private vehicles.

3.7 PLANNED AND POTENTIAL PROJECTS

This section presents a list of potential urban development and transportation projects planned or envisioned for the corridor. The inclusion of certain projects in this list should not necessarily be seen as an endorsement, but will be used in the development of scenarios.

3.7.1 DEVELOPMENT PROJECTS

Planned and potential development projects in the study area categorized into: urban development, industry, agriculture and tourism. These projects are also identified in figure 3.33.

URBAN DEVELOPMENT

Urban development is likely to occur in the plains south of Cap-Haïtien towards Quartier Morin and Milot. Development of the industrial park will increase pressure for housing between Limonade, Trou-du-Nord and Terrier-Rouge. According to the PANNE, up to 120,000 residents could live in this area. In addition, a new 250 unit housing development is under construction in Terrier-Rouge along the RN6, although not adjacent to any existing urban areas. Development in Ouanaminthe will also continue.

Considering very high population growth over the next 25 years, large areas of the region will be urbanized.

INDUSTRY

The Caracol Industrial Park could accommodate additional industries. Ultimately, between 20,000 and 65,000 direct jobs could be created. Existing tenants also have plans to extend operations.

AGRICULTURE

Many projects to improve agriculture and fisheries are underway to increase yields and productivity. A number of irrigation projects are planned. USAID funding efforts are centered on banana, corn, rice, beans and cocoa. The development of rural roads is critical to bring products to market.

TOURISM

A number of touristic sites could be developed in the study area including further development of Labadie Beach, development of historic fort sites and voodoo sites, hotels and beaches east of Ferrier (outside the mangrove zone). The concentration of forests, hills, mangroves, coral reefs and agriculture could also lead to ecotourism projects. The historic center of Cap-Haïtien also has important tourism potential. In addition, the Laferrière Citadel and Sans-Souci Palace in Milot also have an important tourism potential and, although located just outside the study area, would be accessed via the RN3. That said, it is difficult to predict travel patterns, which are often off-peak, and currently there is a lack of infrastructure, facilities and services to attract tourists in sufficient volumes to have an important impact on travel in the region.

The development of tourism would be associated with increased travel at the Cap-Haïtien International Airport (either from Port-au-Prince or from outside the country).

MINING

A number of mining projects are in the works in the area south of the RN6. The lack of transportation infrastructure (roads and ports) is a major impediment to their development. The mineral potential of the area is evaluated at approximately 20 billion dollars.

3.7.2 TRANSPORTATION PROJECTS

The following outlines a number of planned and potential transportation projects in the study area as shown in figure 3.33 and in table 3.5.

ROAD PROJECTS

- → A new bypass road is planned around Cap-Haïtien to connect the RN3/RN6 to the RN1.
- → Improvements to the RN1 and RN3 are planned to allow the passage of trucks and travel in all-weather conditions.
- → The PSDH also mentions a number of improvements to national roads and local roads alike.
- → Most communes have plans to pave and add drainage to their streets. Gradual improvements to rural roads are also in the works. For example, the road from the RN6 to Caracol is currently being paved.

AIR TRANSPORTATION

A new terminal is planned for Cap-Haïtien International Airport to accommodate additional passengers. A new control tower and runway lighting are also planned.

MARITIME TRANSPORT

Improvements are planned for the port of Cap-Haïtien to increase its capacity. A new bridge across the Haut-du-Cap River is also in the works to connect Madeline Station with the seafront boulevard and the port.

Table 3-5 Planned and Potential Transportation Projects

Category	Project	Description	Source
Airport	Expansion of Hugo Chavez International Airport	-New passenger terminal, control tower and runway lighting (unknown horizon) -New temporary waiting room to accommodate 100-150 passenger aircraft (opening October 2014)	APN and PSDH
Port	Expansion and improvements to Cap-Haïtien Port	Expansion to increase freight handling capacity (unknown horizon). New bridge	USAID
Port	Creation of a secondary port in Fort-Liberté	Few details available (although port improvement studies did not favor this location)	PSDH
National Roads	Improvements to RN3 from Milot to Saint-Raphaël	Pave, improve drainage to connect to Hinche and the Artibonite.	PSDH
National Roads	Improvements to RN1	Pave, improve drainage to provide an all-weather link to connect Cap-Haïtien and the south (ongoing improvements)	PSDH
National Roads	Ring-road around Cap-Haïtien from RN6 to RN1	New bypass around Cap-Haïtien (unknown horizon, possibly short-term) Construction of a roundabout and bus terminal at the RN6/RN3 intersection.	PSDH and FED
National Roads	Widened RN6/RN3 in Cap-Haïtien from Madeleine to Airport	Expropriation along sea completed in Fall 2014.	
National Roads	New road between Ouanaminthe and Centre/Artibonite	New national road to Artibonite/Hinche	PSDH and PANNE
National Roads	Bypass around Ouanaminthe	New bypass around Ouanaminthe	FED
Other Roads	Caracol Road	Improved road to Caracol from PIC (under construction 2015-2016)	PSDH
Other Roads	Sainte-Suzanne Road	Improved road to Sainte-Suzanne from Trou-du-Nord	PSDH
Other Roads	Perches Road	Improved road to Perches/Vallières from Terrier-Rouge	PSDH
Other Roads	Ferrier-Dominican Republic Road	New road from Ferrier to Pepillo Salcedo in the Dominican Republic	PANNE

Plan de mobilité durable – Corridor de développement du nord - Haïti (corridor Cap-Ouanaminthe)
Sustainable Mobility Plan - Northern Development Corridor - Haiti (Cap-Ouanaminthe Corridor)

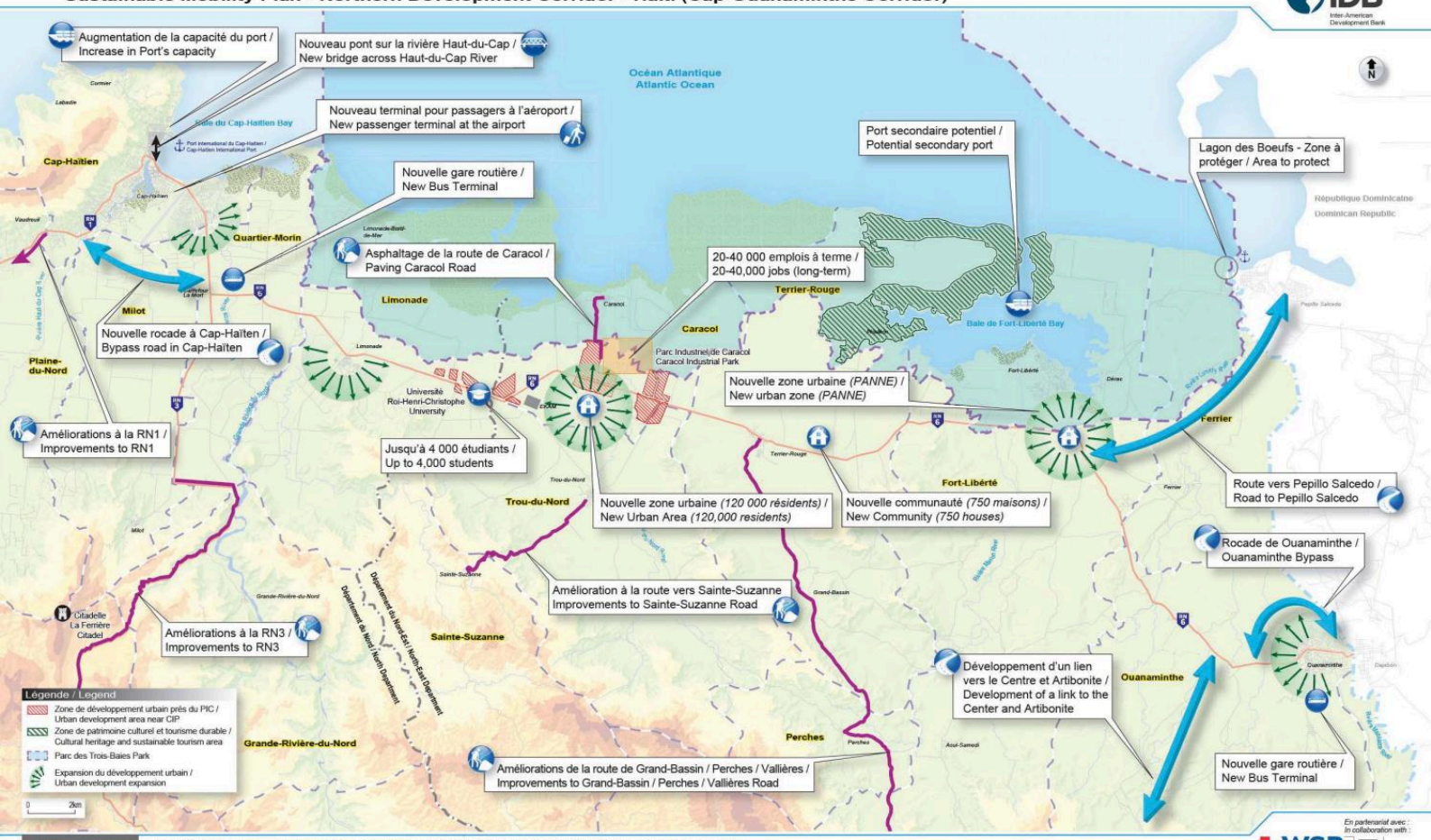


Figure 3.33 **Projets de développement potentiels et planifiés / Planned and Potential Development Projects**

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En partenariat avec : / In collaboration with : WSP IBI DAA

3.7.3 POPULATION AND EMPLOYMENT PROJECTIONS

Population projections for urban centers were undertaken to develop the AIA and PANNE Master Plans in 2012. These were refined in the Urban Growth Study. Both low and high growth scenarios are available. Population projections for 2040 are available in table 3.6 on the next page. The growth estimates assume a low institutional ability to control and direct urban development. The high growth scenario assumes that most planned development projects will be implemented (PIC, institution reform, development of the transportation system, etc.).

The region's urban population would increase by 350,000 (+50%) to 700,000 (+110%) in the low and high growth scenarios, respectively. The communes of Cap-Haïtien, Limonade, Trou-du-Nord, Fort-Liberté and Ouanaminthe would see the highest population growth from 2012 population estimates:

- → +70,000 to +160,000 in Cap-Haïtien;
- → +39,000 to +95,000 in Quartier Petite-Anse as Cap-Haïtien expands towards the south and east;
- → +54,000 to +83,000 in Limonade;
- → +32,000 to +56,000 in Trou-du-Nord;
- → +32,000 to +54,000 in Fort-Liberté;
- → +87,000 to +151,000 in Ouanaminthe;

If this scenario occurs, there would be three cities with more than 100,000 residents and two others would be very close. This is likely to increase travel significantly in the region, especially when coupled with higher employment, incomes and an older population.

It is expected that the rural population will continue to slowly diminish. High growth is expected in urban areas, in communes along the RN6 corridor from Cap-Haïtien to Ouanaminthe.

No employment projections are available for the Northern Corridor, especially since existing employment is unknown. There are only figures for the PIC which range from 20,000 (by 2020, on track) to 65,000 employees (longer timeframe) up from close to 8,000 currently and 2,500 when the data collection was undertaken in May and June 2014.

Table 3-6 Population Projections 2040

Commune	Total Population 2012 (IHSI Estimate)	Urban Population 2012 (IHSI Estimate)	Rural Population 2012 (IHSI Estimate)	Total Population 2040 (Low Growth ERM)	Total Population 2040 (High Growth ERM)	Urban Population 2040 (Low Growth ERM)	Urban Population 2040 (High Growth ERM)	Rural Population 2040 (ERM)
Cap-Haïtien	261,864	256,808	5,056	372,968	525,354	364,047	516,433	8,920
Quartier-Morin	26,109	4,125	21,984	47,656	54,662	16,737	23,743	30,919
Cap-Haïtien Subsector	**287,973**	**260,933**	**27,040**	**420,623**	**580,015**	**380,784**	**540,176**	**39,839**
Limonade	52,625	13,851	27,434	106,683	138,728	76,554	108,599	30,129
Caracol	7,362	2,979	4,383	12,257	15,190	7,007	9,940	5,250
Sainte-Suzanne	26,750	2,210	24,540	23,479	23,483	3,287	3,290	20,192
Terrier-Rouge	28,938	22,255	6,683	52,847	74,752	52,329	74,233	3,287
Trou-du-Nord	46,695	24,154	22,541	78,235	102,007	56,792	80,564	518
PIC Subsector	**162,370**	**70,473**	**91,897**	**273,501**	**354,159**	**195,969**	**276,627**	**77,533**
Capotille	18,496	1,185	17,311	28,953	28,953	2,206	2,206	26,748
Ferrier	13,973	8,165	5,808	28,216	36,252	19,198	27,234	9,018
Fort-Liberté	32,861	24,505	8,356	59,150	83,270	57,622	81,741	1,529
Mont-Organisé	20,015	4,354	15,661	30,183	30,183	8,073	8,073	22,110
Ouanaminthe	101,280	64,524	36,756	173,922	237,430	151,721	215,229	22,201
Perches	11,028	6,124	4,904	15,343	15,343	11,365	11,365	3,978
Fort-Liberté – Ouanaminthe Subsector	**197,653**	**108,857**	**88,796**	**335,768**	**431,433**	**250,185**	**345,849**	**85,583**
Study Area	**647,996**	**440,263**	**207,733**	**1,029,893**	**1,365,607**	**826,938**	**1,162,652**	
North Department	1,018,411	490,385	528,026	n.a.	n.a.	n.a.	n.a.	n.a.
North-East Department	375,966	173,745	202,221	n.a.	n.a.	n.a.	n.a.	n.a.
Haiti	10,413,211	5,154,940	5,258,271	14,848,000	14,848,000	9,935,000	9,935,000	4,913,000

Sources: IHSI (2003, 2009 and 2012), ERM (2014), PANNE-CIAT (2012) and AIA (2012).

Notes: Haiti population projections are from the IHSI. No departmental projections are available.

3.8 INITIAL STAKEHOLDER INTERVIEWS AND INSTITUTIONNAL CONSULTATION

Various stakeholders were consulted throughout this study to supplement the diagnostic of the actual situation as well as to gather information regarding projects and investments that can have an impact on travel patterns and demand (actual and future). The typical topics of conversation and information requests were:

- → What are the major strengths and weaknesses related to the transportation system?
- → What are their opinions regarding the future of the region and its transportation system?
- → What are the planned projects and investments?
- → Discussion about the stakeholder's role in the region.

These interviews were planned early in the mandate. The information, comments and opinions collected during these meetings will be used to enrich the reports, plans and proposals. A total of 19 stakeholder interviews and 1 institutional consultation were held between May 14th and June 10th, 2014. The following pages present a summary of key topics and elements of discussion for each of the stakeholders' interviews and institutional consultation. Detailed original minutes of meetings are presented in Appendix B.

Also, transportation users were given the opportunity to give their opinion about transportation as part of the origin-destination survey.

3.8.1 STAKEHOLDER CONSULTATION OUTLINE

The principal issues identified by the transportation consultation exercise relate to the poor condition of transport infrastructure, lack of coordinated land use planning and development control, and a lack of organized freight services.

The construction of the RN6 road facilitated rapid, but uncoordinated, growth along the corridor. The absence of formal land use planning has resulted in many different developments being constructed directly on the roadside which has in turn created lots of pedestrian activity on an important arterial road. Given that there are no sidewalks or bicycle paths, inevitable conflicts were created between freight vehicles, general traffic, public transport boarding and alighting activities, cyclists and pedestrians, and free roaming cattle. The concentration of such activities around the RN6 is symptomatic of the poor quality secondary roads and lack of basic infrastructure such as street lighting which would potentially facilitate the creation of more traditional residential centers away for arterial roads.

Whilst the RN6 is noted as being the only road which is in good condition, many stakeholder concerns regarding safety and traffic conditions originate from the fact that the design of the road is not suitable for the current behavior of its users. These problems are expected to be further exacerbated with the expansion of the PIC and other planned developments within the area. A summary of these is provided below for completeness:

- → Realization of the Trois-Baies Park (Fort-Liberté, Caracol and Limonade) has been announced by the government. UTE to launch a study for the realization of a development on the northern periphery of the PIC (radius of about 5 km). This study will set out the land use zones and regulations for the development, and should be completed by 2016. The city of Caracol will be given more power to enforce this plan.
- → Port Expansion project to receive 2,000 to 2,500 containers per month in 25 years.
- → A rice treatment plant is under construction (1st plant of its kind in the plain).
- → The upgrade and expansion of the port of Cap-Haïtien.

- → The airport is currently undergoing an expansion to accommodate a new departure hall with 200 additional seats). Works are underway but are still not completed (December 2015). A new terminal building is also expected in the coming years.

The fragile socio-economic conditions within Haiti were also noted by many stakeholders during the consultations. With the exception from the PIC, which enjoys comparatively good transport links within its walls, transport infrastructure of economically important industries such as agriculture, natural resources and tourism are lacking. In particular secondary roads are noted to be in poor condition and are prone to flooding and do not provide sufficient access to market for farmers. Likewise public transport facilities for tourists are insufficient both in terms of safety and reliability, which in turn creates a negative image for tourists.

The consultation process identified a varied array of potential solutions and measures that could be implemented to resolve some of the existing transportation issues. These are noted in full within the consultation table with the key points being summarized below:

- → Empowerment of local municipalities to improve land use planning to ensure that there is greater anticipation and control of development along new roads. Regulating permissions for tap-tap stops on arterial route would also improve traffic flows and create extra width.
- → Revitalize centers in order to create an active and attractive place which will help reinforce its function as an exchange and liveable area. Add street lighting to main squares, and create incentives for the establishment of businesses.
- → Improve key secondary roads in rural areas – all weather roads required to remove problems with ford flooding etc.
- → Modernization of transportation equipment (vehicles and infrastructure) and regulation/enforcement of vehicles and drivers, for example through the implementation of safety standards regular assessments.
- → Implementation of bicycle paths on the RN6 and provision of bicycles for employees of the PIC.
- → Restrict free-roaming cattle access to RN6.
- → Improve management of motorcycles and moto-taxis (including enforcement of limit of 1 passenger on moto-taxis).
- → Provide access to credit for freight companies and public transport service providers, with the aim of making freight services more reliable.
- → Consideration of protection of mangroves and other sensitive areas, when planning new infrastructure due to their importance to the regional economy.

3.8.2 TRANSPORTATION USER CONSULTATION

As part of the Origin-Destination Survey (see methodology in section 3.3.1), many comments were received on transportation in the region (sample size (n) of 5,319 validated questionnaires entered).

In particular, question 9 of the OD survey asked user “What problems do you experience with the mode of transportation you currently use?”. Multiple choices such as costs (vehicle, gas, transport service), comfort, road conditions, infrastructures, safety, etc. were available but, most importantly, the “other” answer was the most popular among the choice. Table 3.11 presents the

overall breakdown of problems users identified by mode of transportation used. The following general findings are:

- → The most popular answer was related to road conditions for all types of modes used except for walking and cycling;
- → Pedestrians and cyclists feel that the most problematic issue is the lack of infrastructure;
- → The second most reported problem was the concern of security;
- → Cost of gasoline and travel time came in closely at 3rd and 4th positions.

Table 3-7 OD survey results: Summary of transportation problems identified by mode of transportation

Problems	Type of Vehicle											General Total
	Car	Bus	Truck	Tractor-Trailer	Moto	Moto-taxi	Pedestrian	Tap-tap	Bike	Other, precise	(Empty)	
Comfort		1			2	65		6			2	**76**
Vehicle	10		5	1	10	1		25		2	3	**57**
Cost of gasoline	98	2	14	3	33	9	2	27	1	1	7	**197**
Costs		1			1	74	1	9			3	**89**
Roads conditions	152	26	51	7	78	209	54	184	43	6	11	**821**
Poor choice of destination			1		1	7						**9**
Service Frequency	1					60	7	20			2	**90**
Lack of infrastructure (sidewalks, track, etc.)		1	1		1		73	7	66	3	2	**154**
Security	80	16	30	2	35	76	13	78	33	2	4	**369**
Parking	42	4	13	1	2		2	15			1	**80**
Long time of travel		1	1		5	38	37	4	34	3	1	**124**
Other	*215*	*117*	*61*	*11*	*128*	*184*	*107*	*391*	*63*	*15*	*23*	***1315***
No object (question not asked)	1259	601	958	161	761	1418	883	2324	477	275	416	**9533**
No Answer	420	268	388	26	248	565	333	1160	158	62	79	**3707**
General Total	**2277**	**1038**	**1523**	**212**	**1305**	**2706**	**1512**	**4250**	**875**	**369**	**554**	**16621**
Number of users	713	340	488	68	422	838	490	1388	267	121		5135
Number of respondents	293	72	100	42	174	273	157	228	109	59		1507

Although out of the multiple choices offered for this question of the survey, the main problems identified could clearly be identified, the "other" choice was the most popular answer. This can be explained by the choice of words used by the user that were different from the choices given and entered separately by the surveyor. When examining the most popular "other" answers, it can clearly be observed that they correspond to the categories identified above. Figure 3.34 below shows a breakdown by size of words (word clouds) for the most popular answers in the "other" category of problems identified. Other problems mostly relate to either road conditions (problem, route, roadway, too narrow, bad, etc.) or safety issues (free range, animals, too many accidents, etc.).

Figure 3.34 Word cloud of transportation problems identified in the "other" category by surveyed transportation users



3.9 KEY FINDINGS OF CURRENT AND PROJECTED CONDITIONS

This section is presented in the form of the current conditions indicators and a strength, weakness, opportunity and threat analysis.

3.9.1 TRANSPORTATION INDICATORS – CURRENT CONDITIONS

This section presents a number of key indicators pertaining to transport in the study area. This evaluation is based on the results of the analysis of current conditions, available literature and data collection presented in the previous sections of this chapter. The list and the evaluators are based on the IDB's Methodological Guide for the Indicators of the ESCI (2013). The evaluators have three categories: green (no problem), yellow (problem, but not critical) and red (critical issue) based on the ESCI's stoplight classification criteria. It should be noted that these were developed for cities and the current mandate comprises large rural areas.

These indicators are shown by category (economic, environmental, land-use and transport/mobility) and reveal a number of challenges:

- → A relatively weak economy with low incomes and a low GDP per capita;
- → Relatively low vehicle emissions, but few environmental controls;
- → Few urban planning tools are available and enforced. On the bright side, urban areas have a good urban density, although the quality of housing is deficient;
- → A high transit and active transportation modal, even though there is little transportation infrastructure. The little transport infrastructure available is skewed towards cars.

→ An unaffordable transit system, even for travelling within an urban area.

3.9.1.1 ECONOMIC INDICATORS

As mentioned in section 3.7.1, little detailed economic data is available for the region. For this reason, national level data was used in the assessment. Haiti has a number of economic challenges including a low GDP per capita, high inequality and high unemployment. This reduces the capacity of the local population to pay for transportation services (either directly through fares or indirectly through taxes and fees).

Table 3-8 Economic Indicators – Current Conditions

Category	Indicator Definition	Indicator Value	Evaluator
Economy	Strength of Economy – Average GDP per person in Haiti (USD, 2013) Source: WEO, IMF	1,300[H]	🔴
	Unemployment rate – Haiti (IHSI, 2007)	17 to 41%	🔴
	Informal employment as a percentage of total employment	57%[H]	🔴
Transparency / Management	Transparency International Corruption Perception Index	19 (161st of 175)[H]	🔴

Note: the evaluators are based on the IDB's Indicators for the ESCI, except for indicators marked with a "1". The evaluation is done using stoplight criteria (green, yellow and red). Green indicates there is no major problem, amber a problem that should be addressed and red is a critical issue. Indicators marked with an "H" are national level data where regional or local figures were not available.

3.9.1.2 ENVIRONMENTAL INDICATORS

Estimated greenhouse gas emissions related to transportation are quite low due to little long-distance travel and little use of private vehicle modes. That said, few environmental regulations have been implemented or are enforced.

Table 3-9 Environmental Indicators – Current Conditions

Category	Indicator Definition	Indicator Value	Evaluator
Environment	Air Quality Control – Existence, monitoring and enforcement of air quality	Regulations not effective and not enforced	🔴
	Transport GHG emissions per capita (annual kg CO2 per capita) – for regional travel	53	🟢
	Noise – Existence of regulatory mechanisms to reduce noise pollution	Regulations not effective and not enforced	🔴

Note: the evaluators are based on the IDB's Indicators for the ESCI, except for indicators marked with a "1". The evaluation is done using stoplight criteria (green, yellow and red). Green indicates there is no major problem, amber a problem that should be addressed and red is a critical issue. Indicators marked with an "H" are national level data where regional or local figures were not available.

3.9.1.3 LAND-USE, PLANNING AND ZONING INDICATORS

Urban areas in the region are very dense and can support transit services and numerous local services. On the other hand, there is a general lack of enforced urban plans or zoning regulations. There is little ability to direct urban development in desirable areas except through the provision of positive measures such as housing, transport and electricity. All communes have informally settled areas which have poorly developed street grids that increase travel distances and decrease the effectiveness, if not render impossible, the delivery of public services (sanitation, transport, local bus/tap-tap, water, sewers, etc.).

Table 3-10 Land-Use, Planning and Zoning Indicators – Current Conditions

Category	Indicator Definition	Indicator Value	Evaluator
Land Use, Planning and Zoning	Density (Net) urban population density (residents/km²) for cities of the study area (Source: IHSI, 2012)	14,327	🟢
	Land Use Planning – Existence and active implementation of a land use plan	The cities do not have Master Plans	🔴
	Up to-date, legally binding Master Plan	The cities do not have Master Plans	🔴
	Urban Inequality – Poverty – Percentage of the population below the poverty line	No formal measure available, empirically a high percentage	🔴
	Urban Inequality – Poverty – Percentage of housing located in informal settlements	No formal measure available, empirically a high percentage	🔴

Note: the evaluators are based on the IDB's Indicators for the ESCI, except for indicators marked with a "1". The evaluation is done using stoplight criteria (green, yellow and red). Green indicates there is no major problem, amber a problem that should be addressed and red is a critical issue. Indicators marked with an "H" are national level data where regional or local figures were not available.

3.9.1.4 TRANSPORTATION AND MOBILITY INDICATORS

The following findings can be made concerning transportation and mobility based on the indicators in the table below:

- → The road transport network is underdeveloped, and most of it is difficult to use. It also favours private transportation since there is very little infrastructure for pedestrians, no infrastructure for cyclists and no infrastructure dedicated to collective transportation even though these modes represent the vast majority of users.
- → There is little information available on transport safety, although empirically accident rates are likely high.

- → There is a general lack of capabilities for transportation planning and management in the region.
- → Although travel times and distances are relatively short, tap-tap and bus fares are very high relative to incomes in the region. Return-fare on local transit would represent close to 30 % of a lower-quintile household's daily income.

Table 3-11 Mobility and Transportation Indicators – Current Conditions

Category	Indicator Definition	Indicator Value	Evaluator
Mobility / Transportation	Balanced transportation infrastructure – Kilometers of roads per 100,000 population	197 (including many not passable)	🔴
	Balanced transportation infrastructure – Kilometers of roads dedicated to transit per 100,000 population	0	🔴
	Balanced transportation infrastructure – Kilometers of bicycle path per 100,000 population	0	🔴
	Balanced transportation infrastructure – Kilometers of sidewalks and walking paths per 100,000 population	14.8	🔴
	Public transport and active transportation – Modal Share	>70%	🟢
	Clean Transportation – Average age of public transport fleet (2004-2005)	>12[H]	🔴
	Safe Transportation – Transportation fatalities per 1,000 population (Estimate)	N.A.	⚫
	Average travel speed on primary thoroughfares during peak hours (km/h)	29	🟡
	Number of automobiles per capita (Haiti)	N.A.	⚫
	Planned and managed transportation – Transportation planning and management system	Existing OD survey (this mandate)	🟡
	Affordability of travel (2 trips per day x Average fare) / Income of bottom quintile (Assumed at 90 HTG per day)	30% (inside Cap-Haïtien) to148% (regional travel)	🔴
	Average travel time – PM peak hour – All modes[1]	>45	🟡
	Average travel distance (km) – PM peak hour – All modes[1]	8.7	🟢
	Average travel distance (km) – PM peak hour – Public transit[1]	8.3	🟢

Category	Indicator Definition	Indicator Value	Evaluator
	Average travel distance (km) – PM peak hour – Private vehicles[1]	11.2	

Note: the evaluators are based on the IDB's Indicators for the ESCI, except for indicators marked with a "1". The evaluation is done using stoplight criteria (green, yellow and red). Green indicates there is no major problem, amber a problem that should be addressed and red is a critical issue. Indicators marked with an "H" are national level data where regional or local figures were not available.

3.9.2 ANALYSIS OF STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS

3.9.2.1 STRENGTHS

- A high transit and active transportation modal share, despite a drastically underdeveloped transportation system.
- The region has good connections with the Dominican Republic, access to a port in Cap-Haïtien and is served by an international airport.
- New major industrial investments in Caracol and in Ouanaminthe are providing employment to the region's residents.
- The RN6 is in good condition and allows better travel conditions between the region's larger cities and towns. Most segments of the RN6 have a large residual vehicular capacity.
- Travel conditions on intercity buses are improving after the purchase of new buses and minibuses.
- The airport of Cap-Haïtien has a high capacity, which is largely unused.

3.9.2.2 WEAKNESSES

- The transportation system is largely undeveloped and is heavily skewed towards private vehicles, despite high transit and active transportation modal shares.
- Little institutional capabilities to develop, maintain, operate and enforce the transportation system.
- Existing institutions are not properly enforcing existing regulations, whether it is land-use, vehicle emissions, access management, vehicle safety, traffic codes and others. This lack of enforcement further encourages undesirable behaviors.
- There are no urban plans, master plans or transportation plans for the study area's communes. Little capacities exist at the local level in terms of transportation and urban planning.
- Few alternative routes exist apart from major roads. Many areas can be isolated after storms and this limits accessibility and emergency interventions.
- Some important trip generators are located far away from existing urban areas which require workers and students to travel longer distances.

- → Current road design on major roads is not appropriate and unsafe for all road users, especially in urban areas. Pedestrians and cyclists are particularly at risk, compounded by the lack of active transportation infrastructure.
- → Nighttime free ranging of livestock and theft discourages travel after dark and therefore concentrates most travel, especially transportation of goods, during daytime when traffic conditions are at their worst thus increasing travel times.
- → The centers of Cap-Haïtien and Ouanaminthe are often congested and there are no alternative routes for through traffic. Certain segments in the center of these two cities are at capacity.
- → Transit needs to be more organized and many vehicles are overcrowded, unsafe and uncomfortable. No scheduled departures are available. There are no organized goods transport companies.
- → Many roads are in very poor condition and are vulnerable to flooding, which can leave communities isolated after storms. Travel to isolated communities is slow.
- → Although there are few motorized vehicles relative to the region's population, the existing vehicle pool is older and is more polluting than later models.
- → There is little accessibility to transport services in isolated areas south of the RN6.
- → Travel by mass transit and active transport is significantly slower than by private vehicle, motorcycle or moto-taxi thus making it less competitive in the event the economy of the region would improve and the population could afford turning to private modes.
- → Transit fares (tap-tap and bus) are high relative to the population's income.
- → Most surveyed users were not interested in walking, cycling or in tap-taps, likely due to the lack of infrastructure, comfort and safety.

3.9.2.3 OPPORTUNITIES

Numerous improvements could be made to the region's transportation infrastructure and services, but these opportunities are mostly aimed at identifying on-transport elements that could have an impact on travel in the region.

- → The region is expected to grow at a fast rate, although it is a challenge to manage this growth, most future residents will live in areas that have not yet built or densified existing areas. Development patterns for these areas, including connected street grids, will shape future travel in the region.
- → Increased wages will allow more residents to transition from day to day living and be able to better plan their own lives and make long-term decisions (e.g. housing location to minimize transport costs).
- → The region has significant development potential. The development of transportation infrastructure and services could encourage further investment in agriculture, in natural resources, tourism and industry and further improve living conditions.

- Significant investments in industry, tourism, agriculture and natural resources could in turn be used as a lever to induce change in transportation (e.g. minimal standards for vehicles, etc.).
- Most residents in the study area live in areas that have a topography that is well adapted for walking and cycling, although the infrastructure is lacking.
- Planned improvements to the RN1 and RN3 will better connect the study area to the rest of the country and greatly reduce travel times.

3.9.2.4 THREATS

- The region will see considerable growth over the coming 25 years. According to some scenarios, the region's population could more than double. The overall population could be somewhere between 1.0 to 1.4 million residents, up from 650,000 by 2040. Managing this growth and providing transportation services will be a considerable challenge to keep up with this increasing demand.
- Although improved wages will bring noticeable improvements in residents' quality of lives, this would likely increase motor vehicle ownership rates (currently there are approximately 35 vehicles per 1,000 residents in Haiti), motorized travel, congestion and pollution. As a comparison, in 2009 and not including two-wheelers, the Dominican Republic had 132 motor vehicles per 1,000 capita in 2009, Guatemala 66, Jamaica 185 and the United States 803 (World Bank, 2013). Haiti also benefits from subsidized oil prices which could further encourage motorization. Nevertheless, many countries at comparable development levels can have drastically different motorized travel rates (Ecola et al., 2014).
- Further motorization rates would also increase the number of accidents, injuries and deaths if no extensive interventions are implemented to improve road safety. Increased motorization could also be an important threat to active transportation as motorized vehicle volumes further increase.
- Important population increases will require significant improvements to the region's transportation infrastructure.
- The development of transport networks reduces operational costs for economically productive activities, but also does so for less desirable activities. The development of transport in certain areas could lead to cutting down mangroves along the coast and further deforestation in mountainous zones if not properly controlled.
- The development of the transport network could encourage many residents to locate further away than their current workplace, school or business, this would increase the total distance travelled increasing emissions and requiring additional capacity on the transport network.
- Improvements to connections with the Dominican Republic and harmonization of regulation could have some negative impacts on the area's economy if the business sector, including the transportation sector, is not well prepared for this type of change and increased competition.

- The centers of Cap-Haïtien and Ouanaminthe could be further congested with increased travel because there is limited capacity and high demand for travel in these corridors. These areas are also critical for goods transportation coming in and out of the region.
- The region's population will increase further. The lack of land-use planning and regulations could further accentuate some existing linear development patterns and increase the number of residents in close proximity to major roads. The lack of well-planned and regulated development of residents and services in close proximity would also lead to illegal squatting and the creation of slums (e.g. Cité Soleil neighbourhood in Port-au-Prince).
- The construction of new major trip generators isolated from transportation infrastructure and existing urban areas.
- The area is prone to natural hazards (flooding, hurricanes and seismic activity) and the transportation system is in dire need to be adapted to this reality.

4 VISION, GOALS, OBJECTIVES AND CONSTRAINTS

This chapter of the Plan establishes the vision and goals that will be used to develop the proposed measures. It is critical that the vision and goals be clearly established in order to orient the recommendations of this Plan. The vision, goals, objectives and constraints are elaborated from the diagnosis presented in the two previous chapters.

4.1 VISION AND PRINCIPLES FOR TRANSPORT IN THE NORTHERN CORRIDOR

As presented in the diagnosis, the regional transportation system should help to generate economic prosperity, reduce inequalities and improve living conditions through ensuring the movement of people and goods with surrounding areas and within the region. Safe and efficient travel conditions should be offered for all modes of travel, whether by foot, by bike, by transit or by private vehicle. The Sustainable Mobility Plan aims to direct the development of the region's transportation infrastructure away from just road transport, but also include walking, cycling and transit as integral to the functioning of the transportation system.

The fast growth of the region, especially with the addition of Caracol Industrial Park, compounds the need for action. The development of the transportation system should help foster economic growth in the region through reducing transport costs and providing better access to jobs, employees and services.

4.2 GOALS AND OBJECTIVES

In order to alleviate many problems and difficulties raised in the diagnosis, the Sustainable Mobility Plan has the following goals (not in any particular order of importance or preference):

4.2.1 TRANSPORTATION MODES – QUALITY OF SERVICE

- → Provide safe and comfortable infrastructure for pedestrians and cyclists where there is high demand (within 2 km of built areas) and where other vehicles travel at high speeds (National Roads).
- → Ensure a level of service of D[8] or better for all transport modes by 2040, except where there are constraints. Where there is limited room to expand capacity, active modes and transit will be favored (author's note: Level of Service D or better could lead to more expensive interventions than if we accept a lower standard such as E).
- → Provide well-located and efficiently planned transit stations (buses, tap-taps, moto taxis) in all towns and cities.

[8] Transportation related levels of service (LOS) are based on average travel delays (time lost compared to free flow conditions) or density (number of vehicles per lane per fixed length (kilometer) at a fixed time (peak). A LOS of D is considered acceptable by users. As for a comparison, LOS A represents free flow conditions, thus with no delays as for LOS F represents conditions above the capacity of the infrastructure and major delays or density. For example, according to North American standards, at an unsignalized (stop controlled) intersection, an LOS of F represents an average delay at or above 50 seconds of waiting time (time between the first stop approaching an intersection and the time when crossing it). It is of usual practice to design infrastructures for a LOS of D or better at the planning stage for future conditions.

- All vehicles should be safe, in good running condition and comfortable.

4.2.2 INFRASTRUCTURE QUALITY

- Ensure future investments are appropriate to all modes of travel, especially walking, cycling and mass transit.
- Direct transportation investments away from environmentally, ecologically, agricultural and culturally sensitive areas and to hinder the development of sensitive areas, specifically: the Parc des Trois-Baies and the mangrove along the coast, Labadie, the Citadel/Sans-Souci in Milot are among these sensitive areas.
- Improve and provide proper safety for all transportation modes through design, regulation and enforcement.
- Infrastructure should be built to last and should be passable in most weather conditions.
- Infrastructure should be properly maintained. Specialized maintenance techniques should be avoided to ensure that these are used over time.
- Reduce isolation in rural areas by connecting all cities, towns and villages with roads passable in all-weather conditions. All towns and cities should have at least two all-weather links to reduce isolation during floods and ensure disaster response capabilities, if ever necessary.
- Newly developed urban areas should have proper street grids that facilitate walking and ensure proper transit services can be provided. Existing areas should also be adapted, where possible.
- Measures should be adapted to the Haitian context since sufficient local buy-in (local population, private transport actors and all levels of government) is required for the success of any measure.

4.2.3 INSTITUTIONAL CAPACITY

- Reinforce governmental and non-governmental institutional capabilities to develop, maintain and operate the transportation system.
- Enforcement capabilities should be reinforced to increase transportation safety and traffic fluidity.
- Create local planning capabilities to develop and enforce local development plans and regulations.
- Ensure the development of the local construction and transportation sectors to develop, maintain and operate the system.

4.2.4 IMPROVING ACCESSIBILITY

- Ensure local transportation fares are affordable to households in the lowest income quintile. A local return fare should be no more than 10% of the lowest quintile's income (Note: this could be very difficult to achieve without subsidies since GPD levels are not expected to rise significantly and significant investment is required).

- → Reduce the need to travel long distances by providing affordable shops and services within walking distance of most residents.
- → Local services such as schools, shops and healthcare should be well-located in the center of towns, villages and cities. The walking route should not be hazardous by providing proper infrastructure: sidewalks and trails.
- → Develop transportation for active modes, walking and cycling, which have no marginal trip cost.
- → Improve the dignity of travelling by active modes and mass transit by reducing overcrowding, improving reliability and increasing comfort.

4.2.5 TRANSPORTATION SAFETY

- → Gradually increase and enforce vehicle safety standards.
- → Develop adequate enforcement capabilities.
- → Implement, improve and enforce driver licencing and education.
- → Reduce vehicular speeds, especially in urban areas.
- → Direct urban development and services away from high-speed travel corridors, where possible.
- → Ensure tap-taps and other transit vehicles have useable and safe areas to stop.

4.3 CONSTRAINTS

The development of the Plan takes into account the following regulatory, institutional, physical and economic constraints.

4.3.1 REGULATORY AND INSTITUTIONAL CONSTRAINTS

- → The success of the transportation plan is highly dependent on related and supporting policies (economic growth, institutional capabilities in all fields, development of social services, decentralization and other reforms).
- → Many organisations do not currently have sufficient capabilities to intervene.

4.3.2 PHYSICAL CONSTRAINTS

- → The topography of the area: the ocean, mountains, rivers, etc. limit interventions.
- → Many areas are already developed, even informal ones, and it is expensive to retrofit these sectors.
- → Major streets in some towns travel to historic areas where space is limited to intervene.

4.3.3 ECONOMIC CONSTRAINTS

- → Financial resources are limited to fund, maintain and operate transportation projects. Ideally, projects would eventually be self-sustaining. This is the case for the Haitian government, the local population and international organizations.

- Ensure the longevity and sustainability of investments in the region. Measures should be affordable and not require unusual maintenance that risks their abandonment.
- Importing parts or international expertise is expensive.
- The financial capacity of the local population is limited to pay transport fares.
- Many local residents live on a day-to-day basis and it is difficult for them to plan ahead to minimize their long-term costs.
- Economic projections do not increase real incomes very significantly over the coming decades in absolute terms. The economic realities of today, although improved, will not be extremely different from today.

5 FUTURE TRANSPORTATION DEMAND AND SCENARIOS

This chapter presents the development and the assessment of the regional transportation network for the next 5 to 25 years to come. The future transportation demand, combined with the objectives, goals and constraints presented in the previous chapter will culminate with a recommended transportation scenario that will be developed in the following chapter.

The assessment of the future transportation demand will be done through the results of the current conditions and the development of a regional transportation model (VISUM) which assessed three scenarios: 1) high population growth, 2) low population growth and 3) adjusted population growth. An analysis of the second series of stakeholder consultations is also presented. The results will present the impact of the growth transportation scenarios with minimal interventions and with transportation improvements for the transportation network in 2040.

5.1 GENERAL METHODOLOGY AND ASSUMPTIONS

The future travel demand was assessed using a regional transportation model that was developed with the VISUM software and calibrated and validated against the existing May-June 2014 conditions. Numerous factors can influence the region's mobility (demography, economic, land-use and transport). Many of these factors are interrelated and have effects on some of the other factors, which also have an influence on transport.

The different variables can have an influence on various aspect of mobility:

- → The number of trips per person (how often do people travel?);
- → The effects of technology (e.g. improved communications can decrease the need for travel).
- → The origins and destinations of these trips (where are people originating and where are they going?);
- → The mode of travel used (walk, bike, transit, car, etc.);
- → The time of travel (peak, off-peak, weekday, weekend, etc.);
- → The sequence of trips (trip chaining vs. a series of home-based trips);
- → The route choice.

Some of these factors that were captured from the travel origin-destination survey are assumed within the VISUM model and others are assumptions (e.g. land use, development levels and demography). The assessment of current conditions, the origin-destination survey and the counts were used to develop a model of the current PM peak hour. Additional details on the modelling are available in Appendix E.

5.1.1 GENERAL ASSUMPTIONS

In order to assess the projected situation in 5 to 25 years, the following general assumptions were made:

- → The number of people travelling is driven by demographic and employment growth in the region. Since these are unique to each scenario, population and employment is available in the following section.

- Economic development levels will continue to increase over time. The GDP per capita is expected to increase at an average rate of 2.5% to 3% per year. This assumes an improved Haitian economic performance than past performance (WEO, 2014). In turn, this should translate into increased wages for the region's workers and increased motorization (rate of vehicle ownership), but it should remain low compared to other countries in the Caribbean. Development of the transport network focused on active and mass transportation and supportive policies should help counteract this effect (UN-HABITAT, 2013 and Ecola et al., 2014). The assessment assumes that supportive infrastructure, land-use and economic policies are implemented.
- Additional people of working age are expected over the next 25 years (Haitian Statistics Institute or IHSI). The percentage of 15 to 64 year olds is expected to increase from 60% in 2010 to 67% in 2040. This is mostly due to a reduction in the proportion of children (0 to 14 years old). As such, trip generation rates per capita were increased accordingly based on the relationship between household size and trip generation rates in developed countries over the past few decades (FHWA, 2011).
- Future travel patterns will be similar for each of the zones in the study area.

5.1.2 LIMITATIONS OF THE METHODOLOGY

This methodology has some limitations which need to be understood to interpret the results:

- The assessment is dependent on underlying demographic, economic, land-use, travel behavior and development assumptions.
- The objective of the model is to give a macro-level assessment. Therefore, care should be used when interpreting results at a small scale, for example when developing the road network in a small urban area such as Trou-du-Nord or Limonade. Operational improvements might also be required due to local traffic conditions (e.g. turning lanes at an intersection, installation of traffic signal vs. stop sign, etc.).
- The location of links is conceptual and their exact location should be adjusted based on local constraints (urban development, environmental constraints, etc.).
- The behavior within cities, towns and small cities outside the RN6 corridor was not assessed since origin-destination surveys and counts were not undertaken in these areas. Also, the model only represents volumes linked with areas to the south-east of Cap-Haïtien since the center of the City was outside the scope of current data collection. Future work, outside the scope of this mandate, should incorporate this area into a model. The internal traffic captured from the existing traffic counts within cities, towns and small cities along the RN6 corridor was input as the base volumes in the model to consider its impact.
- It is difficult to assess the trip generation rates of communes south of the RN6 since few of these residents were captured during the origin-destination survey.
- Also, trips generated by an urban area or a new generator next to the RN6 are not modelled.
- Travel origin and destination patterns will likely change over time and will need to be monitored over time.

- → The model does not assess induced development due to development of the transportation network. The population projections were adjusted based on numerous factors, including transportation infrastructure (ERM, 2014).
- → This model is built to assess capacity and volumes. Other reasons beyond demand can be used to recommend the best course (accessibility, resiliency of the transport network, etc.).

5.2 DEVELOPMENT OF POPULATION SCENARIOS

The three following scenarios were assessed:

- **1-High Growth Scenario**: this corresponds to the high growth scenario in the population growth study. This corresponds to a total population increase of approximately 700,000 residents by 2040 (+140,000 by 2020) in the study area.
- **2-Low Growth Scenario**: this corresponds to the low growth scenario in the population growth study. This corresponds to a total population increase of approximately 350,000 residents by 2040 (+85,000 by 2020) in the study area.
- **3-Adjusted Travel-Demand Management Scenario**: This corresponds to the high growth scenario, except that a number of travel demand measures are implemented: reduction of the trip rate for the PIC (employees enter and exit over multiple hours instead of during a single hour). This was not done for the rest of the study area since generation rates per person are low. This scenario also assumes that a higher proportion of employees live in communities adjacent to the PIC such as Trou-du-Nord, Terrier-Rouge and Limonade. This assumes that these communities are less dependent on Cap-Haïtien, although it remains a very large urban center.

Population figures for all three scenarios are shown in table 5.1. In all three scenarios, the highest population growth is expected in Cap-Haïtien, Ouanaminthe and the communes surrounding the PIC. By 2040, all three scenarios assume that the Caracol Industrial Park (PIC) has 40,000 employees and the University of Limonade has 4,000 students. The rural population is also the same in all three scenarios and is expected to decrease. It is assumed that travel to areas external to the study area will increase by 3% per year at the same rate as expected GDP growth.

Table 5-1 Population and Employment Projections 2020 and 2040 by Commune for Three Scenarios

Commune	Total Population 2012 (IHSI Estimate)	Total Population 2020 (Scenario 1-High Growth)	Total Population 2020 (2-Low Growth)	Total Population 2040 (Scenario 1-High Growth)	Total Population 2040 (2-Low Growth)	Total Population 2040 (Scenario 3-Adjusted Growth)
Cap-Haïtien	261,864	322,060	292,009	525,354	372,968	525,354
Quartier-Morin	26,109	31,296	30,606	54,662	47,656	54,662
Cap-Haïtien Subsector	**287,973**	**353,356**	**322,615**	**580,015**	**420,623**	**580,015**
Limonade	52,625	65,997	62,839	138,728	106,683	138,728
Caracol	7,362	8,805	8,403	15,190	12,257	15,190
Sainte-Suzanne	26,750	30,625	30,427	23,483	23,479	23,483
Terrier-Rouge	28,938	36,498	33,498	74,752	52,847	74,752
Trou-du-Nord	46,695	56,474	53,218	102,007	78,235	102,007
PIC	3,000 emp.	20,000 emp.	20,000 emp.	40,000 emp.	40,000 emp.	*40,000 emp.**
University of Limonade	1,500 students	2,500 students	2,500 students	4,000 students	4,000 students	4,000 students
PIC Subsector	**162,370**	**198,400**	**188,385**	**354,159**	**273,501**	**354,159**
Capotille	18,496	20,325	20,325	28,953	28,953	28,953
Ferrier	13,973	16,884	15,783	36,252	28,216	36,252
Fort-Liberté	32,861	40,116	37,016	83,270	59,150	83,270
Mont-Organisé	20,015	21,836	21,836	30,183	30,183	30,183
Ouanaminthe	101,280	124,460	115,761	237,430	173,922	237,430
Perches	11,028	11,859	11,859	15,343	15,343	15,343
Fort-Liberté – Ouanaminthe Subsector	**197,653**	**235,480**	**22,581**	**431,433**	**335,768**	**431,433**
Study Area	**647,996**	**787,236**	**733,582**	**1,365,607**	**1,029,893**	**1,365,607**

Sources: IHSI (2003, 2009 and 2012), ERM (2014), PANNE-CIAT (2012) and AIA (2012).

*Note: *Lower trip generation rate used for the peak hour and adjustment of origins and destinations.*

5.3 EVALUATION OF TRANSPORTATION SCENARIOS

This section presents the impact of the transportation scenarios with minimal interventions and with transportation improvements for the transportation network in 2040. This assessment is used to evaluate local alternatives. Recommendations for the 2020 horizon are shown in the following section and are related to the 2040 recommendations.

5.3.1 IMPACT OF MINIMAL INTERVENTIONS OF ALL THREE SCENARIOS – 2040

All three scenarios were assessed to see the impact of a minimal intervention scenario. Only investments about to be implemented are included:

- → The reconstruction of the road between Caracol and the PIC's western entrance.
- → The widening of the RN3/RN6 in Cap-Haïtien between the airport and station Madeline.

- → The acquisition of new buses for the PIC's employee fleet.
- → The development of the Port of Cap-Haïtien serving the logistical needs of the PIC and the rest of the region.
- → The continued development of commercial flights at the Cap-Haïtien International Airport.

Private vehicle volumes and capacity in 2040 are shown in figures 5.1 to 5.3 for each of the three scenarios. Public transit passenger volumes are shown in figures 5.4 to 5.6. Detailed maps are available in Appendix E. Analysis results were also assessed and are included in table 5.2 and are inspired from the transportation and mobility indicators developed for current conditions.

5.3.1.1 FINDINGS OF MINIMAL INTERVENTION MODELLING – PRIVATE VEHICLES

In terms of capacity and volumes for private vehicles, this analysis allows us to expect that during the PM peak hour for 2040:

- → Roads leading into Cap-Haïtien will be at capacity between the RN6/RN3 intersection and the center of the city. Since this link will already have four lanes between the airport and station Madeline, it seems that additional links will also be required to better distribute demand.
- → The RN6 through the center of Ouanaminthe will be at capacity for all scenarios. Buildings in the center of Ouanaminthe are close to the road and space is insufficient to accommodate vehicles, pedestrians, cyclists and street-side vendors. Additional parallel streets could help distribute internal and market traffic.
- → The same can be said for the centers of Limonade, Quartier-Morin and Terrier-Rouge where the RN6 will be at capacity.
- → The PIC's western gate will be at capacity. An additional gate or additional lanes will be required except for scenario 3 where travel to the PIC is reduced during the peak hour.
- → High vehicular volumes along the RN6 will make it difficult and hazardous for pedestrians and cyclists to travel along and cross safely. This problem will be compounded in urban areas where there is a lot of activity and there are multiple lanes per direction. It is reasonable to expect that pedestrian-vehicle collisions will increase significantly if no safety measures are implemented.

5.3.1.2 FINDINGS OF MINIMAL INTERVENTION MODELLING – COLLECTIVE TRANSPORTATION

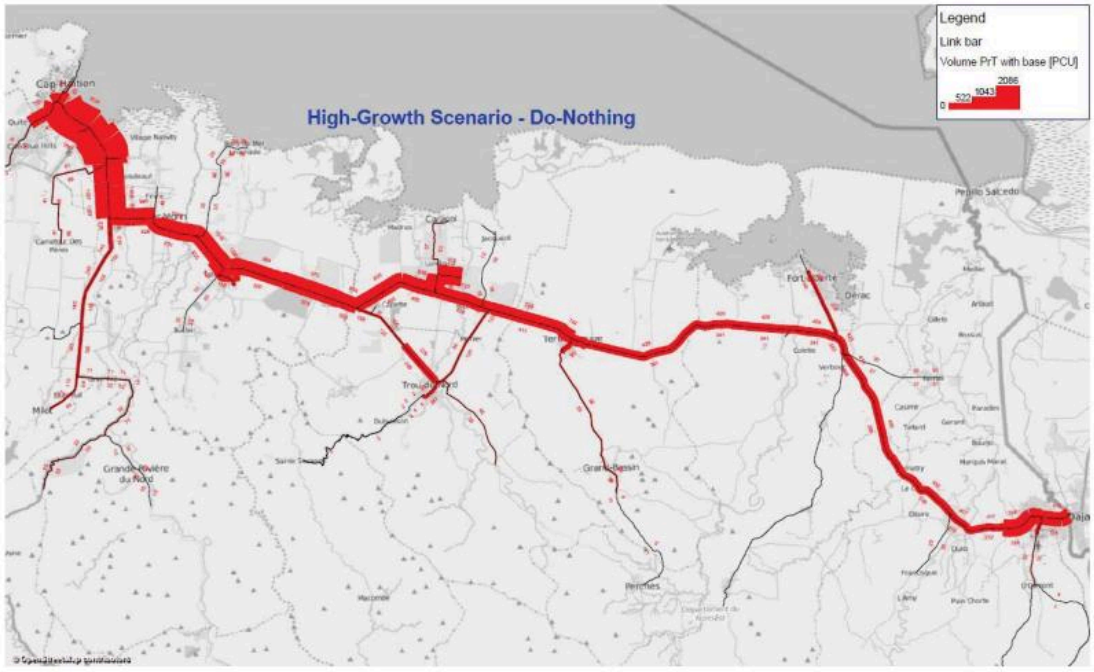
Concerning collective transit trips, during the peak hour in 2040:

- → The Caracol Industrial Park will generate thousands of collective transit and active transportation trips to other communes, especially to Limonade, Cap-Haïtien, Terrier-Rouge and Trou-du-Nord. This would require a very large fleet of transit vehicles.
- → The RN6 and the RN3 between the center of Cap-Haïtien and Terrier-Rouge would have very high transit passenger loads (5,000 to 10,000 passengers per hour in the peak direction). These loads are due to the combination of regional, local and PIC passengers. High capacity vehicles will be required along this corridor since between 350 and 700 tap-taps would be required to meet this demand and would significantly decrease capacity along the RN6. Transit priority measures will be required (especially between Limonade and the center of Cap-Haïtien).

→ East of Terrier-Rouge, transit demand will be lower with demand varying from 800 to 2,500 passengers per hour, but still enough to justify high capacity transit vehicles.

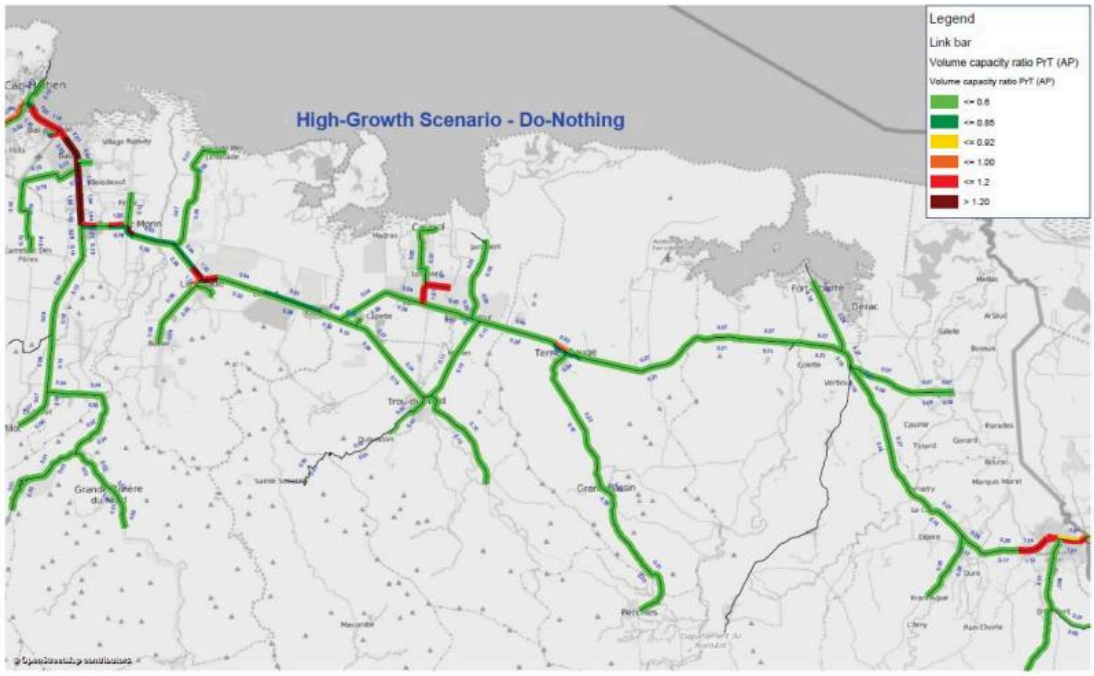
Figure 5.1 Scenario 1 – Forecast Motorized Vehicle Volumes and Volume to Capacity Ratios 2040 – Minimal Interventions

Motorized Vehicle Volumes (in PCU)



Note: Volumes west of the Airport do not include any traffic generated after this intersection.

Volume to Capacity Ratios



Note: Vehicle volumes are expressed in passenger car units (PCUs) instead of the total volume. A motorcycle is equivalent to 0.5 passenger cars and a truck/bus is equivalent to 3.

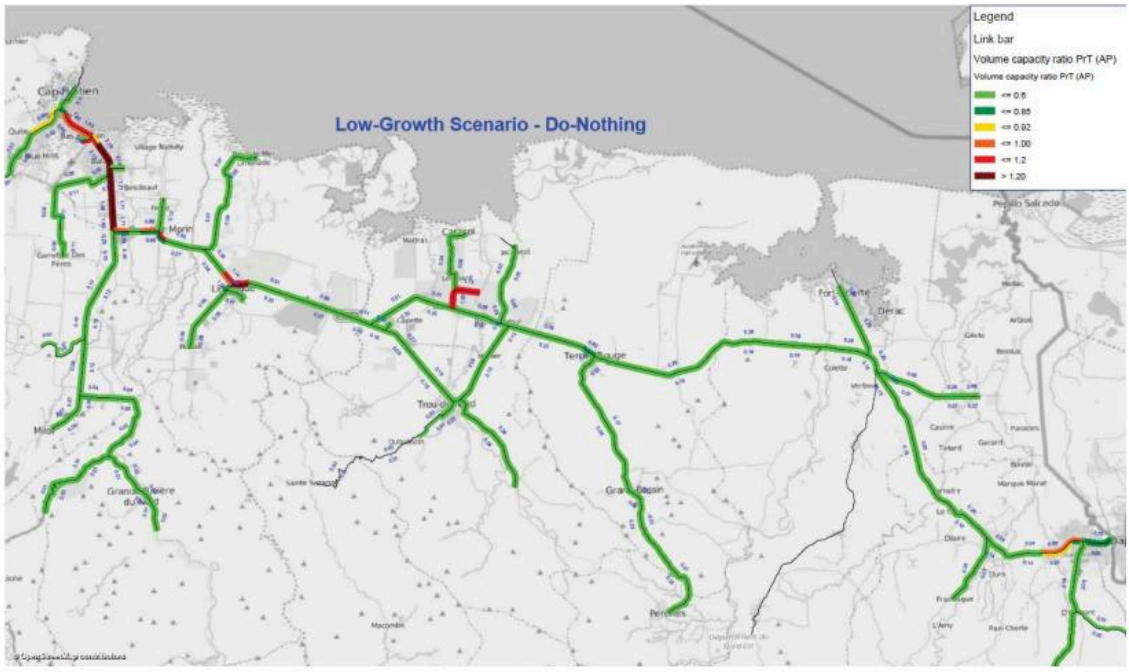
Figure 5.2 Scenario 2 – Forecast Motorized Vehicle Volumes and Volume to Capacity Ratios 2040 – Minimal Interventions

Motorized Vehicle Volumes (in PCU)



Note: Volumes west of the Airport do not include any traffic generated after this intersection.

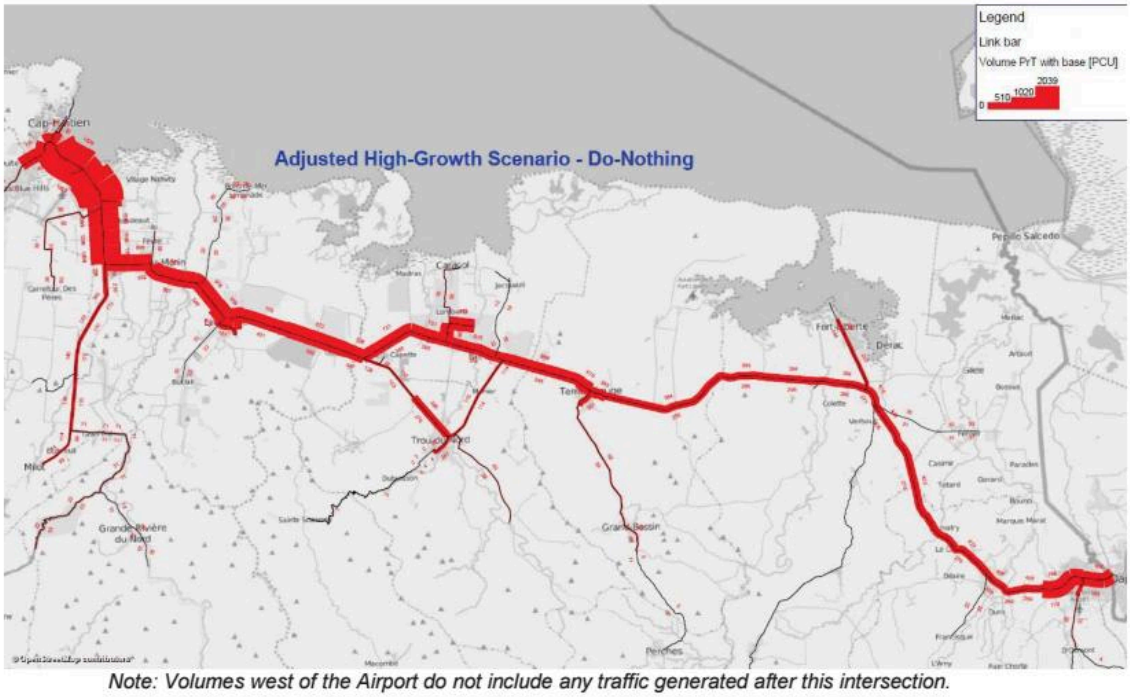
Volume to Capacity Ratios



Note: Vehicle volumes are expressed in passenger car units (PCUs) instead of the total volume. A motorcycle is equivalent to 0.5 passenger cars and a truck/bus is equivalent to 3.

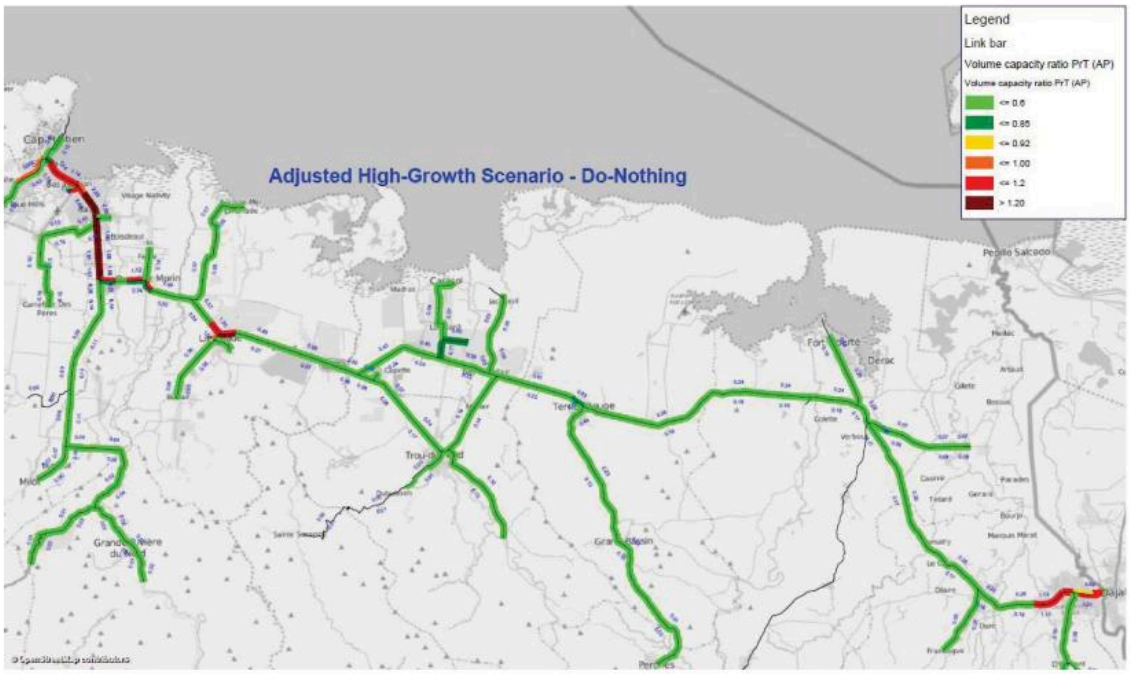
Figure 5.3 Scenario 3 – Forecast Motorized Vehicle Volumes and Volume to Capacity Ratios 2040 – Minimal Interventions

Motorized Vehicle Volumes (in PCU)



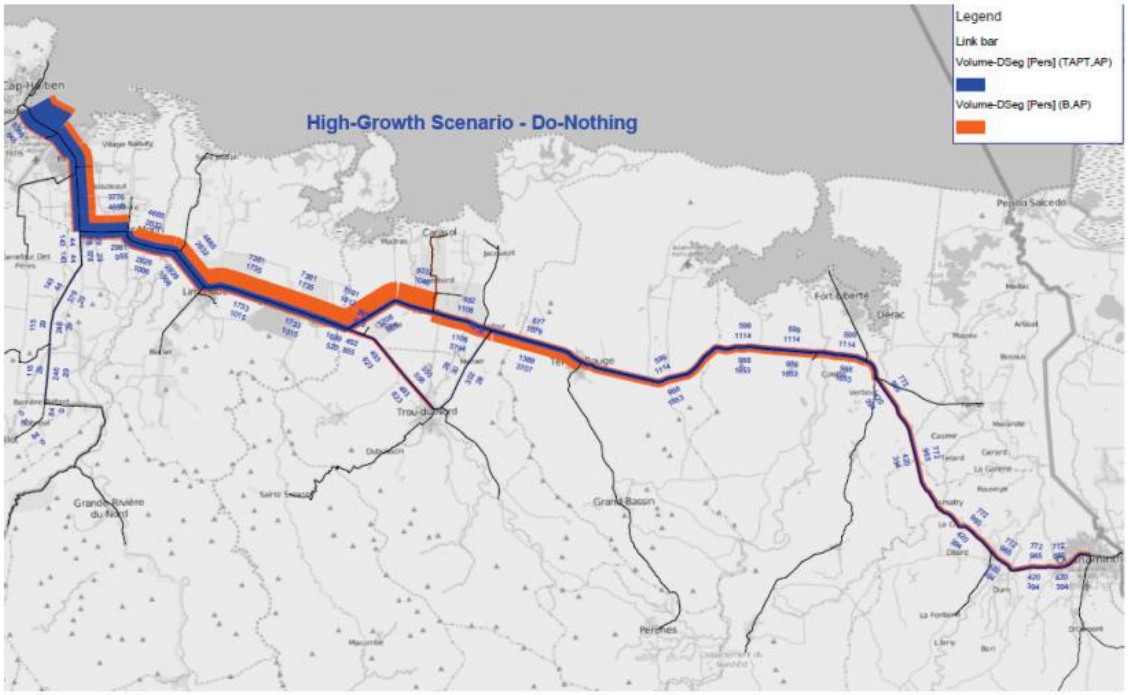
Note: Volumes west of the Airport do not include any traffic generated after this intersection.

Volume to Capacity Ratios



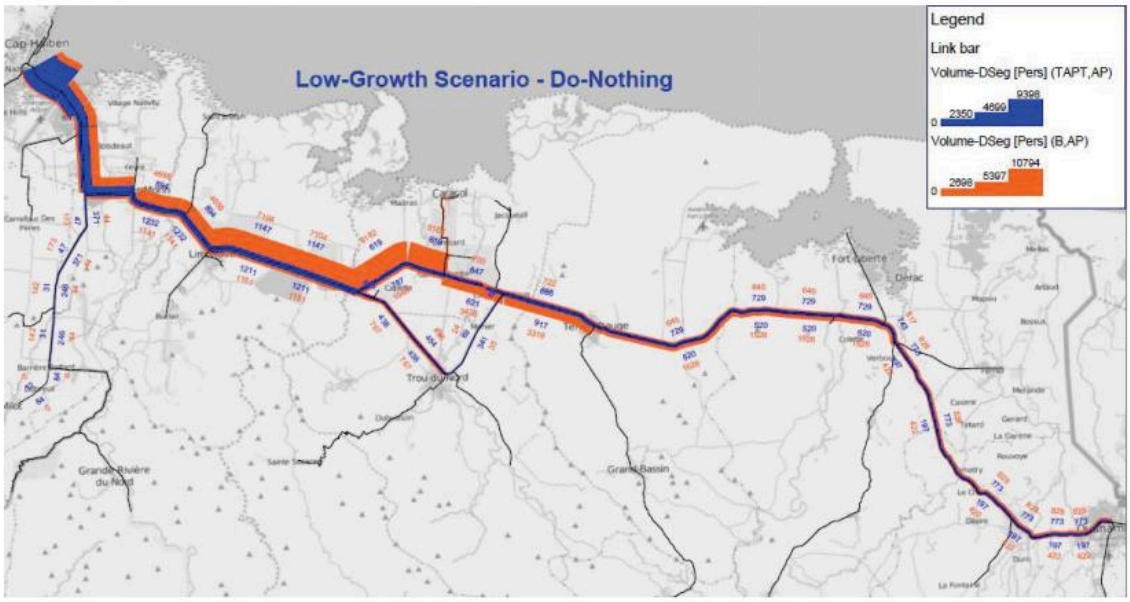
Note: Vehicle volumes are expressed in passenger car units (PCUs) instead of the total volume. A motorcycle is equivalent to 0.5 passenger cars and a truck/bus is equivalent to 3.

Figure 5.4 Scenario 1 – Public Transit Person Volumes 2040 – Minimal Interventions



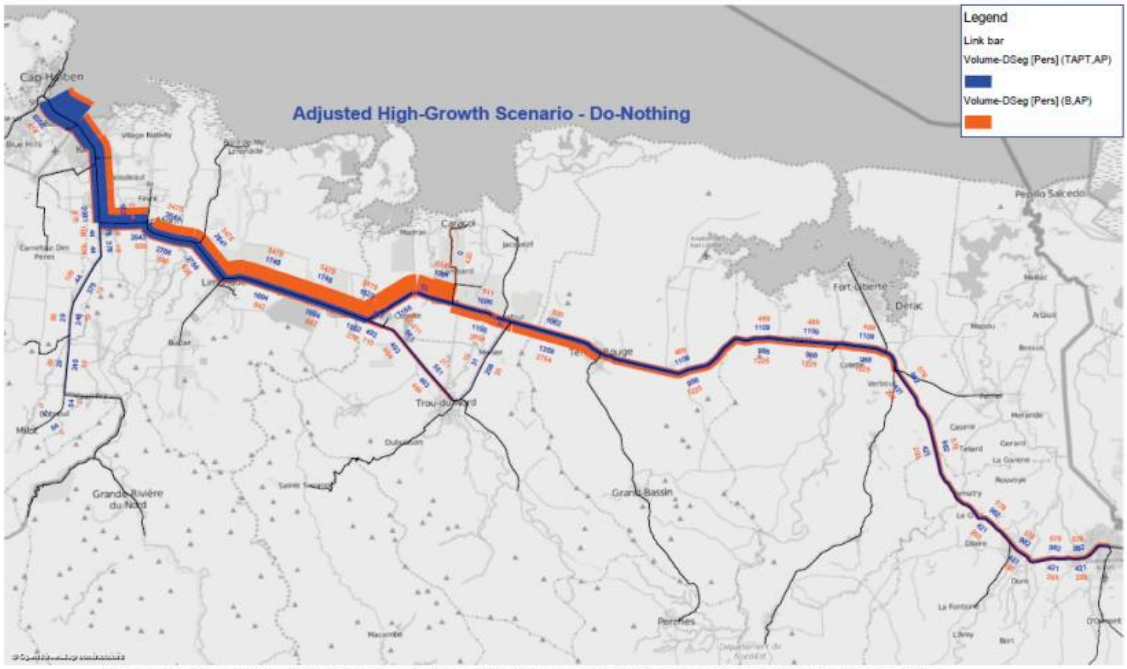
Note: Volumes west of the Airport do not include any travel generated after this intersection.

Figure 5.5 Scenario 2 – Public Transit Person Volumes 2040 – Minimal Interventions



Note: Volumes west of the Airport do not include any travel generated after this intersection.

Figure 5.6 Scenario 3 – Public Transit Person Volumes 2040 – Minimal Interventions



Note: Volumes west of the Airport do not include any travel generated after this intersection.

5.3.2 DEVELOPMENT OF LOCAL ALTERNATIVES TO ALLEVIATE CAPACITY ISSUES

Most roadway capacity issues are localized. The following presents a discussion on the identification of a preferred alternative to alleviate local capacity issues for road or transit capacity and is applied to the three population growth scenarios. These recommendations are used to assess the impact of the scenarios with interventions in the following section (5.3.3).

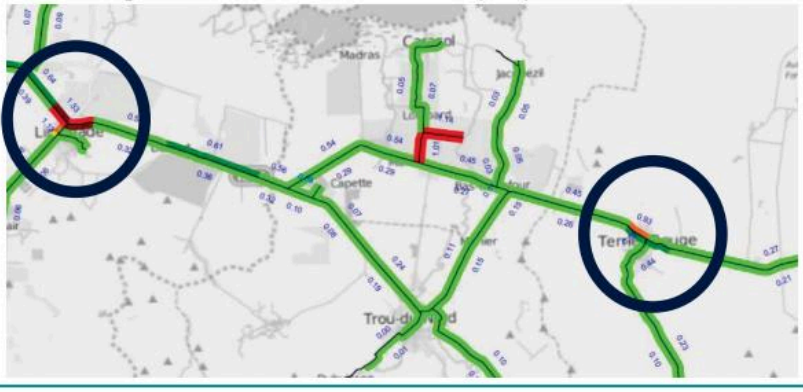
5.3.2.1 CAP-HAÏTIEN

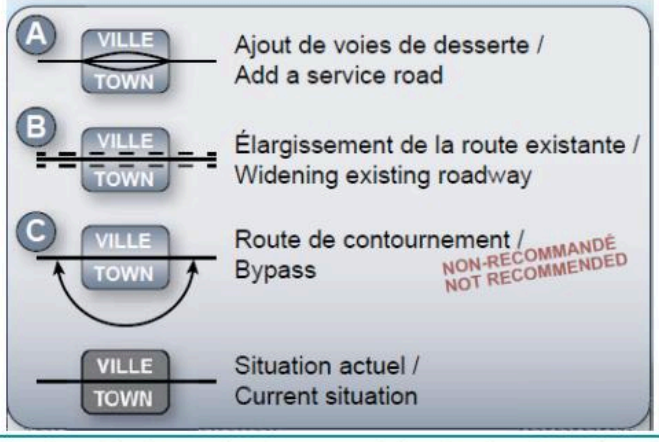
Topic	Discussion
Issue(s)	-General congestion due to lack of road and transit capacity entering Cap-Haïtien (concentration of demand) and very high transit passenger volumes on the RN6 towards the center of Cap-Haïtien. -The transport network converges towards the center of Cap-Haïtien -The center of Cap-Haïtien is the largest generator of trips in the region -The river and the airport are barriers to build alternative links to the RN3/RN6 
Possible solutions	-Widening of RN3/RN6 towards center with active transport infrastructure and a central median. There is little room to expand between 4 traffic lanes per direction, especially considering the high transit demand. An overly wide road would also provide an unfavorable urban environment (alternative roads from south of the airport are therefore preferable). -Bus reserved lanes or a BRT along RN6/RN3 to Station Madeline (very high transit demand) -A network of urban arterials to better distribute private vehicles and transit trips. This includes a road to the south of the airport, an area which is also likely to urbanize (therefore, should have active transport facilities when they open). The main function of this road is to provide another link between both sides of the City than for bypass traffic. A link closer to the center of Cap-Haïtien would be preferable but would be extremely cost prohibitive since it would require tunneling or the relocation of the airport. -Review configuration of traffic in center of Cap-Haïtien (i.e. one-way streets). This could help improve operations in the center but does not alleviate the bottleneck by itself. Note: the current mandate did not assess conditions past the airport since there was no data collection in the center of Cap-Haïtien or along the RN1.
Preferred solution(s)	All of the measures above will be required to increase capacity. No stand-alone measure is sufficient. The preferred alignments should be developed as part of a local urban plan.

5.3.2.2 OUANAMINTHE

Topic	Discussion
Issue(s)	-General congestion due to lack of road and transit capacity going through the center of Ouanaminthe, especially on market days. -The RN6 is very narrow and there is no room to widen. -There are no other efficient east-west urban roads. -As the city develops, additional major roads will be required to create a continuous grid. 
Possible solutions	1) Widening RN6 in the center of Ouanaminthe. There is little room to expand and many buildings would need to be demolished. 2) The development of a network of urban major streets would better distribute private vehicles and transit trips, serve expanded urban areas and provide alternative links.
Preferred solution(s)	The development of urban major streets to the north and south of Ouanaminthe is preferred to avoid major impacts on the center of the city. These would be built as urban roads because urban development will likely follow soon afterwards. Proper pedestrian and cycling infrastructure would be provided on opening day. The preferred alignments should be developed as part of a local urban plan.

5.3.2.3 RN6 IN LIMONADE AND TERRIER-ROUGE

Topic	Discussion
Issue(s)	-Lack of road and transit capacity going through the centers of Limonade and Terrier-Rouge. -The RN6 is very narrow and there is no room to widen and difficult to add sidewalks or bicycle facilities. -These segments are used as informal tap-tap stations. 

Topic	Discussion
Possible solutions	A) Widening RN6 to add local service roads on one or both sides of the road. This would likely require property acquisitions. B) Widening RN6 in the center of the town. This would likely require property acquisitions. C) Creating a bypass around the urban area. This has been done previously in other towns in Haiti with little success since the center of the city followed shortly. That said, these could be built as new urban roads, anticipating that the center of the city will be relocated, if the property impacts or costs of upgrading the RN6 are prohibitive. 
Preferred solution(s)	Each option has advantages and drawbacks. A preferred option and alignment should be developed as part of a local urban plan. A bypass (C) does not seem feasible.

5.3.3 IMPACT OF SCENARIOS WITH TRANSPORTATON INTERVENTIONS – 2040

Since the scenarios are driven around land-use and population, instead of the structure of the transportation network as is the usual practice, similar interventions are applied to the three scenarios. These were determined based on capacity issues of the minimal intervention scenario, the vision, goals and objectives of the Plan and previously proposed interventions.

5.3.3.1 TRANSPORTATION IMPROVEMENTS FOR ALL THREE SCENARIOS

The following interventions are part of each of the three scenarios (measures retained for the final scenario will be refined in the following chapter):

Land Use

The following assumptions are made in order to assess the scenarios:

- → All communes have developed, adopted and are implementing land-use plans and regulations to steer urban growth towards favorable areas.
- → Major trip generators are located close to the region's transportation network.

Active Transportation

The following assumptions are made in order to keep existing active modal shares:

- → Creation of walking paths within urban areas and along major roads between cities. Comfortable walking conditions are provided along all streets and roads.

- → Development of a regional cycling path network linking all urban areas and major destinations, including the PIC. A network of bicycle paths in the vicinity of the PIC is presented in Appendix H. Continuous and connected cycling networks are provided within urban areas (mesh grid width of 400 to 800 meters).
- → Safe crossings are provided at multiple locations along major roads near transit stops and urban areas. Sample traffic-calming measures are presented as part of Appendix H.

Public Transit

The following assumptions are made in order to increase the transit level of service:

- → The transit network is still centered along the RN6 since most towns and trip generators are located along this corridor. A number of transit stations are located along this corridor and are served by regional and local services. Local transit services serve urban areas and smaller communes and connect to one or more of the major transit stations along the RN6 corridor. A sample design for a transit station is presented in Appendix H for Limonade.
- → The quality and capacity of vehicles are improved to meet demand.
- → Because of the high demand for transit, transit priority measures are provided along parts of the RN6 from Station Madeline in Cap-Haïtien to Ouanaminthe. This is to ensure that sufficient capacity and commercial speeds are provided. These can take the form of: reserved lanes, bus rapid transit corridors, high capacity stations with transit passing lanes, etc. These measures will vary along the corridor based on the demand and the context and are provided to achieve commercial speeds of at least 20 km/h in urban areas and 25-40 km/h in rural.
- → The same route structure from the PIC is offered serving adjacent communes. The routes from the PIC are modified to take advantage of an improved eastern gate and a more direct route to Trou-du-Nord.

Road Network

The following assumptions are made in order to offer sufficient roadway capacity:

- → The Haitian National Road Network is complete and the RN1 and RN3 are both completed to allow the passage of trucks between the study area, Port-au-Prince and the rest of the country. A new National Road is built between the Artibonite region and Ouanaminthe.
- → Improvements to existing roads are privileged over creating new links in undeveloped areas, except where:
  - Urban growth is expected and desired;
  - Roads would require 3 lanes or more per direction;
- → Roads reaching rural communes to the south of the RN6 are now passable in all-weather conditions and to allow regular transit services. Roads leading to environmentally sensitive areas are not improved until strong land-use controls are in place.

- → The PIC's eastern gate and the road leading to the RN6 are passable for trucks and buses to better distribute demand. A new road is built between Trou-du-Nord and the PIC to shorten travel distances and serve this growing urban area.
- → A new road is built between Limonade and Grande-Rivière-du-Nord to verify if the demand is sufficient for its warrant.
- → Networks of major streets are built in urban areas, these roads are built to increase connectivity (reduce walking distances), allow for better local transit services (most urban residents within 400 meters of a transit route), provide an opportunity to develop a cycling network and better distribute traffic. Links added to the model are conceptual. Not all links are added to the model due to the regional nature of the model (see limitations in section 5.1.2). Specifically for select urban areas:
  - In Cap-Haïtien, a network of major streets is developed to better distribute traffic and serve anticipated urban development towards the south. The development of an urban street grid is limited by a number of barriers including the Haut-du-Cap River, the mountains and the airport. A link between the RN6 and the RN1 south of the airport is added to reduce demand on the RN3 between Carrefour La Mort and Station Madeline.
  - In Ouanaminthe, a grid of major urban streets is developed around the existing urban core to improve the structure of future urban growth, better distribute traffic and avoid widening the RN6 through the center of the city.
  - In the center of Limonade and Terrier-Rouge, either the center of the city is shifted away from the RN6 for increased capacity or local frontage roads are built to support adjacent land uses.

5.3.3.2 ASSESSMENT OF TRANSPORTATION IMPROVEMENTS FOR ALL THREE SCENARIOS

The three scenarios were assessed using the regional travel-demand model. Private vehicle volumes and capacity are shown in figures 5.7 to 5.9 for each of the three scenarios. Public transit passenger volumes are shown in figures 5.10 to 5.12. Detailed maps are available in Appendix E. Relevant transport indicators were assessed for each of the three scenarios, including the minimal intervention scenario, and are available in table 5.2.

The following key findings were derived from this assessment:

- → Sufficient road and transit capacity is provided throughout the region, except at a few select locations in the center of Cap-Haïtien where there is no room to expand and could be undesirable from the perspective of the urban environment;
- → The PIC's eastern gate allows better distributing transit and traffic demand, instead of requiring further widening of Caracol Road.
- → The development of a major street grid in Cap-Haïtien allows a better distribution of traffic throughout the city. Also, this avoids widening the RN3/RN6 beyond two lanes per direction between Carrefour La Mort and the center of Cap-Haïtien. This allows the development of a high capacity transit system along this road (such as a Bus Rapid Transit). It should be reminded that traffic volumes on the RN1 and the new street from the RN6 to the RN1 will be higher than what is shown since the data collection (counts and survey) did not include the entire City. That said, the airport is a major barrier to creating an urban street grid within parts of Cap-Haïtien.

- The development of a continuous major street grid in Ouanaminthe also allows a better distribution of traffic around the City, although is not as necessary in scenario 2.
- The highest vehicle volumes along the RN6, except in Cap-Haïtien, are expected between Quartier Morin and Trou-du-Nord.
- A proposed link between Limonade and Grande-Rivière-du-Nord allowing a better access to the RN3 would not be heavily used (around 60 vehicles per hour in the peak direction).
- The PIC will be one of the region's largest generators and its development at a much faster rate than population growth is the main factor increasing kilometers travelled and GHG emissions due to transport in the region. This explains the higher per capita GHG emissions in scenario 2.

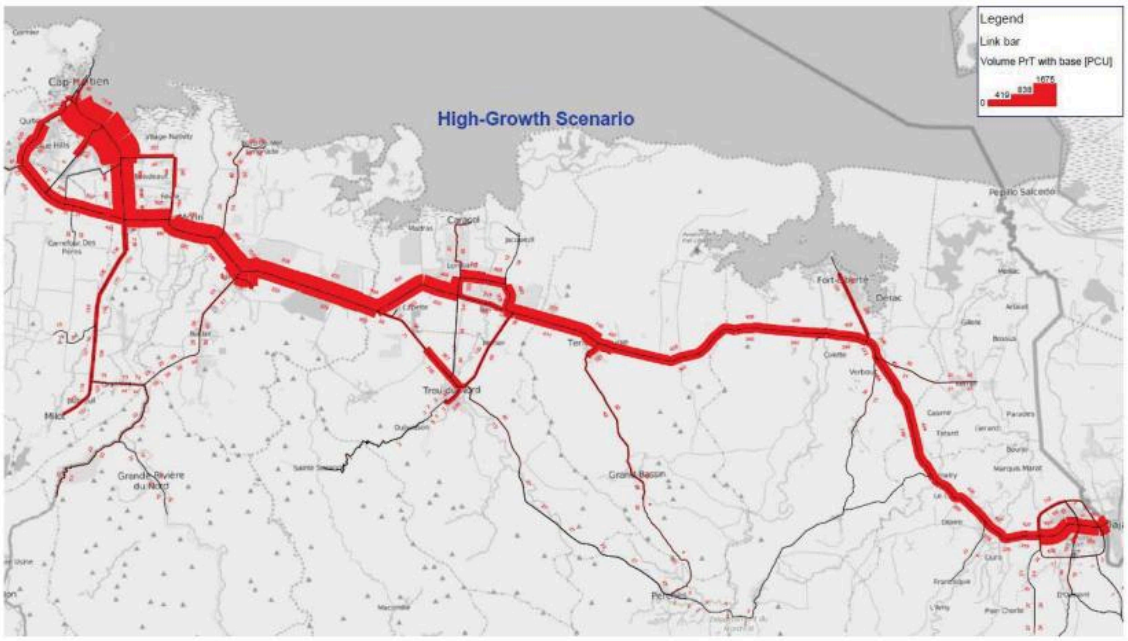
Table 5.2 Indicators – Projected Conditions 2040

Category	Definition	Existing		Scenario 1				Scenario 2				Scenario 3			
		Benchmark – Existing	Evaluator	2040 Scenario 1 (High) – Minimal	Evaluator	2040 Scenario 1 (High) – With Interventions	Evaluator	2040 Scenario 2 (Low) – Minimal	Evaluator	2040 Scenario 2 (Low) – With Interventions	Evaluator	2040 Scenario 3 (Adjusted) – Minimal	Evaluator	2040 Scenario 3 (Adjusted) – With Interventions	Evaluator
Economy	Strength of Economy – Average GDP per person in Haiti (USD, 2013) Source: WEO, IMF	1,300[H]	🔴	2,500-3,000[H]	🔴	2,500-3,000[H]	🔴	2,500-3,000[H]	🔴	2,500-3,000[H]	🔴	2,500-3,000[H]	🔴	2,500-3,000[H]	🔴
Environment	Transport GHG emissions per capita (annual kg CO2 per capita) – for regional travel	53	🟢	148	🟢	97	🟢	137	🟢	106	🟢	87	🟢	85	🟢
Mobility / Transportation	Balanced transportation infrastructure – Kilometers of roads per 100,000 population	197 (including many not passable)	🔴	93 (including many not passable)	🔴	150-250 (including many not passable)	🔴	124 (including many not passable)	🔴	150-250 (including many not passable)	🔴	93 (including many not passable)	🔴	150-250 (including many not passable)	🔴
	Balanced transportation infrastructure – Kilometers of roads dedicated to transit per 100,000 population	0	🔴	0	🔴	<10 (some segments of RN6)	🔴	0	🔴	<10 (some segments of RN6)	🔴	0	🔴	<10 (some segments of RN6)	🔴
	Balanced transportation infrastructure – Kilometers of bicycle path per 100,000 population	0	🔴	0	🔴	9-22 (125 to 300km)	🟡	0	🔴	12-29 (125 to 300km)	🟡	0	🔴	9-22 (125 to 300km)	🟡
	Balanced transportation infrastructure – Kilometers of sidewalks and walking paths per 100,000 population	14.8	🔴	7.0	🔴	20-35, still likely not caught to 2-4 times length of road network	🔴	9.3	🔴	20-35, still likely not caught to 2-4 times length of road network	🔴	7.0	🔴	20-35, still likely not caught to 2-4 times length of road network	🔴
	Public transport and active transportation – Modal Share – PM Peak Hour	>75%	🟢	>75%	🟢	>75%	🟢	>75%	🟢	>75%	🟢	>75%	🟢	>75%	🟢
	Average travel speed on primary thoroughfares during peak hours	29	🟡	6	🔴	>30	🟢	10	🔴	>30	🟢	5	🔴	>30	🟢
	Affordability of travel (2 trips per day x Average fare) / Income of bottom quintile (Assumed at 90 HTG per day)	30% (inside Cap-Haïtien) to148% (regional travel)	🔴	15% (inside Cap-Haïtien) to 74% (regional travel), assuming no major fare increase	🔴	<15% (inside Cap-Haïtien) to <74% (regional travel), requires higher GDP or high external subsidies	🔴	15% (inside Cap-Haïtien) to 74% (regional travel), assuming no major fare increase	🔴	<15% (inside Cap-Haïtien) to <74% (regional travel), requires higher GDP or high external subsidies	🔴	15% (inside Cap-Haïtien) to 74% (regional travel), assuming no major fare increase	🔴	<15% (inside Cap-Haïtien) to <74% (regional travel), requires higher GDP or high external subsidies	🔴
	Average travel time – PM peak hour – All modes[1]	>45	🟡	136	🔴	<30	🟢	61	🔴	<30	🟢	122	🔴	<30	🟢
	Average travel distance – PM peak hour – All modes[1]	8.7	🟢	12.4	🟡	12.3	🟡	11.4	🟡	11.3	🟡	11.7	🟡	11.5	🟡
	Average travel distance – PM peak hour – Public transit[1]	8.3	🟢	12.3	🟡	12.3	🟡	11.1	🟡	11.1	🟡	11.6	🟡	11.5	🟡
	Average travel distance – PM peak hour – Private vehicles[1]	11.2	🟡	13.1	🟡	12.7	🟡	13.2	🟡	12.6	🟡	12.3	🟡	11.9	🟡

Note: the evaluators are based on the IDB's Indicators for the ESCI, except for indicators marked with a "1". The evaluation is done using stoplight criteria (green, yellow and red). Green indicates there is no major problem, amber a problem that should be addressed and red is a critical issue. Details are available in Appendix F. Indicators marked with an "H" are national level data where regional or local figures were not available.

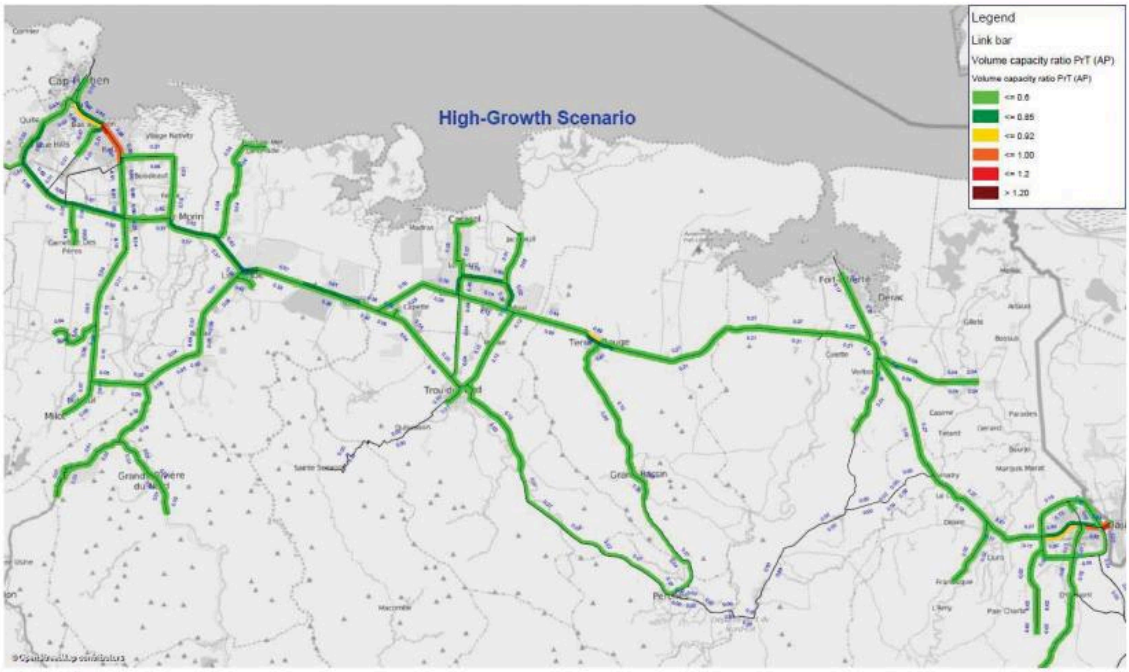
Figure 5.7 Scenario 1 – Forecast Motorized Vehicle Volumes and Volume to Capacity Ratios 2040 – Including Transportation Improvements

Motorized Vehicle Volumes (in PCU)



Note: Volumes west of the Airport do not include any travel generated after this intersection.

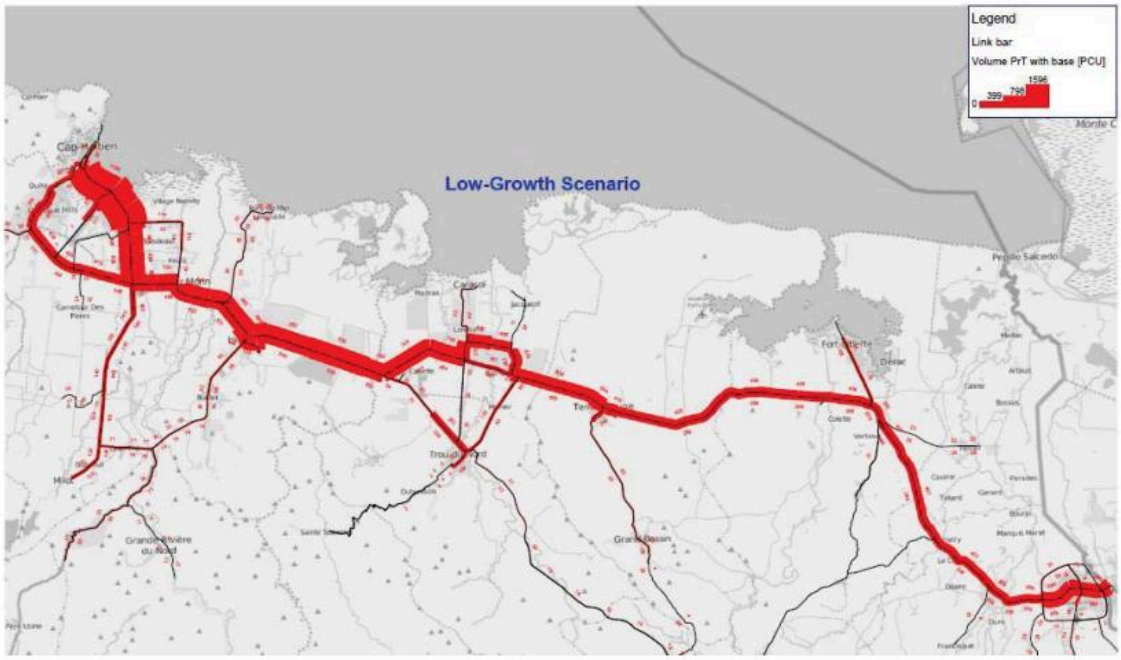
Volume to Capacity Ratios



Note: Vehicle volumes are expressed in passenger car units (PCUs) instead of the total volume. A motorcycle is equivalent to 0.5 passenger cars and a truck/bus is equivalent to 3.

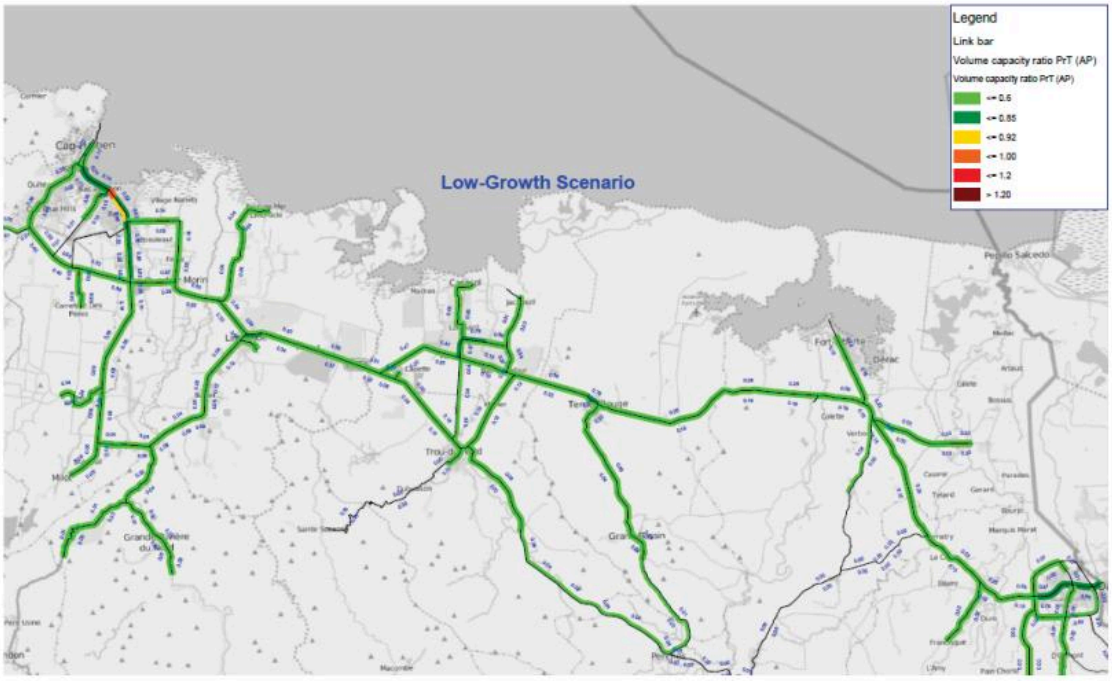
Figure 5.8 Scenario 2 – Forecast Motorized Vehicle Volumes and Volume to Capacity Ratios 2040 – Including Transportation Improvements

Motorized Vehicle Volumes (in PCU)



Note: Volumes west of the Airport do not include any travel generated after this intersection.

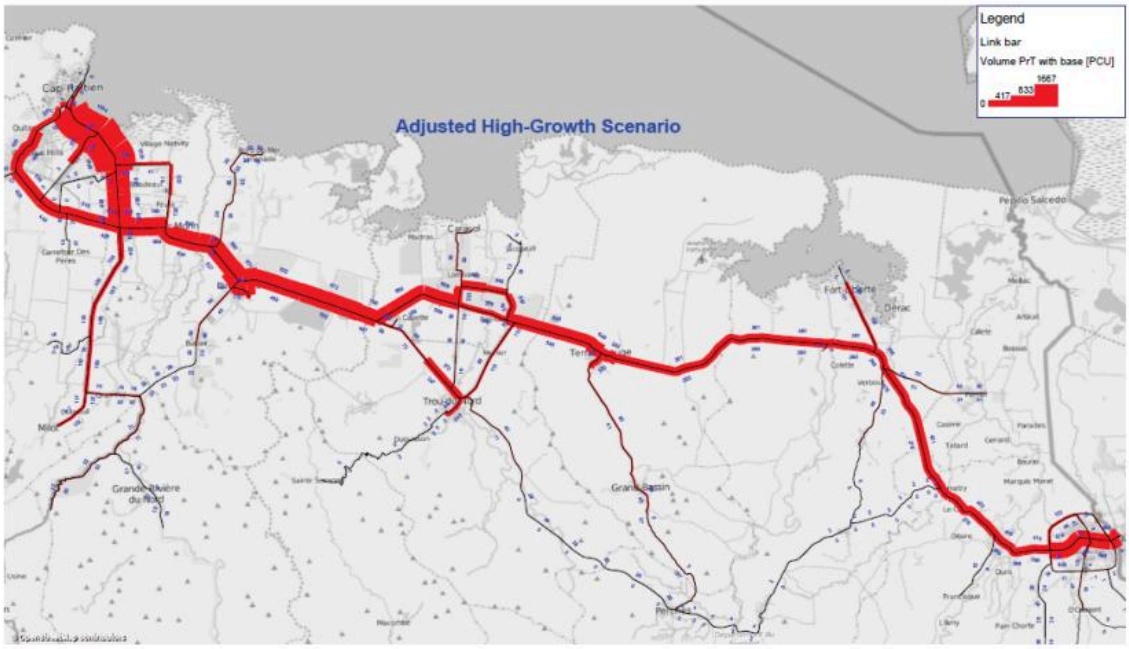
Volume/Capacity Ratios



Note: Vehicle volumes are expressed in passenger car units (PCUs) instead of the total volume. A motorcycle is equivalent to 0.5 passenger cars and a truck/bus is equivalent to 3.

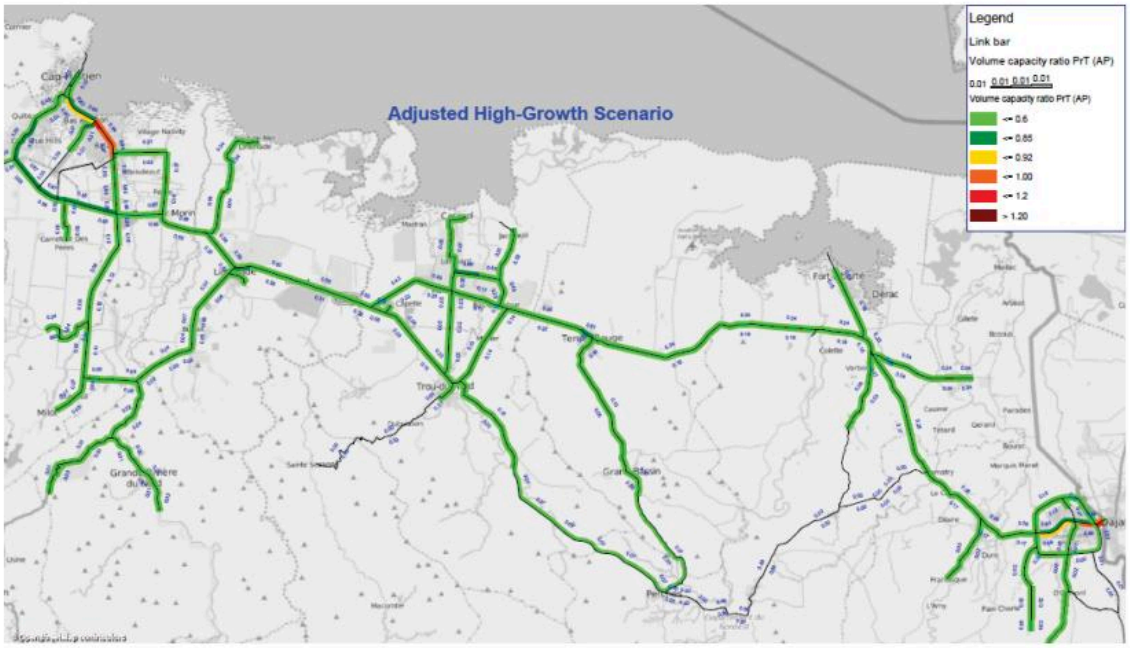
Figure 5.9 Scenario 3 – Forecast Motorized Vehicle Volumes and Volume to Capacity Ratios 2040 – Including Transportation Improvements

Motorized Vehicle Volumes (in PCU)



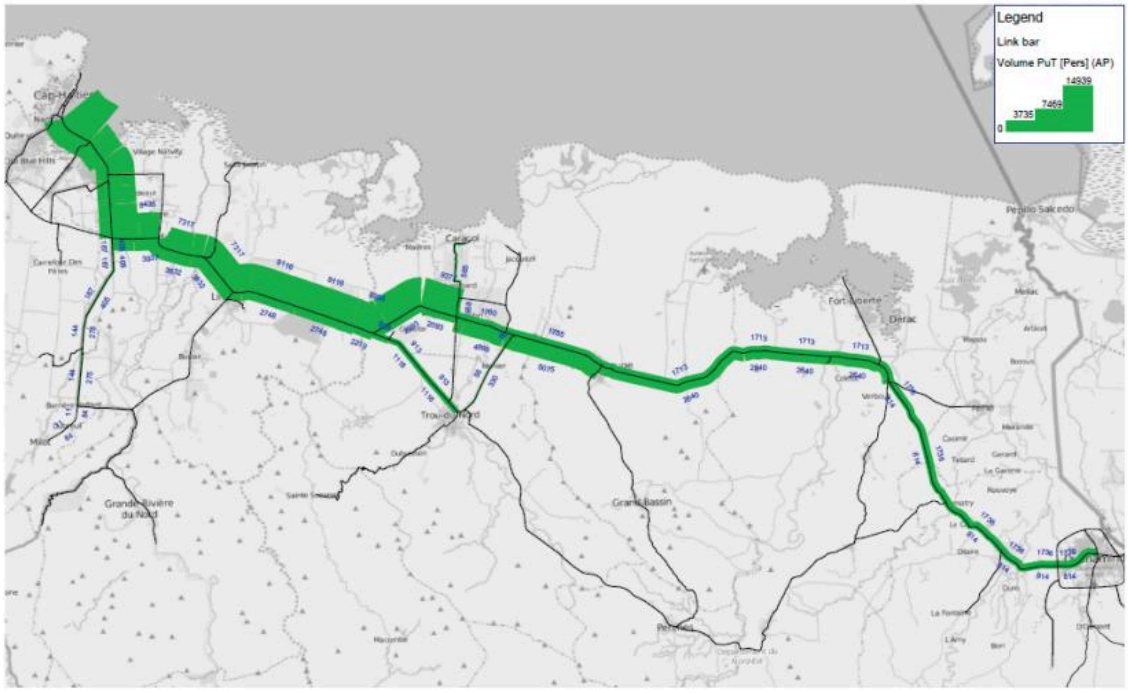
Note: Volumes west of the Airport do not include any travel generated after this intersection.

Volume/Capacity Ratios



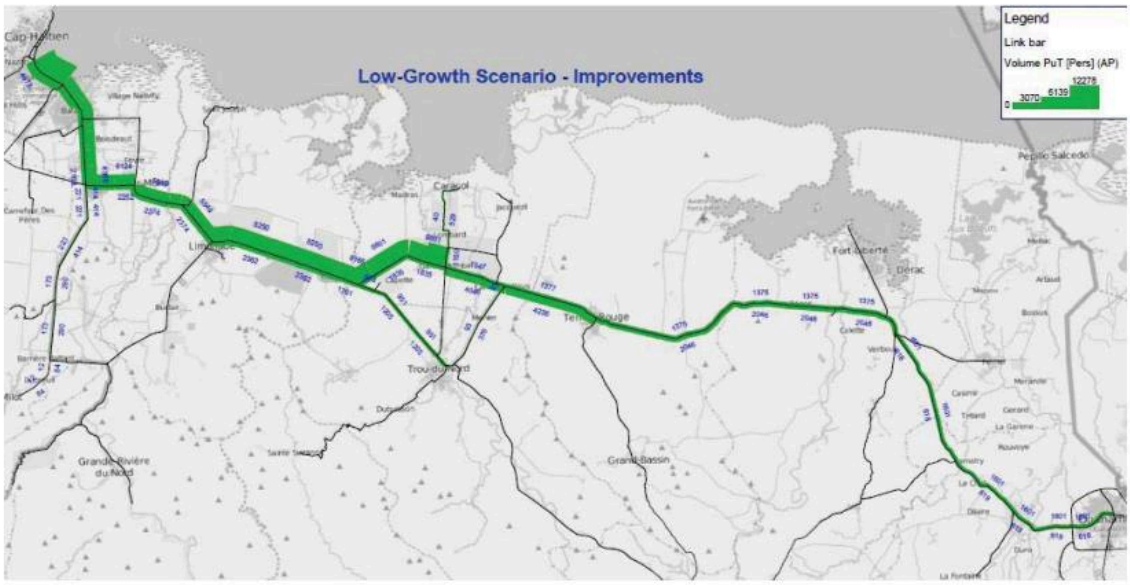
Note: Vehicle volumes are expressed in passenger car units (PCUs) instead of the total volume. A motorcycle is equivalent to 0.5 passenger cars and a truck/bus is equivalent to 3.

Figure 5.10 Scenario 1 – Public Transit Person Volumes 2040 – Including Transportation Improvements



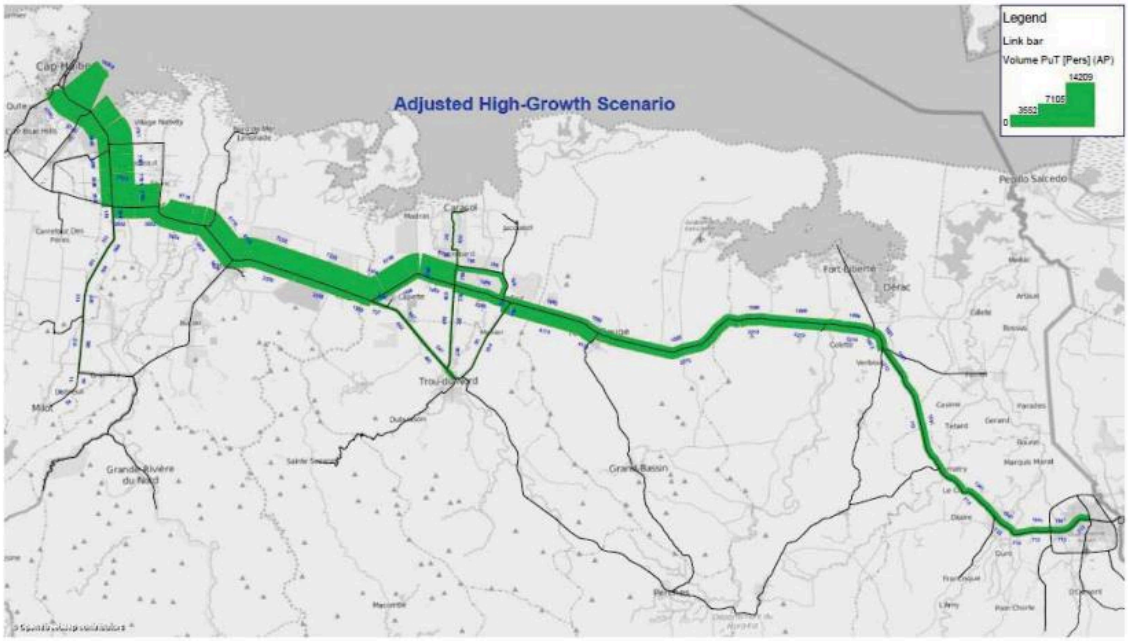
Note: Volumes west of the Airport do not include any travel generated after this intersection.

Figure 5.11 Scenario 2 – Public Transit Person Volumes 2040 – Including Transportation Improvements



Note: Volumes west of the Airport do not include any travel generated after this intersection.

Figure 5.12 Scenario 3 – Public Transit Person Volumes 2040 – Including Transportation Improvements



Note: Volumes west of the Airport do not include any travel generated after this intersection.

5.3.4 EVALUATION OF 2020 HORIZON

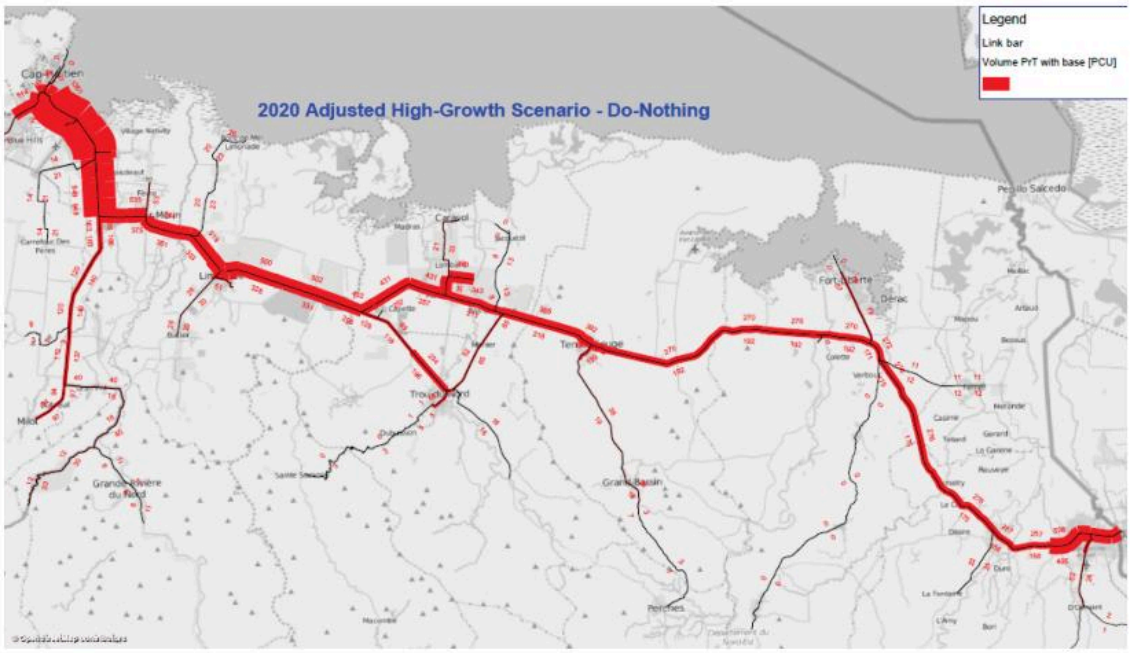
The 2020 horizon is evaluated after the 2040 horizon since the objective is to identify which long-term improvements are required in the short-term. This scenario is assessed using the worst case scenario (scenario 1) since there are few differences in population levels (+10 to +20%) and the main driver in trips for the region, the PIC, has 20,000 employees in all scenarios.

The 2020 horizon was assessed using the same minimal interventions assumed in the 2040 horizon (see section 5.3.1) as shown in figure 5.13 and the findings are:

- → The RN3/RN6 in the center of Cap-Haïtien will continue to be heavily congested. The widening of the RN3/RN6 south of the airport to the limits of the urbanized area should be sufficient. Alternative roads, such as a bypass, are not yet required as observed in figure 5.14.
- → High vehicular volumes along the RN6 will make it more difficult and hazardous for pedestrians and cyclists to travel along and cross safely. This problem will be compounded in urban areas where there is a lot of activity. It is reasonable to expect that pedestrian-vehicle collisions will increase significantly if no safety measures are implemented. Sample traffic calming and pedestrian crossings are shown in Appendix H as a pre-investment project.

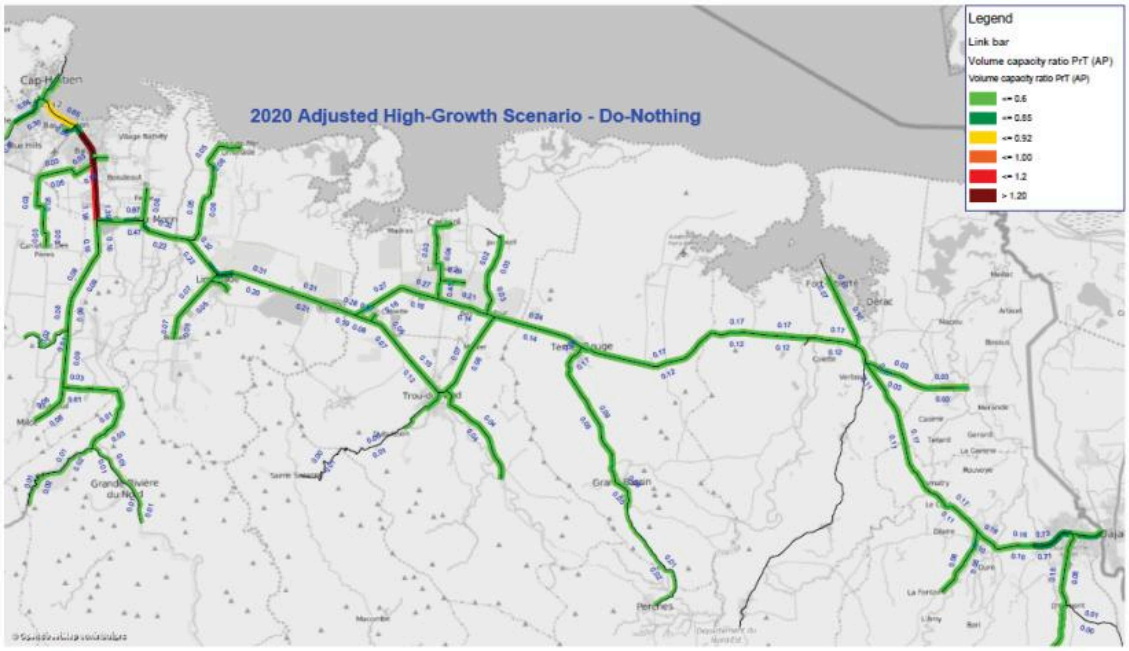
Figure 5.13 Scenario 1 – Forecast Motorized Vehicle Volumes and Volume to Capacity Ratios 2020 – Minimal Interventions

Motorized Vehicle Volumes (in PCU)



Note: Volumes west of the Airport do not include any travel generated after this intersection.

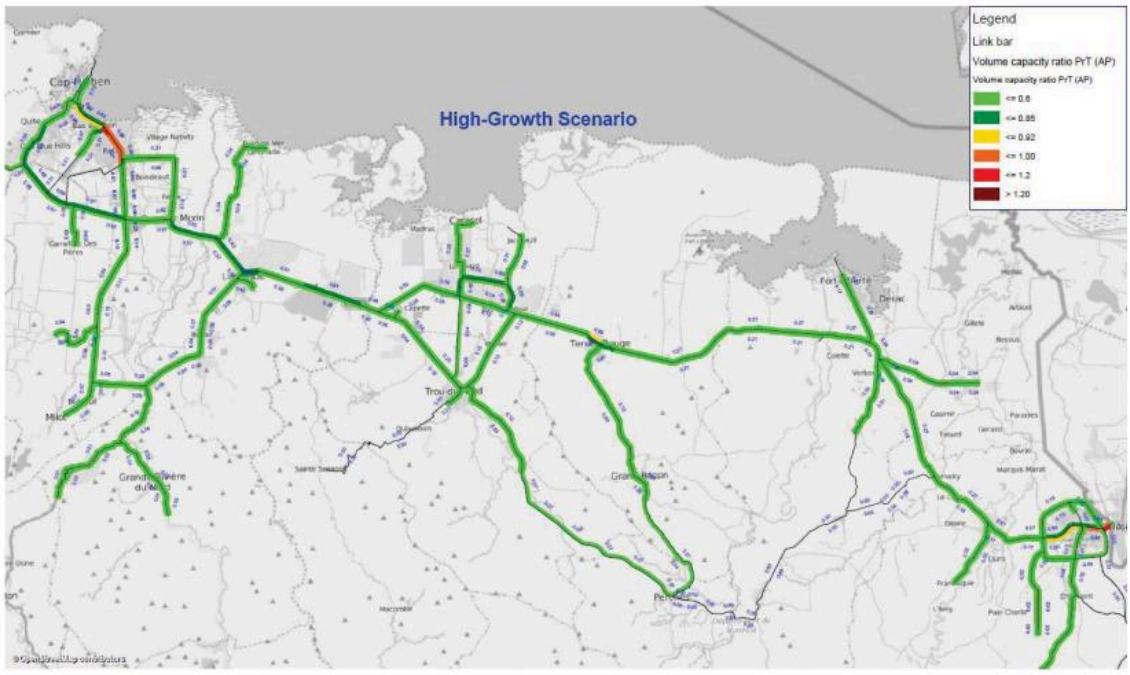
Volume to Capacity Ratios



Note: Vehicle volumes are expressed in passenger car units (PCUs) instead of the total volume. A motorcycle is equivalent to 0.5 passenger cars and a truck/bus is equivalent to 3.

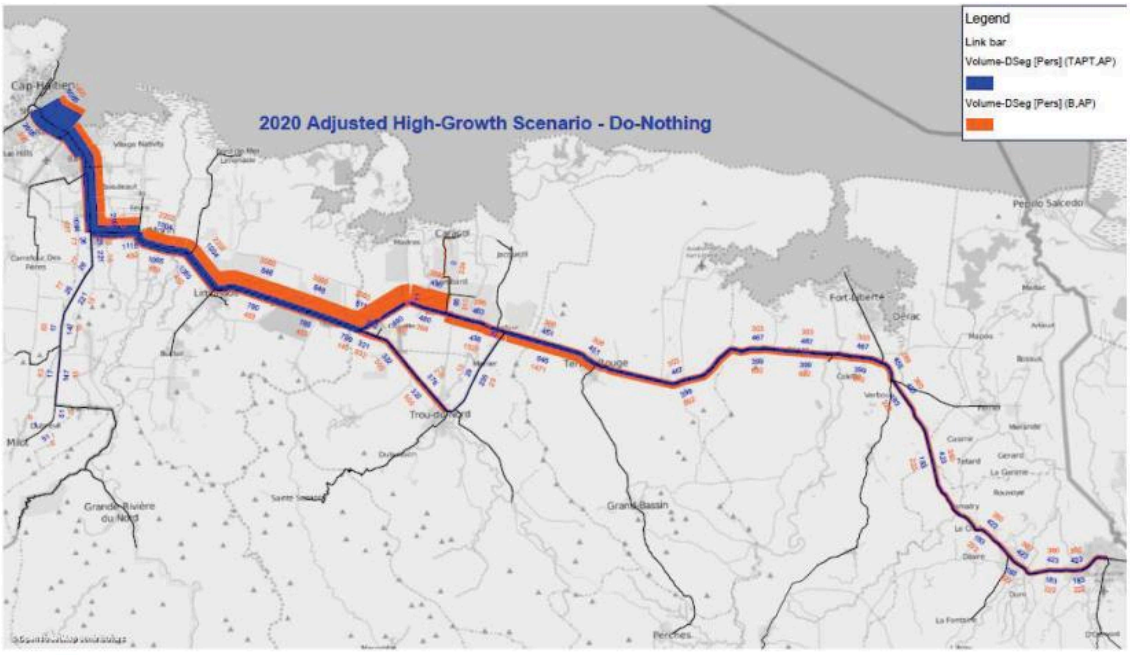
Figure 5.14 Scenario 1 – Forecast Motorized Vehicle Volume to Capacity Ratios 2020 – Including Transportation Improvements

Volume to Capacity Ratios



Note: Vehicle volumes are expressed in passenger car units (PCUs) instead of the total volume. A motorcycle is equivalent to 0.5 passenger cars and a truck/bus is equivalent to 3.

Figure 5.15 Scenario 1 – Public Transit Person Volumes 2020



Note: Volumes west of the Airport do not include any travel generated after this intersection.

5.4 SECOND STAKEHOLDER CONSULTATION

A second stakeholder consultation was organized in May 2015 to present the current conditions, the results of the modelling and preliminary pre-investment projects. Meetings were held in Cap-Haïtien, Port-au-Prince and online. Representatives from various institutions were present:

- → At the central government level: MTPTC, MAST MEF, MARDNR, MPCE, CIAT and UTE;
- → At the local government level: mayors of Limonade and Terrier-Rouge;
- → Local organizations or institutions: SONAPI, University of Limonade and the CCI;
- → International organizations: World Bank and IBD.

Some of the concerns and comments were similar to the initial consultation and included:

- → A need for an alternative link to the RN6 that can be used in cases of emergency or during political demonstrations. No alternative links exist during these events.
- → Many concerns about the growth of motorcycles in Haiti and suggestions. Additional control is required.
- → Some actors requested a seaside road, possibly reserved for trucks. However, this would cut through the Parc National des Trois Baies and go against the principles of this preservation area.
- → Bypass roads have been used elsewhere in Haiti and the center of the city soon followed the new road (merchants follow clients using transport).

Detailed notes are available in Appendix B.

6 MEASURES AND POLICIES OF THE SUSTAINABLE MOBILITY PLAN

This chapter is about the measures and policies in this Sustainable Mobility Plan, which provides a roadmap for the region to developing and managing the region's transportation system and to guide future transportation decisions. It does not detail measures street corner by street corner or present plans of specific interventions. The measures and policies of the Master Plan are divided into the following categories:

- → Supporting policies: since the development of a sustainable transportation system requires other interventions to strengthen institutions, encourage social and economic development and land-use measures.
- → Active transportation focusing on walking and cycling.
- → Collective transportation.
- → The development of a road and street network.
- → Regulatory and enforcement measures.
- → The expected impact on indicators after the implementation of the Plan's measures and policies.
- → Guidance on implementation of the Sustainable Mobility Plan.

Some measures can be implemented immediately in the coming years, some continuously over time and others only in the long-term. Cost estimation and phasing of measures are provided.

6.1 METHODOLOGY

Measures and policies of the Master Plan are developed according to the key findings and analyses provided in chapters 2 and 3, the vision, objectives and goals from chapter 4 and the future transportation assessment of chapter 5, which are summarized in the following table.

Table 6-1 Summary of key findings and objectives

Category	Key findings/objectives	Chapter
Supporting policies	The substantial population increase creates a strain on existing transportation infrastructure, especially since most urban development is unplanned.	3.1.2
	Local communes and departments have little expertise and financial resources to plan, manage, build and operate the transportation system.	2.2.1.4

Category	Key findings/objectives	Chapter
	Most major transportation and urban development projects are funded, at least in part, by international organizations and groups. They are often undertaken and managed by external organisations. In turn, this hinders the development of Haitian expertise in the private and public sectors.	2.2.1.4
	There is a lack of coordination between communal, departmental, national and international organisations. Responsibilities linked to transportation and urban planning and its implementation are fragmented across multiple organisations.	2.2.1.4
	No entity is actively managing land-use and transportation planning in the entire region.	2.2.1.4
Active transportation	A high proportion of adults have mobility impairments in Haiti, especially among women and people with lower-incomes. Based on observations in the field, it appears that the vast majority of transportation infrastructure and vehicles are not adapted for persons with a physical disability or impairment.	3.2.3
	Current road design on major roads is not appropriate and unsafe. Pedestrians and cyclists are particularly at risk, compounded by the lack of active transportation infrastructure.	3.5
	The study area has little functional facilities for pedestrians and cycling, although it is a highly used mode of transportation.	3.2.3
Collective transportation	The tap-tap is the most widely used travel mode in the region although very few dedicated stops are provided. Therefore, transit vehicles often stop in the middle of the street/road.	3.3.2
	Although travel times and distances are relatively short, tap-tap and bus fares are very high relative to incomes in the region.	3.3.2

Category	Key findings/objectives	Chapter
Urban streets and rural roads and streets	The road network is used by all modes of transportation. Furthermore, it not only serves to allow people and goods to travel, but is also a space for social activities and trade.	3.2.2
	The road transport network is underdeveloped, and most of it is difficult to use. It also favors private transportation since there is very little infrastructure for pedestrians, no infrastructure for cyclists and no infrastructure dedicated to collective transportation even though these modes represent the vast majority of users.	3.2.2
	Few alternative routes exist apart from major roads. Many areas can be isolated after storms and this limits accessibility and emergency interventions.	3.1.1
	General congestion due to lack of road and transit capacity entering Cap-Haïtien (concentration of demand) and very high transit passenger volumes on the RN6 towards the center of Cap-Haïtien.	5.3.2.1
	General congestion due to lack of road and transit capacity going through the center of Ouanaminthe, especially on market days.	5.3.2.2
Institutions	Little institutional capabilities to develop, maintain, operate and enforce the transportation system. Existing institutions are not properly enforcing existing regulations, whether it is land-use, vehicle emissions, access management, vehicle safety, traffic codes and others.	2.2.1
	Enforcement of traffic regulations is very sparse (vehicle conditions, overcrowding, speeds, general traffic rules, etc.);	2.2.2
	Many land-use, traffic and environmental regulations exist, but few are applied. In some cases, it is not clear who is responsible for their enforcement (e.g. the condition of tap-taps, etc.).	2.2.2
Objectives	Improvement of quality of service	4.2.1
	Improvement of infrastructure quality	4.2.2

Category	Key findings/objectives	Chapter
	Development of institutional capacity	4.2.3
	Accessibility improvement	4.2.4
	Improvement of transportation safety	4.2.5

6.2 SUPPORTING POLICIES

A sustainable mobility plan should not only be focused on mobility and accessibility, but its' success is also dependent on the overall context. Non-transport measures are an integral part of solving existing and future transportation challenges since they are interrelated. For example, increased wages through the economic development could increase the affordability of transit if costs are kept under control. Hopefully, these elements can create a virtuous cycle building and reinforcing each other: economic development can help strengthen institutions and increase the quality of education and infrastructure, which can then increase efficiency and create further development.

6.2.1 ECONOMIC DEVELOPMENT

The region's low wages and GPD per capita, high unemployment, high inequality and high proportion of workers in the informal sector are important challenges facing Haiti and the region. Although this allows for high transit and active modal shares, this decreases the affordability of transportation due to low wages and hinders generating taxation or fare revenue which can be used to build, maintain and operate the transportation system. Economic development is a necessary precondition to ensure the Sustainable Mobility Plan's success. In turn, the development of the transportation system could reduce transactional costs and increase efficiencies which can foster the region's development.

6.2.2 INTEGRATED LAND-USE AND TRANSPORTATION PLANNING: DEVELOPMENT OF URBAN PLANS AND LAND USE REGULATIONS

The development of a transportation system is not to move people from point A to point B in the quickest possible time at an affordable cost, but to maximize accessibility. Accessibility measures the number and the quality of destinations reachable within a reasonable time for each mode of travel. Therefore, increasing accessibility can either be done through increasing travel speeds, but also locating services and employment closer to residents. The development of mixed urban centers with services and employment is integral to achieving increased accessibility.

The development of communes also requires the development of well-connected street grids to better distribute demand and decrease travel distances, including through informal urban developments.

Transport is also a tool to steer the region's development because it is underserved by all means of transportation and will influence where future residents will locate, whether permitted or not. For this reason, the transportation network will not be improved in highly sensitive areas such as the coastal mangroves.

Urban plans and subsequent regulations will need to be coherent with the Sustainable Mobility Plan. Additional guidance is given in the rest of this chapter, and especially in section 6.7.2.

6.2.3 DEVELOPMENT OF BASIC SERVICES, HOUSING AND HEALTH SERVICES

Improving accessibility requires not only integrated land-use and transportation planning, but also coordination with various ministries (health, education, etc.), communes and non-governmental organizations when they locate new facilities such as health clinics and schools. The development

of services (both the quantity and the quality) in the region's growing towns and cities will help reduce the need to travel. These new facilities should be easily accessible close to transit and town centers.

6.2.4 INSTITUTIONAL STRENGTHENING AND REFORM

The strengthening of governmental and civil society institutions is also necessary to support this plan. It is necessary to build, operate, finance, maintain and regulate the transportation system. Specifically, the development of institutions will need to overcome the following challenges:

- → Coordination between the various communes, departments and Haitian government ministries. This is to overcome the effects of administrative barriers and to coordinate interventions between ministries. For example, ports are the responsibility of the MEF, airports are the responsibility of The MTPTC and roads are a shared responsibility between the MTPTC and the region's communes. This will become more of a challenge over time as different organizations have more resources.
- → Institutions will require the financial resources to build, operate, finance, maintain and regulate the transportation system. This can be achieved through fees, taxation and external subsidies.
- → Institutions should work closely and conduct meaningful consultation with the region's residents, businesses and civil society organisations.
- → Development and retention of staff with sufficient expertise to develop, regulate, operate and maintain the region's transportation system. This involves Haitian organizations working in partnership with international organizations to develop and transfer knowledge and expertise.
- → Implement the decentralization and deconcentration of decision-making as stated in the Haitian constitution.

6.3 ACTIVE TRANSPORTATION

Active transportation, mainly walking and cycling, is an integral part of the transportation system. Walking is the start and end point of any trip: either to access transit, a car or cover the entire distance by foot. Active transportation also has the advantage of being the least costly form of transportation and is already widely used in the region. The region, although surrounded by mountains, has a relatively level plateau where it could be easy to walk or cycle if appropriate infrastructure was available.

6.3.1 PRIORITIZING ACTIVE TRANSPORTATION IN THE DEVELOPMENT OF PROJECTS

Active transportation should be an integral part of all transportation projects, even where currently there are very few pedestrians. Traditionally, the development of transport networks has attracted urban development which, in turn, generated pedestrians and transit riders. This includes, ensuring that appropriate walking and cycling facilities are provided. Focusing resources on less car-oriented measures should allow a slower increase in motorization, even as development levels increase (Ecola et al., 2014).

This should extend beyond transportation projects and should be incorporated into new development. For example, if a new school or industry is built, pedestrian paths or sidewalks should also be provided to reach adjacent built areas.

6.3.2 SUPPORTIVE LAND-USE POLICIES AND STREET GRIDS

Supportive land-use and street grids are integral to encouraging travel using active transportation. By extension, it is also necessary for giving access to collective transportation routes. Supportive land-use and street grids entails:

- → Encouraging the development of mixed, compact and dense urban areas.
- → Developing networks of connected major and local streets throughout urban areas, including informal urban developments.
- → Properly locating major trip generators within urban areas and in areas that are easily accessible by all means of travel.

These measures encourage the use of active transport by reducing average travel distances thus reducing transport related GHG emissions (Ewing & Reid, 2010; TRB, 2009; UN-Habitat, 2013a & 2013b). Cities with better connected street networks also are more prosperous (UN-Habitat, 2010).

6.3.3 WALKING

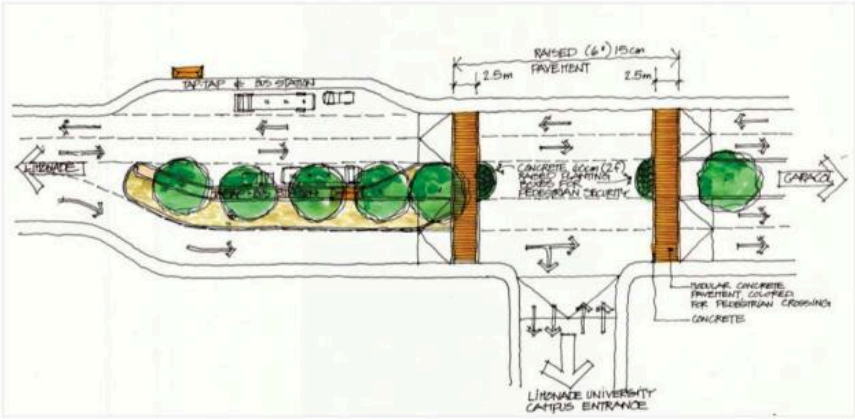
The following measures and guidelines are proposed to promote walking throughout the region:

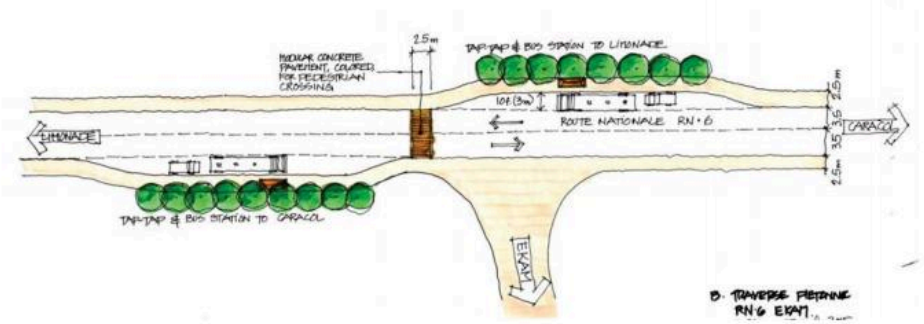
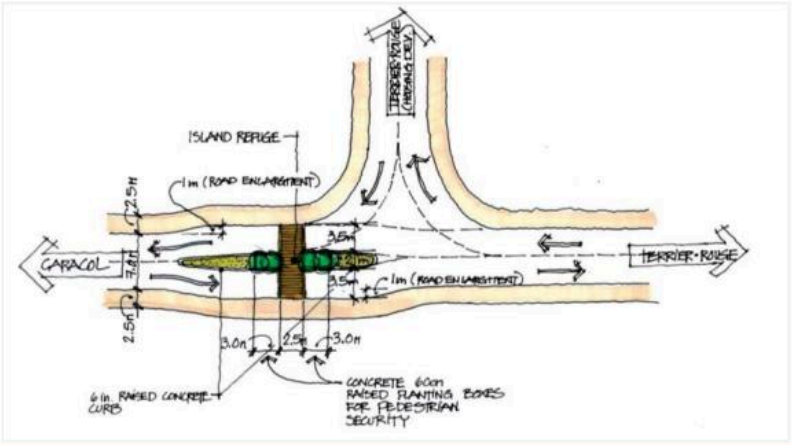
- → Create street grids with good connectivity in all urban areas and appropriate infrastructure (sidewalks, pathways or shoulders) on all rural roads (see figure 6.1).
- → The ITDP's Better Streets, Better Cities guidelines (2011) could be used as guidelines until Haitian standards are developed and adopted.
- → All high volume roads in urban and rural areas should have walking facilities, ideally on both sides to minimize crossing, especially since they are used by transit services. They should not be adjacent to travel lanes. Safe crossings should be provided at most transit stops, urban developments and intersections (pedestrian crossing, median-island, pedestrian signal, traffic calming, etc.). Roads with more than one lane per direction should have center islands to allow safe pedestrian crossings (see Box below and pre-investment project in Appendix H). In urban areas, vendors often congregate on the side of the road and sufficient space should be provided, where possible.
- → On lower volume rural roads, adjacent pathways or shoulders are appropriate.
- → On local streets in urban areas, streets should provide for sidewalks on both sides of the street. The addition of traffic calming measures should provide for a good walking environment.
- → Sidewalks and footpaths should have a minimal width of 1.5m, continuous, clear of obstacles and of 3m, if shared with cyclists. Appropriate measures should be implemented at driveways and intersections.
- → If it is prohibitive to implement walking infrastructure, right-of-ways and building setbacks should allow for future implementation, regardless of whether it is currently warranted.
- → The region's walking network should be fully accessible to all users. Best practices for universal accessibility should be used in all new or retrofit projects throughout the region, where possible, by: removing accessibility barriers (islands across crosswalks, installing curb ramps, limiting the use of staircases, sidewalks with proper widths, etc.), providing

obstacle-free and continuous sidewalks and ensuring pedestrian crossings and intersections are fully accessible. These measures are more easily implemented when creating new infrastructure than retrofitting.

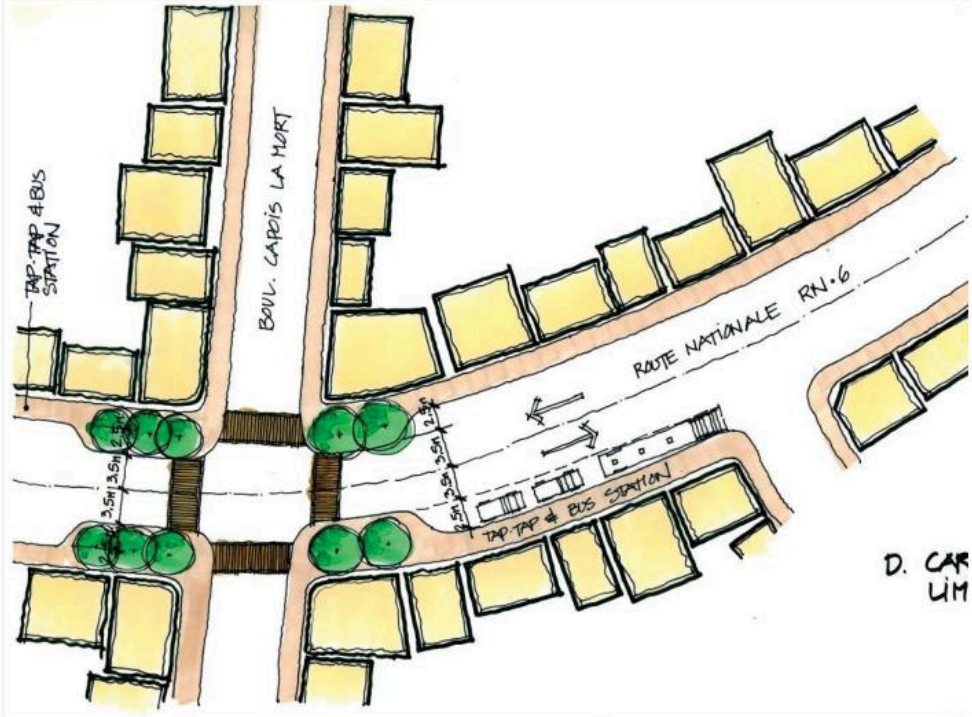
→ The Haitian Traffic Code should be revised to give better priority to pedestrians since some current provisions are missing or unclear (e.g. priority for pedestrians at intersections).

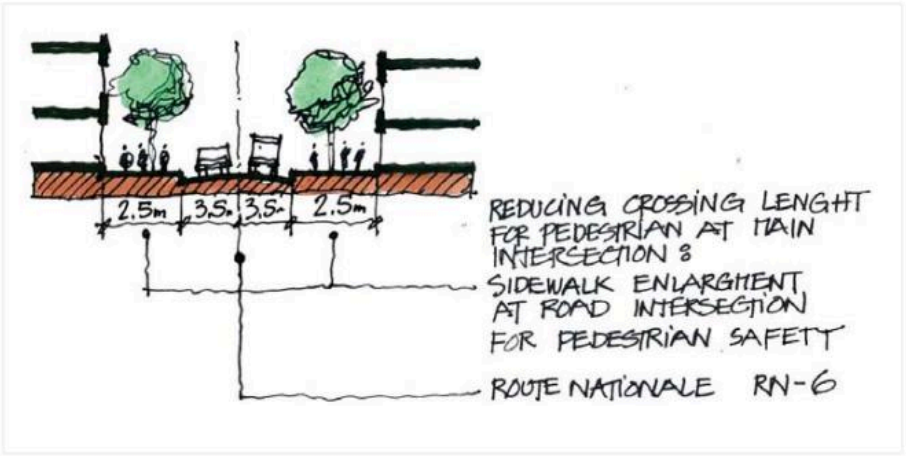
Table 6-2 Pre-Investment Project: Safe Pedestrian Crossings along the RN6

Context	Crossing the street on major roads, can be an especially hazardous experience as there are few crossing points, pedestrian priority is not respected and there are constant streams of vehicles in both directions including motorcycles in between vehicles. With the rapid development of the study area, many parts of the RN-6 will be very difficult to cross. Currently, there are few locations to safely cross the RN-6, except for a few speed bumps placed sporadically. Increased safety can be achieved through multiple means: through better locating trip generators that reduce the need to cross at unsafe areas, better roadway design, and other factors. A few examples along the RN6 are shown below and these pilot projects can be further refined and implemented and, according to their success, be replicated to other specific sites deemed critical throughout the region.
Université de Limonade Pedestrian Crossing	The University of Limonade is frequented by over 1,500 students and around 400 pedestrian crossings per hour can be expected long-term. This concept formalizes tap-tap stops and includes a raised pedestrian crossing to lower vehicle speeds. *Plan View* 

EKAM Pedestrian Crossing	This concept integrates bus stops on both side of this high speed road with a marked pedestrian crossing. 
Housing developme nt outside Terrier-Rouge Pedestrian Crossing	The development concept proposed to implement safe crossing measures of the RN-6 near the main access to the new "Village Terrier-Rouge" housing development. This concept includes widening the RN6 on both sides to allow the construction of a 2 m wide refuge island to protect people crossing the road, which will allow for safer pedestrian crossing in two stages. 
Center of Limonade Pedestrian Crossing	The RN-6 cuts through the heart of Limonade's urban center, becoming a local service road with important activity concentration on both sides of the road. Buses and tap-taps do not have clearly identified and appointed stations stops, causing uncontrolled frequent stops along the road in the urban area. There are almost no safe pedestrian crossings in the urban center of Limonade, the only elements intended to limit the flow of vehicles being speed bumps (only two were identified near the intersection of the RN-6 with Boulevard Capois Lamort). Since it is the main intersection in the urban center of the city, the implementation of traffic calming measures would be relevant at this location. A new bus and tap-tap station located outside the center would also be beneficial (see section 6.4.3). The development concept proposed to secure the intersection of the RN-6 and Boul. Capois Lamort, in the heart of Limonade's urban center, includes the following: -Curb extensions on the RN6, next to the intersection with Boul. Capois Lamort, in both directions and on both sides of the RN-6 with widened sidewalks, that could be partially used by vendors -Buses/Tap-Tap stops will be implemented immediately after the curb extensions,

for both eastbound (Caracol / Terrier-Rouge) and westbound (Cap-Haïtien) travel.





Plan de mobilité durable – Corridor de développement du nord - Haïti (corridor Cap-Ouanaminthe)
Sustainable Mobility Plan - Northern Development Corridor - Haiti (Cap-Ouanaminthe Corridor)

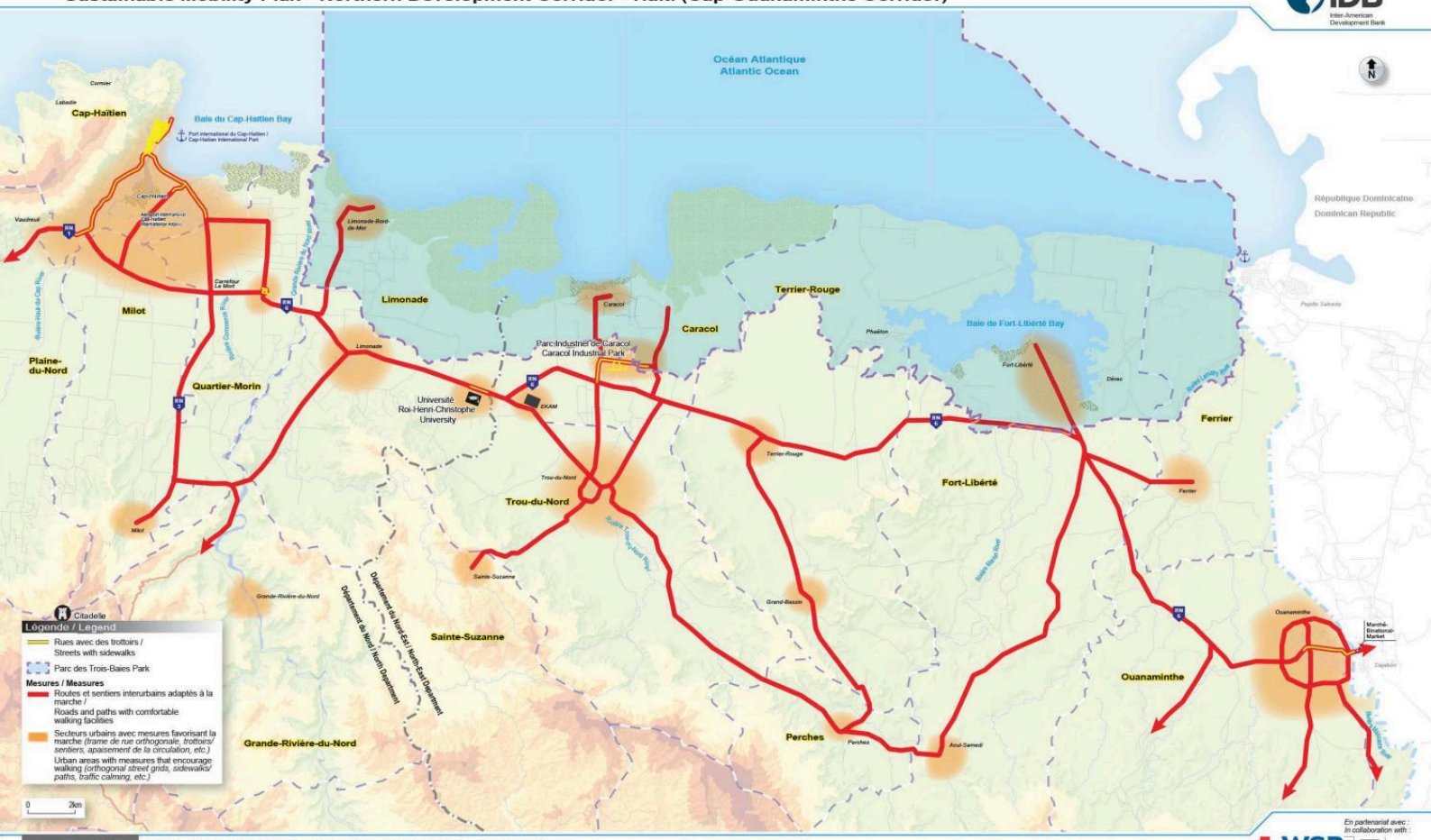


Figure 6.1 **Mesures proposées pour la marche / Proposed Walking Measures**

141-15934-00_Fig6-1_ProposedWalkingMeasures.ai

En partenariat avec : / In collaboration with : WSP IBI DAA

6.3.4 CYCLING

The following measures and guidelines are proposed to promote cycling throughout the region:

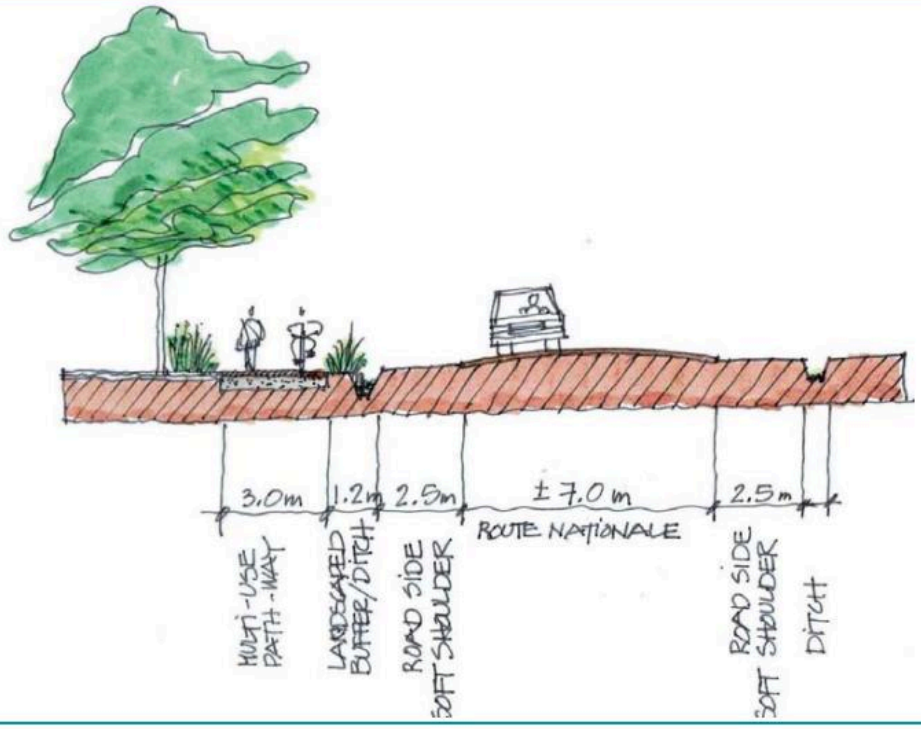
- → Create a regional cycling network connecting all urban areas and major trip generators (see figure 6.2). These will require pathways (some shared pedestrians) or dedicated lanes on roads with higher motorized traffic and shoulders on lower volume rural roads. Standards for bicycle facilities will need to be developed for Haiti, until then standards such as the NACTO Urban Bikeway Design Guide and the ITDP's Better Streets, Better Cities can be used.
- → This regional network should be completed with a network of connected and continuous cycling paths within urban areas, likely around major streets. A mesh width of 400 to 500m in urban areas is desirable. These can be identified during the development of urban plans for communes.
- → Install sufficient bicycle parking in all new public facilities and install bicycle parking along streets in urban areas.
- → Consider a bicycle sharing or bicycle lending for PIC employees. This could allow a reduction of transit transportation costs.
- → Implement safe bicycle crossings across high volume roads, in coordination with pedestrian crossings.
- → Implement measures to discourage the use of pathways by motorized two or three wheeler vehicles. This requires the installation of physical devices that also hinder pedestrians and cyclists. Therefore, these should be implemented only where necessary. The Traffic Code should also be amended to forbid access to these pathways to motorized vehicles.
- → Until sufficient land use controls are in place, bike paths should not be built in areas where urban development is undesired except along existing roadways.
- → The Haitian Traffic Code should be revised to better define cyclists' priority as some provisions are unclear.

Table 6-3 Pre-Investment Project: PIC Area Cycling Network

Context	The development of multi-use pathways (cycling and pedestrian) between the PIC and nearby villages and towns in the vicinity would reduce the dependence on vehicular transport (private transport and transit) of employees from the PIC. This could also reduce worker transport costs. The institutional aspect of this project, likely through SONAPI, could be to sell/give or rent/lend bicycles to employees at a low-cost or provide them for free. Parking sites for bicycles are already available on site. The traffic count campaign carried out in 2014 showed that around 400 pedestrians and cyclists enter and exit the PIC between 5:00 AM and 8:00PM. Given the risk of urbanization of the surrounding areas of potential off-road bike paths, it is preferable to implement the bike paths alongside existing roads.

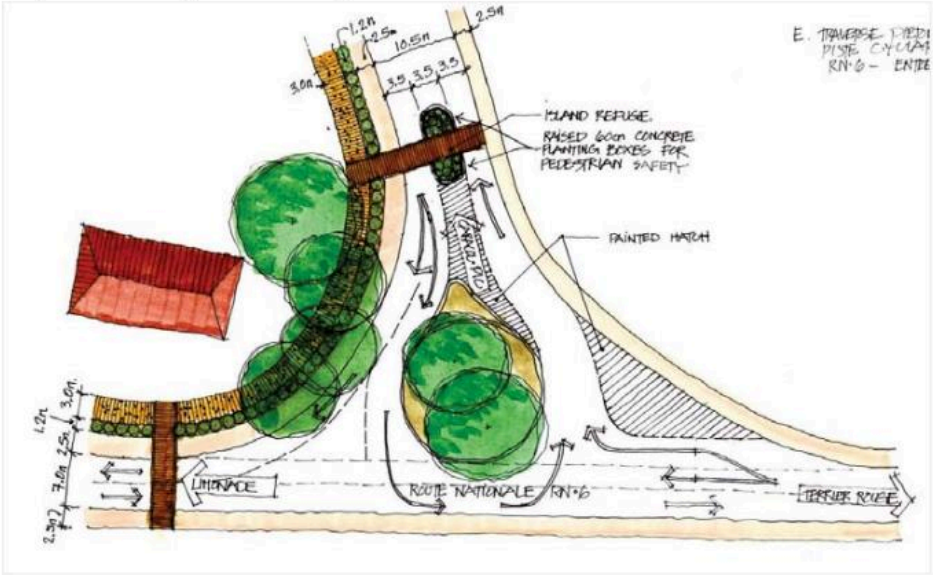
Proposed Cycling Network	Approximately 25km of cycle paths are proposed. These can be shared for pedestrians and access should be prohibited for motor vehicles. (YELLOW : ALONGSIDE ASPHALTED ROAD / ORANGE : ALONGSIDE DIRT ROAD) 

Typical Cross-Section along RN6



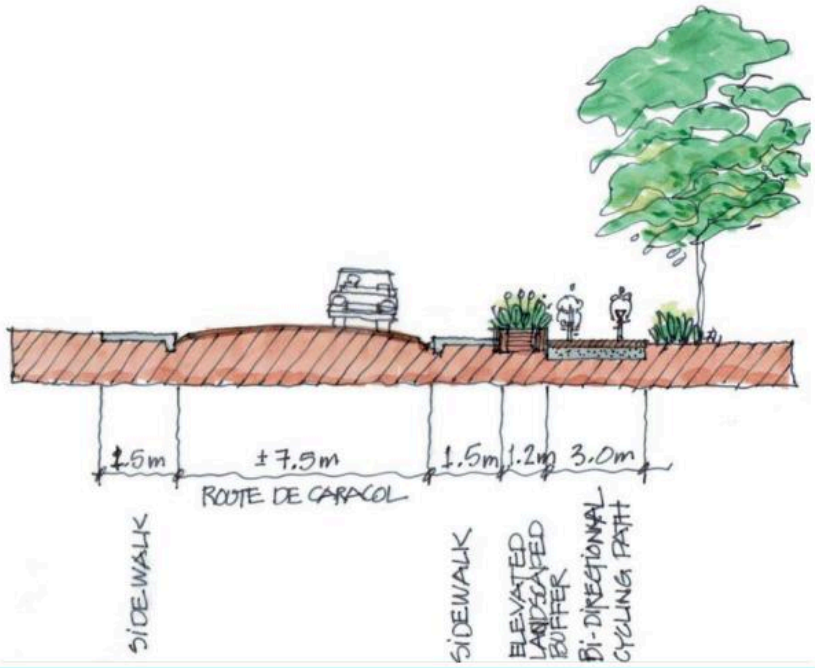
Crossing the RN6

Proposed concept for crossing the RN6



Caracol Road Bike Path

Proposed Cross-Section



6.3.5 PRIORITY ACTIVE TRANSPORTATION ACTIONS

The improvement of active transportation conditions will require considerable efforts over a long time period. That said, the following next steps are recommended:

- → Improve the safety of pedestrians and cyclists by improving conditions for pedestrians and cyclists through the center of cities and towns along the RN6, especially: Cap-Haïtien, Quartier-Morin, Limonade, Terrier-Rouge and the west entrance of Ouanaminthe. This can also be done in conjunction with improving key pedestrian crossings (see Appendix H), creating tap-tap stations and slowing vehicular speeds (see section 6.5.3.1).
- → Creating connected street grids in developing urban areas and enforcing the right-of-ways required to build these grids.
- → Develop a walking and cycling network in the vicinity of the PIC to connect it to adjacent communes (see Appendix H).
- → Build appropriate active transport facilities as part of all new roads and anticipate urbanization. Any new major travel generator should have proper active transportation facilities connecting it to adjacent areas on opening day.
- → Start developing active transport guidelines, training professionals and implementing a few pilot projects (to be monitored and then further refined).

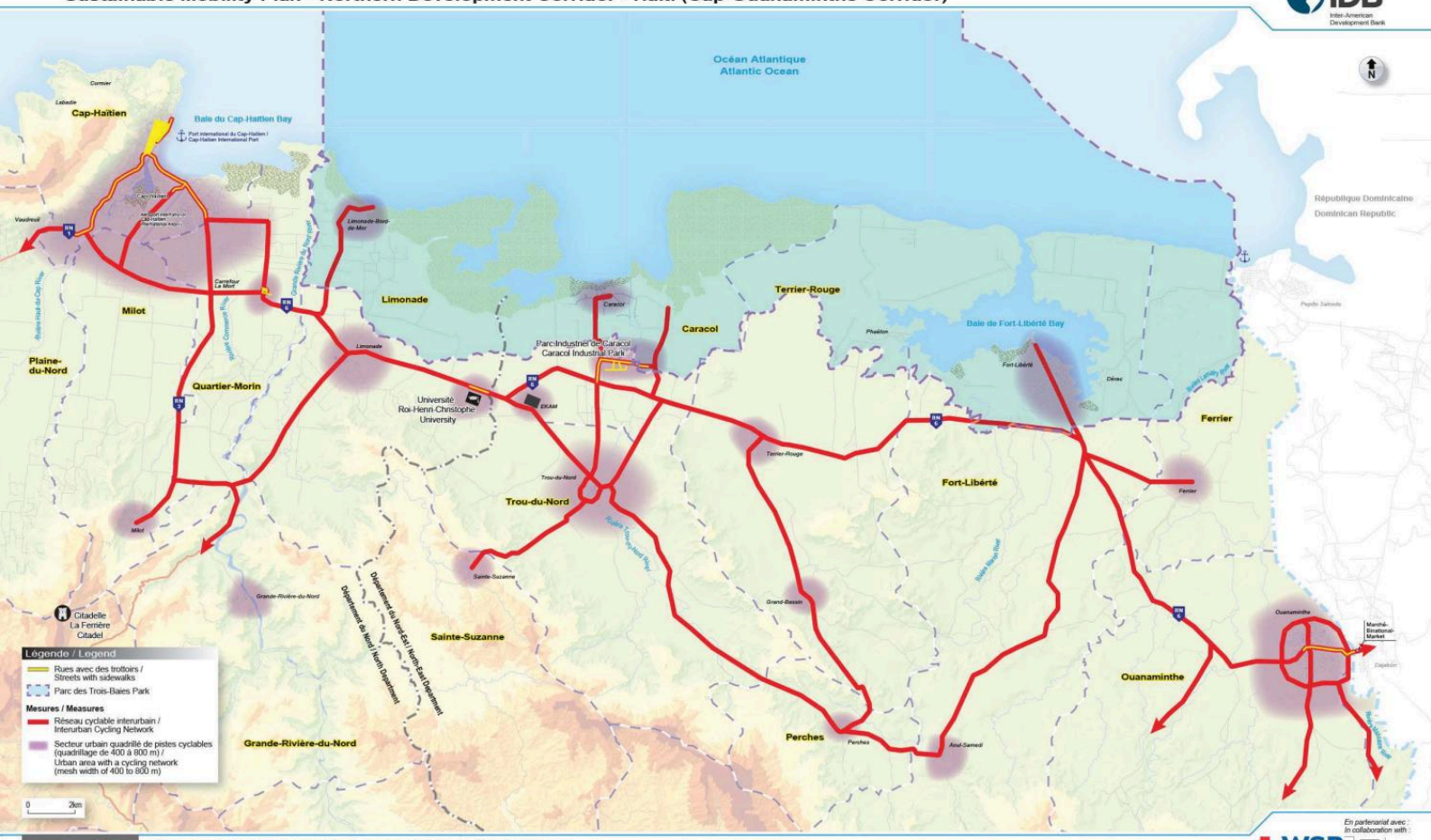


Figure 6.2 **Mesures proposés pour le cyclisme / Proposed Cycling Measures**

141-15934-00_Fig6-6_ProposedCyclingMeasures_20150408.ai

En partenariat avec : / In collaboration with : WSP IBI DAA

6.4 COLLECTIVE TRANSPORTATION

6.4.1 TRANSITIONNING FROM INFORMAL TO FORMAL TRANSIT

Currently, almost all existing collective transportation services are provided through informal tap-tap operators, except for the PIC and interurban coaches. This transition will require the development of an agency or organization responsible for determining and enforcing minimal quality of service, establish fares, develop transit routes and maintain transit stops and stations. This agency should be self-funding receiving revenues from the region's transit operators. Additional revenues could be generated by renting vending areas at major transit stations to merchants. Quality of service (vehicle quality and capacity) standards should increase gradually over time as the region's economy develops.

The objective is to gradually implement transit quality of service standards that are improved over time. In the short-term the focus should be:

- → Ensuring that tap-taps are safe and in good-working condition.
- → Operators charge appropriate fare levels (high enough to encourage new transit operators to offer services, but still relatively affordable)..[9]
- → Develop a short-term transit network.
- → Enforce the use of well-located bus stations and stops.

Over time, the focus should shift towards:

- → Introducing higher quality and capacity vehicles.
- → Monitoring and implementing vehicle pollution controls.
- → Review the transit network, preferably on an annual basis.
- → Introduce minimal service frequencies.

6.4.2 TRANSIT NETWORK STRUCTURE

The region's urban centers and important centers are all clustered along the RN6/RN3 corridor. For this reason, it is proposed to use this structure as the backbone of the region's transit system from Station Madeline to Ouanaminthe. Frequent bus routes would travel between major transit stations to serve the region with a number of local stops since this is where the bulk of demand is concentrated. Local transit services serving urban areas (using a network of major urban streets) and rural areas would operate from these stations. Interregional transit services should also use the region's major transit stations to increase connectivity. A proposed network structure is shown in figure 6.3.

The PIC would continue to be served by its existing bus routes serving Limonade, Trou-du-Nord, EKAM and Terrier-Rouge. Additional vehicles will be required to meet future demand.

6.4.3 MAJOR TRANSIT STATIONS

A network of major bus transit stations is required to serve the region, these include:

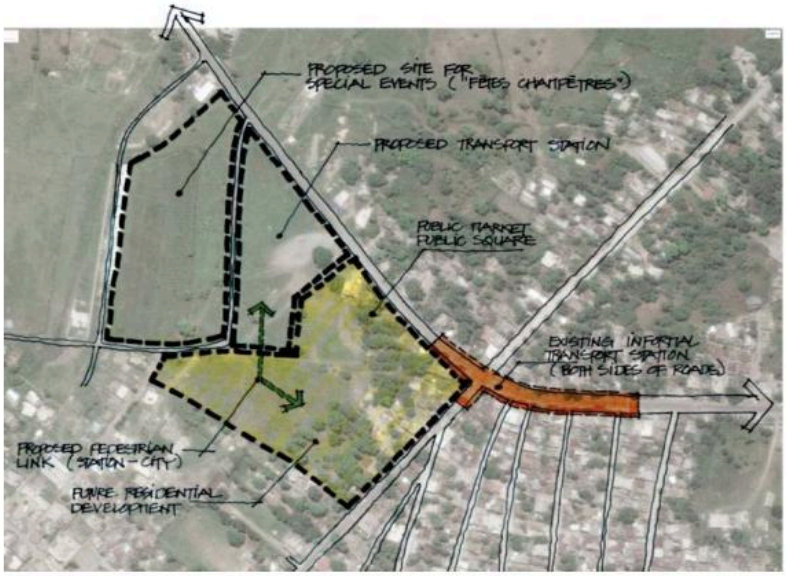
- → An expanded Station Madeline in Cap-Haïtien, also served by interregional buses.
- → A new station at Carrefour La Mort in the vicinity of the RN6/RN3 intersection.

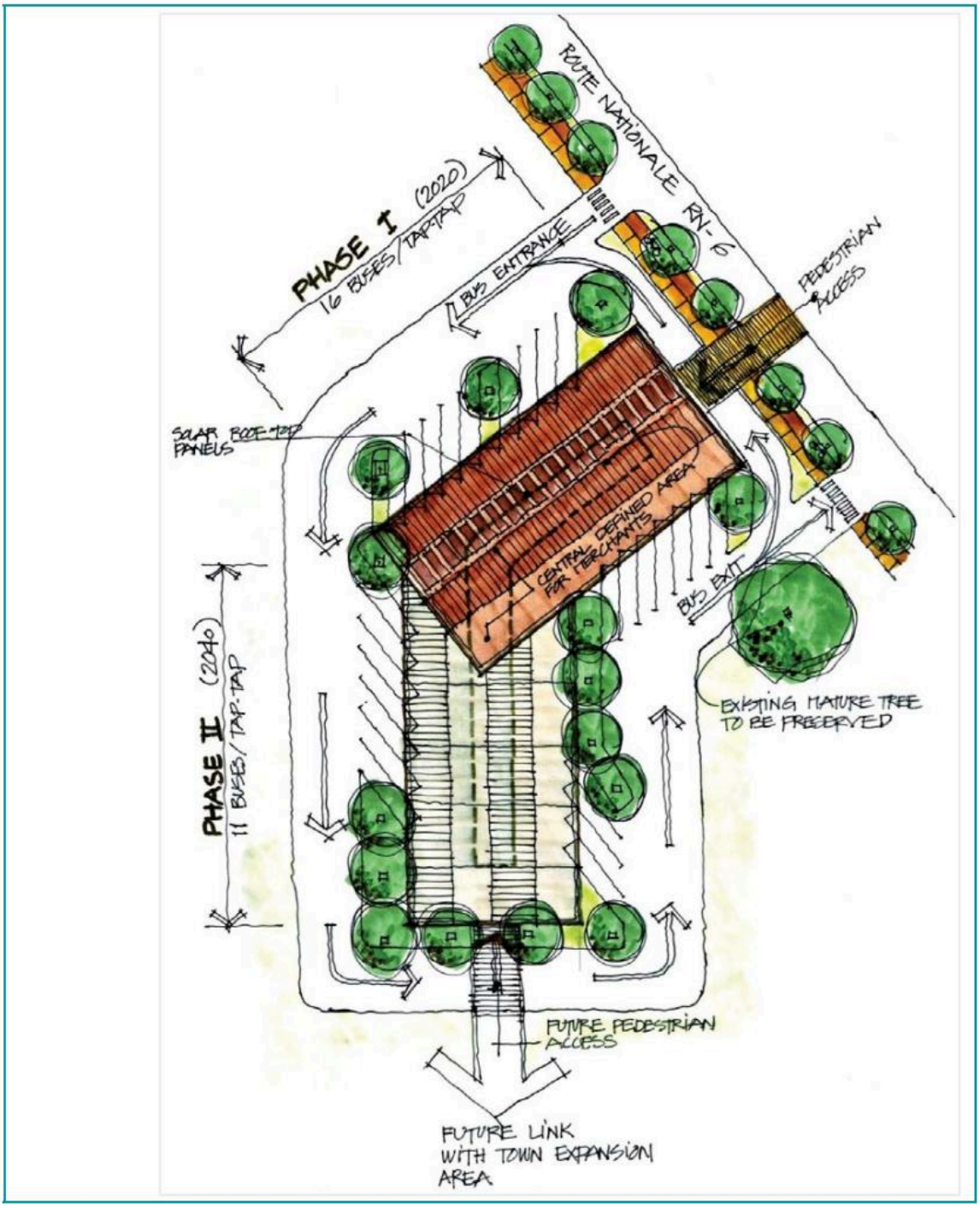
[9] It seems unlikely that transit fares can be set low enough to meet the IDB's affordability criteria without substantial subsidies or wage increases.

- → A new station in Limonade to replace existing roadside informal stops.
- → A new station in Trou-du-Nord to replace the existing station.
- → A new station in Terrier-Rouge to replace existing roadside informal stops.
- → A new station in Fort-Liberté to replace existing roadside informal stops.
- → A new station in Ouanaminthe at a site to be determined to replace existing informal stations.

The final location of these stations should provide good access to the urban area (close to the center of the urban area), while providing good transit operational conditions (close to the RN6). Ideally, many supporting land uses will be located close by. These stations should not be simple bus terminals, but should be integrated into adjacent areas and provide space for vendors and social activities. Direct and comfortable walking paths should lead to these areas. Proper input from tap-tap and bus operators will be required to ensure they will be used once open. A sample design was prepared for Limonade as shown below (further information is available in Appendix H).

Table 6-4 Pre-Investment Project: Proposed Bus and Tap-Tap Station for Limonade

Context	This pre-investment project consists of the development of a new well planned and integrated transit station in Limonade, in one of the future priority development zones identified for the city. The success of the operation will therefore be used as a premise for the replicability of this intervention to other cities in the Northern Corridor (Trou-du-Nord, Terrier-Rouge). Currently, tap-taps stop along the RN6 as shown below in orange.
Site and proposed concept	A site was identified at the western entrance of the city due to its proximity to the RN6 and the town center as shown below. It is also located within the proposed urban growth limit.  The proposed development concept aims to maximize the use of available space on the current site and to identify possible future extension areas. In addition to the traffic and parking spaces, the proposed development identifies areas for the merchants and proposes a future pedestrian/light traffic link with the future development area of the city. A total of 16 berths are planned for 2020 and this will be upgraded to 25 as a second phase by 2040. A turn-around loop, merchant areas and secure pedestrian and bike access points were identified. The implementation of this new major equipment for the city of Limonade will serve as a trigger project, around which the future development of the city center will take place, with a new development based on mixed uses including a public market, a new public square, new residential developments and others.


ROUTE NATIONALE RN-6
PHASE I (2020)
16 BUSES/TAP TAP
BUS ENTRANCE
PEDESTRIAN ACCESS
SOLAR ROOF-TOP PANELS
CENTRAL DEFINED AREA FOR TIER VENDORS
BUS EXIT
PHASE II (2040)
11 BUSES/TAP-TAP
EXISTING MATURE TREE TO BE PRESERVED
FUTURE PEDESTRIAN ACCESS
FUTURE LINK WITH TOWN EXPANSION AREA

6.4.4 TRANSIT INFRASTRUCTURE

Very high transit volumes are expected along the RN6 corridor as can be observed in the previous chapter. This will require a number of measures:

- → High capacity vehicles along most of the RN6.
- → Construction of a network of major transit stations.
- → Construction of a number of bus stops with bus bays and safe pedestrian crossings at select locations along the RN6.
- → Right-of-way protection for transit reserved lanes along the RN6 between Cap-Haïtien and Trou-du-Nord.
- → Construction of a high capacity bus transit corridor between Carrefour La Mort and Station Madeline in Cap-Haïtien along the RN3/RN6. Over 10,000 passengers per hour are expected in the peak direction. This could take the form of reserved bus lanes or a Bus Rapid Transit system (BRT). A sample cross-section is shown in figure 6.4.

It is recommended to put in place transit supportive measures as soon as possible to ensure that a transit supportive built form is in place. Waiting after development occurs might be too late.

6.4.5 PRIORITY ACTIONS

The improvement of the transit network will require considerable efforts over a long time period. That said, the following next steps are recommended:

- → Plan and protect a corridor for reserved bus lanes between Carrefour La Mort and the center of Cap-Haïtien.
- → As part of the development of urban plans, develop a mesh network of urban streets that can accommodate transit vehicles. Minimally, required right-of-ways should be protected.
- → Formalize tap-tap stops in urban areas along the RN6 by creating new properly located stations or through minor improvements (sidewalks, shelters, etc.) in areas already used as stops.
- → Create a regional planning agency. In regards to transit, initial steps should focus on vehicle safety and the general organization of the collective transport industry. The industry should be consulted regularly to ensure the effectiveness of new measures and regulations.
- → Review import duties for collective transport vehicles.
- → When building new roads, anticipate that these will be used by tap-taps and buses. Properly built stops should be provided. Allow for a retrofitting budget to implement these stops in new urbanized areas a few years after implementation.
- → Develop active transport facilities to access stops.



Figure 6.3 **Mesures proposées pour le réseau de transport collectif et de l'Infrastructure / Proposed Transit Network and Infrastructure**

141-15934-00_Fig6-3_ProposedCollectiveTransportMeasures_20150409.ai

En partenariat avec : In collaboration with :

6.5 ROAD NETWORK AND URBAN STREETS

6.5.1 INTERURBAN ROADS

The future interurban road network is presented in figure 6.6 and the following modifications are recommended:

- → The Haitian National Road Network is complete and the RN1 and RN3 are both completed to allow the passage of trucks between the study area, Port-au-Prince and the rest of the country.
- → The PIC's eastern gate and the road leading to the RN6 are passable for trucks and buses to better distribute demand. A new road is built between Trou-du-Nord and the PIC to shorten travel distances and serve this growing urban area, including a complementary bike path.
- → The RN6 will be widened to 2 lanes per direction in Cap-Haïtien with a median. Protection for widening is recommended between Cap-Haïtien and Trou-du-Nord and approaching Ouanaminthe.

6.5.1.1 IMPROVING ROADS TO VILLAGES AND TOWNS FURTHER AWAY FROM THE RN6

Projected volumes do not justify major improvements leading to communes further away from the RN6 (Sainte-Suzanne, Capotille, etc.). On the other hand, improvements to these roads would be beneficial in terms of providing transit access to these isolated areas, encourage the development of agriculture and the development of natural resources and provide all-weather access. A network of roads would also create greater resiliency to natural hazards. As few urban development tools are in place, roads in environmentally sensitive areas should be deferred until these are implemented and effective. A new road between Limonade and Grande-Rivière-du-Nord does not seem necessary according to projected volumes.

6.5.1.2 DEVELOPMENT OF A SECONDARY EAST-WEST ALTERNATIVE TO THE RN6

A secondary east-west road is proposed south of the RN6 to avoid going through the environmentally sensitive mangroves along the coast as shown in figure 6.6. Proper land-use controls will be required to ensure that urban development still only occurs in desired areas. This road is required to improve resiliency in the case of a road closure and was a key demand of local stakeholders.

6.5.1.3 LINKAGES WITH THE DOMINICAN REPUBLIC

At this point, there is only one link between the study area and the Dominican Republic. The results of the analysis have shown that volumes are insufficient to justify a new link with the Dominican Republic. That said, if trade increases significantly between the two countries, one or additional border crossings could be required. A link between the RN6 at Ferrier and Dominican Highway 45 would reduce travel times and avoid congestion in the growing city of Ouanaminthe.

6.5.1.4 NATIONAL ROAD FROM CENTRE-ARTIBONITE TO OUANAMINTHE

Projected volumes do not seem to justify a new road between Ouanaminthe and the Centre and Artibonite departments. That said, this region is greatly underserved by roads and it would allow the development of agriculture in the Centre and Artibonite departments.

6.5.1.5 SECURITY IMPROVEMENTS ALONG THE RN6

Even though detailed accident data is unavailable, a number of intersections along the RN6 were not built according to best practices when the RN6 was retrofitted recently. The following intersections identified in figure 6.8 should be improved:

- → RN6 / Trou-du-Nord Road east access: this intersection has a number of low-angle movements that have low-visibility and high vehicle turning speeds. This intersection should be transformed into a T-intersection to lower speeds and improve visibility.
- → RN6 / Caracol Road: the turning radii are too wide and vehicles turn at high-speeds. A proposal for this intersection is shown in appendix H.
- → Intersections in urban areas where many pedestrians cross the RN6 should also be modified to have shorter pedestrian crossings through the installation of pedestrian refuge islands and curb extensions.

Also, as mentioned previously safe pedestrian crossings should be provided periodically to allow safe pedestrian crossing points. Examples are shown in appendix H.

Periodic safety assessments should be undertaken along roads to identify safety deficiencies.

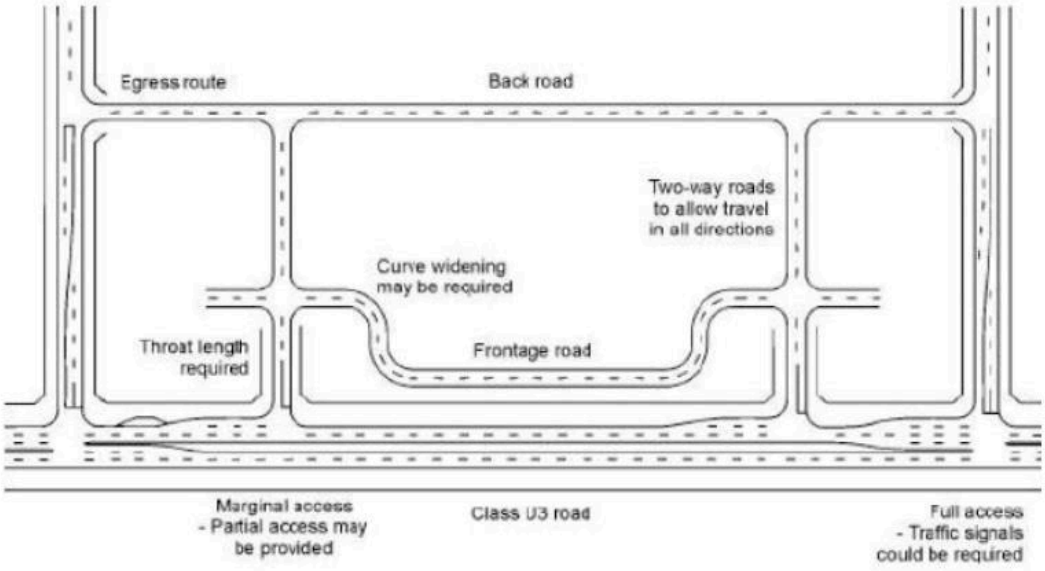
6.5.1.6 ACCESS MANAGEMENT GUIDELINES

The objective of access management is to limit and consolidate access along major roadways while providing access on parallel roadways. The application of these varies according to the type of road (National Road, secondary road and local) and by area type (urban and rural). Generally, prescriptions are more restrictive on high-speed rural National Roads and less so on local streets in urban areas. Detailed guidelines will need to be developed, but at a minimum, the following guidelines should be followed:

- → Restrict access points within and in proximity to intersections, tight curves and bus stops;
- → Limit the number and the width of access points for each property (ideally, a maximum of one entry with a maximal width of 6m);
- → Promote the use of frontage roads, service roads and parallel street networks instead of locating access points on National Roads;
- → Adopt and enforce minimal sight-distance for access points according to the speed of travel and limit the number of obstructions in high-speed areas;
- → Limit the number of access points along high speed roads by encouraging adjacent property owners to consolidate access points.
- → The number of vehicular access points should also be limited to avoid conflict points with pedestrians and cyclists.

The MTPTC would be responsible for applying guidelines along National Roads. A regional planning agency would be able to advise communes on access management on other roads.

Promoting the use of frontage roads and parallel streets to minimize access points on major roads (South African Road Standards).



Source: Sokolow (2006). Note: Vehicles drive on left in this diagram (South Africa).

6.5.2 STREET GRIDS IN CAP-HAÏTIEN AND OUANAMINTHE

In Cap-Haïtien, a network of major streets is developed to better distribute traffic and serve anticipated urban development towards the south as observed in figure 6.6. The development of an urban street grid is limited by a number of barriers including the Haut-du-Cap River, the mountains and the airport. A link between the RN6 and the RN1 south of the airport is added to reduce demand on the RN3 between Carrefour La Mort and Station Madeline. Ideally, multiple links would be added (mesh width of 400m to 800m) to better distribute demand, provide better connectivity and reduce the number of required lanes. This would improve pedestrian safety.

In Ouanaminthe, a grid of major urban streets is developed around the existing urban core-as shown in figure 6.6-to improve the structure of future urban growth, better distribute traffic and avoid widening the RN6 through the center of the city which would require significant expropriations and entail major social and economic impacts.

If the whole right-of-way is not built initially due to the considerable investment that is required or other reasons, posts should be placed at the limits of the fully built infrastructure. The local commune or the MTPTC will need to enforce this right-of-way with regular visits and enforcement, probably on a weekly basis until these streets are fully built. This strategy is also applicable to any future planned streets. This strategy was implemented successfully along the RN1 southeast entrance of Gonaïves, although it required continual efforts from the commune.

All future streets in urban areas should provide for the circulation of buses, pedestrians and cyclists. The recommendations below also apply to Ouanaminthe and Cap-Haïtien.

6.5.3 STREET DESIGN AND GRIDS WITHIN URBAN AREAS

The development of proper street grids and complete streets designed for all modes are integral to the success of the Plan. There are two types of street grids:

→ A network of continuous major streets that serves all modes, and is especially critical for providing effective transit services. Ideally, a grid of streets spaced from 400 to 500m

apart would be provided in all urban areas to provide efficient transit service with good coverage.

→ A well-connected local street networks that is especially important for encouraging active transportation and providing access to transit services. These should have both good internal connectivity and to major streets where transit is provided. Better connected cities with a higher proportion of space devoted to streets and urban spaces are often more prosperous, have higher quality of life and higher productivity (UN-Habitat, 2013b).

This will especially be a challenge in adapting informal urban areas, most of which have poor street connectivity. For example, informal settlements typically only have 3% to 10% of the area dedicated to streets, vs. 20% to 40% in city cores (UN-Habitat, 2013b). The density of intersections follows a similar trend.

Streets are much more than transport infrastructure; they are also a social and commercial space. Ideally, streets should accommodate all of these users where space allows. Table 6.1 presents use and design guidelines for various street types. Figure 6.5 presents typical urban cross-sections. Minimal cross-sections should also be enforced in areas with urban development.

These networks should be identified as part of the local urban commune plans. A network of streets should be identified as part of this process in the next few years. Right-of-ways should be acquired with appropriate compensation, where required, as soon as possible..[10] These right-of-ways should be protected by placing posts at its limits. The local commune or the MTPTC will need to enforce this right-of-way with regular visits and enforcement, probably on a weekly basis until these streets are fully built.

The development of proper street grids requires a considerable effort in the coming years. This effort pales in comparison with the efforts that would be required in the future to retrofit a neighborhood that developed informally. Without properly connected street grids, the residents of these neighborhoods will have less access to public services, to transit services, the installation of utilities and public safety.

Table 6-5 Proposed Street Design Parameters for Urban and Rural Roads

Type of Street	Major Urban Street	Local Urban Street	Major Rural Road	Other Rural Road
Function				
Pedestrians	Allowed, sidewalks provided on both sides	Allowed, sidewalks provided or shared street	Allowed, pathway provided on at least one side	Allowed, usually on shoulder
Cyclists	Allowed, dedicated facility provided	Allowed, usually shared with traffic	Allowed, facility provided, usually shared with pedestrians	Allowed, dedicated facility or shoulders
Transit	Yes	No	Yes	Yes
Private vehicles	Yes	Yes, not encouraged	Yes	Yes
Trucks	Allowed	Not allowed	Allowed	Allowed

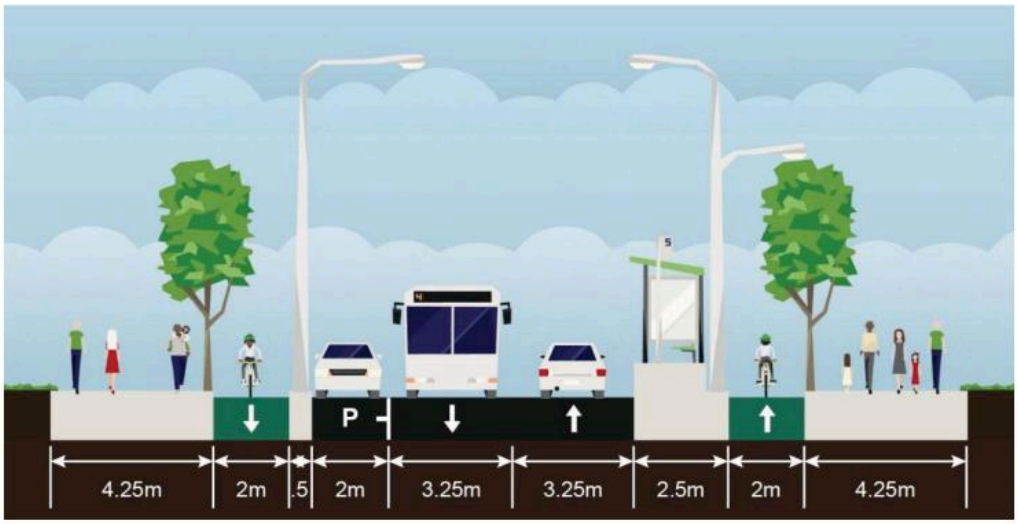
[10] Alternatively, this can be done by developping street grids for an entire neighborhood at one time. Landowners who benefit most due to the increased value of the land can compensate those who lose out most (Economist, July 2nd, 2016).

Type of Street	Major Urban Street	Local Urban Street	Major Rural Road	Other Rural Road
Vendors	Allowed outside travel portions of street	Usually present in market areas	Allowed at some transit stops and intersections where space allows	Usually not present
Characteristics				
Speed limit	40 to 50 km/h	30 km/h or less	50 to 90 km/h	50 to 80 km/h
On-street parking	Can be provided	Can be provided	On shoulders, limited use	On shoulders, limited use
Number of travel lanes per direction	1 to 2	1	1 to 2	1
Transit lanes	Where required	No	Where required	No
Design width				
Total width	20-45m	10-21m	16.5-50m (without ditches)	17-24m (without ditches)
Sidewalks, footpaths per side	1.5m-2.5m	1.5m-2.5m	2.5m-3.5m	1.5m-2.5m
Cycling facility	dedicated facility 3-6m	usually in travel lanes	usually shared with pedestrians	usually shared with pedestrians or in travel lanes
Frontage and vending areas per side	2-3m	2-3m	2-3m	2-3m
Travel lanes (width)	3-3.5m each	3m each	3.5m each	3-3.5m each
Median, where provided	2 to 4m (required when more than one travel lane per direction)	None	2 to 4m (required when more than one travel lane per direction)	None
Parking lane, where provided	2m	2m	2.5m	2m
Transit Lanes and stops	7.6m without stops 11.6m with stops	0	7.6m without stops 11.6m with stops 3m per bus bay	0

Adapted from: AASHTO (2011), ITE (2010) and ITDP (2011).

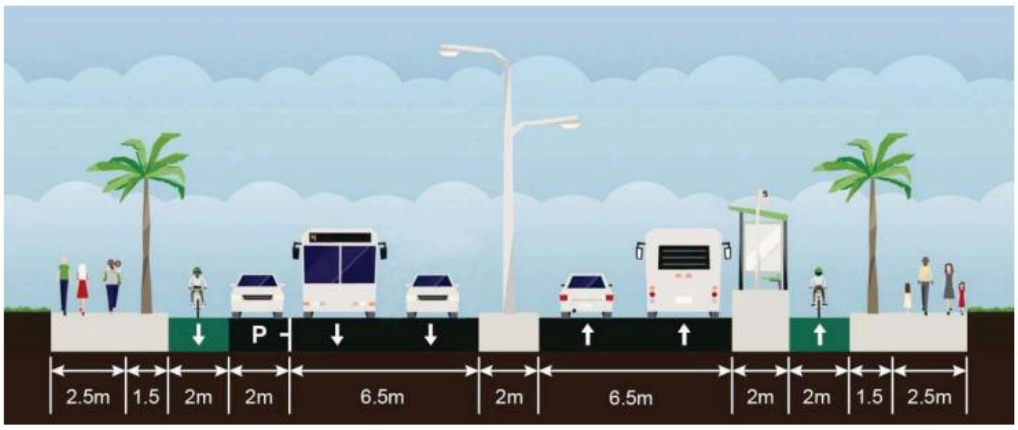
Figure 6.4 Sample Cross-Sections

Major Urban Street – 2 Lanes (24m ROW)



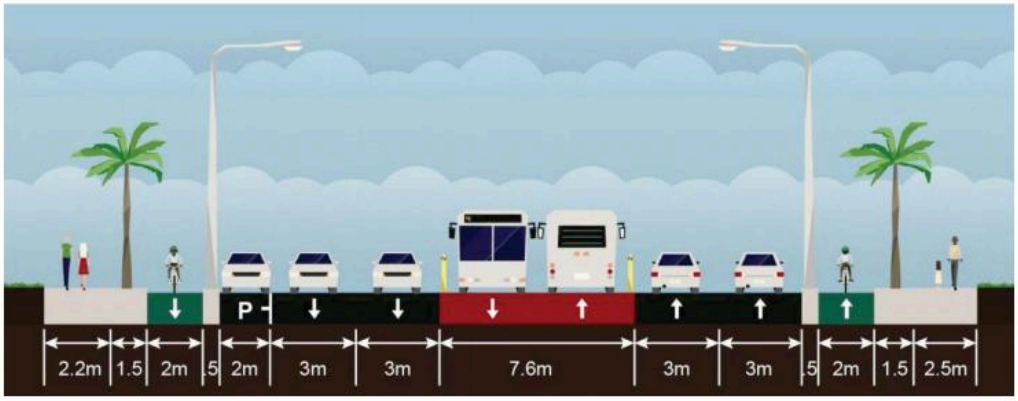
Note: Parking areas can be replaced with bus stops, merchant space, sidewalks or green space.

Major Urban Street – 4 Lanes (31m ROW)



Note: Parking areas can be replaced with bus stops, merchant space, sidewalks or green space.

Major Urban Street – 4 Lanes with reserved bus lanes (35m to 40m ROW)



Note: Where bus stops are provided, the ROW should be widened by a further 4 to 6m. Parking areas can be replaced with bus stops, merchant space, sidewalks or green space.

6.5.3.1 GATEWAY TRAFFIC CALMING AT ENTRANCES TO URBAN AREAS

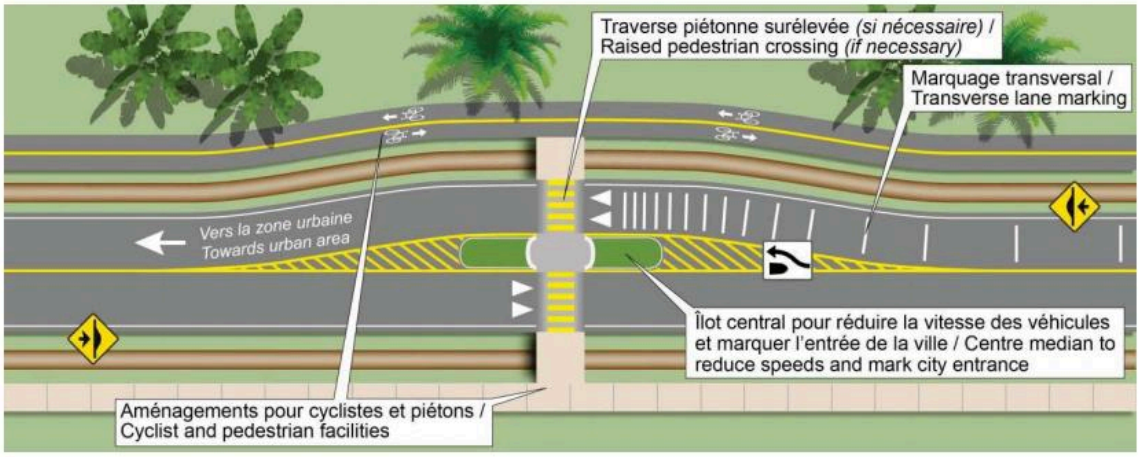
Vehicles travel at high speeds along the RN6 and other areas outside built areas. A typical gateway traffic calming concept for the transition into an urban area is shown in figure 6.5. The objective of this concept is to mark entrances in order to greatly reduce vehicular speeds and increase pedestrian safety. This is composed of a number of modular elements including:

- → A center median island to reduce the speed of vehicles entering the city;
- → A speed table with a pedestrian crossing (if required);
- → Advance signage and markings;
- → Proper roadway lighting;
- → The possibility to include an archway into the design;
- → The provision of sidewalks and/or bicycle pathways on one or both sides.

This concept needs to be adapted to each city entrance through a design exercise. In cases where an intersection is close to the desired location, a roundabout could be used instead of a median center island to reduce travel speeds. Temporary measures such as bollards, transverse markings and lighting can also be used. Sample design guidelines are available in Appendix I. Note that these should be adapted to the appropriate design vehicle (truck, farm equipment or other vehicle types). Archways marking the entrance of a commune can also be incorporated into specific designs and are used throughout Haiti.

Initially, these could be implemented as part of a carefully monitored pilot project in one or two urban areas before being replicated elsewhere.

Figure 6.5 Sample Traffic-Calming Concept for Urban Area Entrances



Roundabouts can also mark the entrance to an urban area if there is an intersection.





Source: WSP. (examples in Québec and Guadeloupe).

Temporary markings such as chevrons (left) and bollards (right) can also be used alone or in conjunction with other measures, although not as effective as a permanent configuration.



Source: FHWA (2009).

Many Haitian cities have archways to mark an entrance. These can be incorporated into the design, such as Barrière Bouteille in Cap-Haïtien. A high-speed impact attenuator should also be incorporated for the high speed approach if this type of structure is incorporated.



Source: Christian Claveau, Panomario (2013).

6.5.3.2 MARKETS AND MERCHANTS

Merchants and markets play an important role in the region's economy and to provide goods and services. Many are attracted to major streets and tap-tap/bus stops due to the number of potential clients. As such, they will not disappear but better management is required to ensure transport safety and better operational conditions on major streets. The following recommendations are made concerning markets and merchants:

- → Upgrade existing markets and provide new markets in well-located areas to attract this activity away from major roads.
- → Provide space for street merchants along major streets, where possible. The space provided between the sidewalk and the travel lanes along major roads to accommodate merchants as shown in the typical cross-sections in figure 6.5. This has the added advantage of further separating pedestrians away from the travel lanes and increasing their comfort. The construction of stalls that reduce the visibility of sidewalks should be proscribed.
- → Merchants and vendors should be informed and trained on the proper location of stands to maximize transport safety. This will be a continual process that will need to be implemented by the MTPTC and local communes.

6.5.4 MOTORCYCLES

Empirically, the number of motorcycles has increased drastically in the past years. Although for some an outright ban would be desirable, motorcycles have a number of advantages (greater mobility, low cost, use of less road space than cars for the same number of passengers, fast point to point travel during peak periods, provide fast access to rural areas, provide income for owners if used as moto-taxis) and disadvantages (higher pollution although less than cars and trucks, decreased use of bicycles, transit and cars, use of sidewalks in congested areas, decreased road safety, difficulty to regulate). The increase in motorcycle travel is less desirable and efficient than walking, cycling and transit, but more so than travel by private car. Therefore, the following recommendations are made:

- → The development of active transportation and transit services can help alleviate the increase in motorcycle use.
- → A motorcycle ban from certain parts of urban areas or at the same times will be very difficult to enforce. A number of Chinese cities (which have high enforcement capabilities) have tried this unsuccessfully (ITDP, 2009). It is therefore, not recommended to ban motorcycles outright, but rather work on tariffs, licencing fees and safety regulations.
- → A review of motorcycle import tariffs could be revised to reduce the number of motorcycles, although care should be taken because of the important role of motorcycles in rural mobility or encourage older more polluting models to stay on the road. Ideally, this would be done in conjunction with other import duties. This could also be done through licensing fees.
- → One of the major inconveniences of motorcycles is their use of sidewalks, bicycle facilities or pathways to avoid congested areas. This might be expected, to a lesser extent in rural areas where lower-speed motorcycles and scooters might use pathways to avoid travelling along high-speed roads. This will need to be managed though the use of physical measures rather than only relying on enforcement. The use of bollards, trees,

gates, low fences and other physical separators can be used to restrict access to walking and cycling facilities. Since they are not ideal for cyclists that need to slow considerably, they should be avoided in areas where there is less risk of use by motorcycles. This has the added advantage of restricting vehicle parking on sidewalks. Regular inspection and maintenance will be required to ensure these are not removed.

Low-fence separating bicycle path **Motorcycles using sidewalks**





Source: People for Bikes.

6.5.5 MOVEMENT OF GOODS AND ACCESS TO PORTS

The following measures are recommended for the transportation of goods:

- → The development and improvement of the road network in the urban centers of Cap-Haïtien and Ouanaminthe will allow quicker access to the Port and the Dominican Republic.
- → The PIC's improved eastern gate will allow improved access to and from the east.
- → Planned interventions of the RN1 and the RN3 will allow trucks to travel from the study area and Port-au-Prince and its larger port.
- → Urban plans should encourage warehouses, transshipment and distribution centers to be located outside the center of cities, such as Cap-Haïtien, where streets are not properly adapted for large vehicles, notwithstanding loading and unloading areas.
- → Measures should be considered to develop a Haitian logistics industry to provide services to major goods generators (trucking, warehouses, etc.).
- → Ideally, truck movements can be done outside of peak periods to reduce travel demand. That said trucks do not represent a large percentage of the overall traffic.

6.5.6 PRIORITY ACTIONS

The improvement of the road network and urban street grids will require considerable efforts over a long time period. That said, the following next steps are recommended:

- → Improve safety of the RN3 and RN6 in urban areas, especially for pedestrians, cyclists and tap-tap users in urban areas. This can be done through providing proper facilities for pedestrians and cyclists, traffic calming and urban design. Areas with safety problems

identified along the RN6 should be improved, but these do not require large-scale improvements.

- → Incorporate all road users into the design and construction process of all new roads, whether they are urban or rural.
- → Develop urban street grids for all urban areas as part of the development of local urban plans. Minimally, these rights-of-way should be closely monitored by the MTPTC and communes, likely on a weekly basis, to ensure they are not built upon.
- → Implement planned improvements along the RN1 and RN3 to allow for the passage of trucks to and from the North and South of the country.

Plan de mobilité durable – Corridor de développement du nord - Haïti (corridor Cap-Ouanaminthe)
Sustainable Mobility Plan - Northern Development Corridor - Haiti (Cap-Ouanaminthe Corridor)

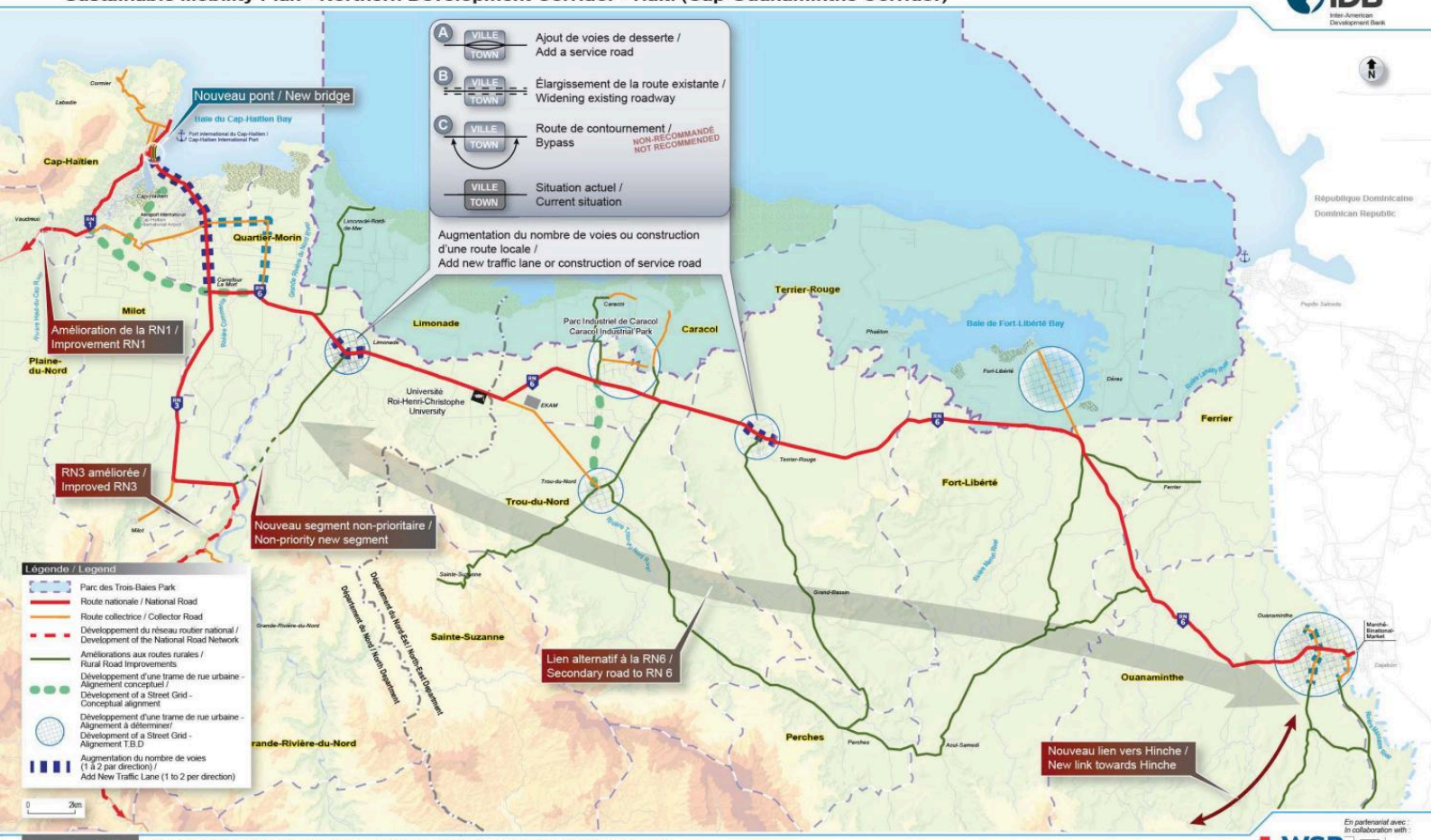


Figure 6.6 **Réseau routier régional proposé en 2040 / Proposed Regional Road Network in 2040**

141-15934-00_Fig6-9_RegRoadNet2040_20150408.ai

6.6 INSTITUTIONS

Institutions are an integral part of implementing the recommendations of this plan and operating a multimodal transportation system. Many physical measures cannot be effectively implemented without institutional strengthening (for example: land-use controls are integral to achieving a good access management policy). As mentioned in section 6.1.4, a general reinforcement of governmental, non-governmental and private organizations is also required in parallel to these planning related recommendations.

6.6.1 REGIONAL URBAN AND TRANSPORT PLANNING AGENCY

The integration of urban planning with multimodal transportation planning is a key element to ensure the success of this plan. Elsewhere, these functions are often segmented into different silos separated by mode and by role (urban planning, zoning, transit, active transport, roads, ports, airports, etc.). This leads to competing interests and poor planning (UN-Habitat, 2013a). There have been discussions to create the "*Authorité d'aménagement du Nord et du Nord-Est (AANNE)*", which would coordinate planning within the region. The implementation of such an agency is an opportunity to also integrate multimodal transport planning within this agency. The geographical scope could cover the study area and also communes to the west of Cap-Haïtien (Vaudreuil, Limbé, etc.). This new authority would coordinate closely with existing communes and ministries. This would either require an intercommunal agreement (as allowed in a 2006 decree on decentralization) or a new national law or decree. Since transit services also face the same regional challenges, the oversight of transit would be a logical next step. In addition, this agency could provide technical expertise to local communes for the development and application of policies (urban plans, active transport, access management and others).

There is also a need to better coordinate transit services throughout the region. Oversight by a regional planning organization would allow for better coordination.

Specifically responsibilities would include:

- → Strategic planning and policy:
  - Regional urban planning.
  - Multimodal regional transport planning (roads, transit, active transportation, freight).
  - Ensure coherence of local plans and projects with a regional vision.
- → Regulations and oversight:
  - Work with ministries to adopt national regulations (traffic, safety, etc.).
  - Application of transport regulations (vehicle conditions, etc.).
- → Coordination:
  - Coordinate with the MTPTC on the management of the RN6.
  - Coordinate with local communes on various projects.
- → Transit services:
  - Establish transit fares and minimal service standards by route. The responsibility for establishing transit fares could also fall under its jurisdiction (currently under the Ministry of social affairs and labor, MAST).
  - Develop criteria and training for admitting individual vehicle owners, drivers and employees.
  - Establish which corridors and routes will be served.
  - Manage and operate the region's transit infrastructure including bus stops, transit stations and bus reserved lanes. Operators would be charged fees for the

maintenance of these facilities (current model used by an owner's association of intercity transit service from Port-au-Prince to the south).

→ Technical expertise:

- Provide technical expertise to local communes on various aspects related to transport and land-use.
- Development and maintain land-use and transportation databases and tools.

This agency will need appropriate human and financial resources to achieve its objectives. It will be difficult to implement a regional plan unless transport funding flows through this agency. It will be a challenge since this will require the repatriation of numerous responsibilities from existing ministries and departments (CIAT, MPCE, MTPTC, MAST, etc.).

6.6.2 MANAGEMENT OF NATIONAL ROADS

The RN3 and the RN6 cross through the study area and serves national, regional and local functions since it is used for the transport of people and goods for international, inter-departmental and local trips. These requirements can be conflicting at times. At a minimum, the following changes should be made:

→ Consideration of transit and active transportation in all projects.

→ Application of access management along the corridor (currently under the SGU unit within the MTPTC).

→ Development of transit and active transport infrastructure along the corridor (pedestrian crosswalks, pathways, bus stops, etc.).

Alternatively, the MTPTC could delegate its authority to plan the corridor to the regional planning agency, while still being responsible for operations, management and maintenance.

6.6.3 INTERNATIONAL ORGANIZATIONS

The use of external investments is an opportunity to influence organizational changes. The construction of externally funded infrastructure could be used to bring about reforms.

International investments should also follow/consider local policies, such as urban plans once adopted (for example, when choosing a location for a new school).

6.6.4 PRIVATE SECTOR

The development of the transport services, construction and professional services industries should also be encouraged in parallel to the development of the public sector. This will require multiple interventions from education policy, taxation, procurement, tariffs and other spheres.

6.6.5 ENFORCEMENT CAPABILITIES

Positive measures to promote sustainable travel are not sufficient, appropriate regulations and their enforcement will also be required. This includes:

→ Developing specialized traffic safety police units within existing police departments in larger communes. This type of specialized unit also exists within Port-au-Prince. Their main role would be to apply traffic and safety regulations. These specialized units should also be responsible for investigating accidents, in parallel with an accident reporting system. This will require specialized training and the development of a central database.

This information should be relayed to local authorities and the MTPTC to assess whether improvements can be done and prioritize future projects.

- → A specialized vehicle inspection unit will also be required to inspect vehicle conditions, passenger overcrowding and other unsafe conditions.
- → The regional planning agency can also play a role in enforcing transit regulations (standards, use of stations, use of bus stops, etc.).

6.6.6 DEVELOPMENT OF TRANSPORT GUIDELINES

Haiti has few standards and guidelines for transport infrastructure and transport service standards. These standards can be inspired from international examples, while accounting for elements that are specific to the Haitian context. As with other elements, these standards will evolve and be completed over time. This will also require establishing committees to recommend and adapt standards and guidelines over time with representation from various organizations.

The development of these guidelines is a good opportunity to also combine them with training of Haitian professionals, while also monitoring the implementation. These will need to cover various topics and the entire project lifecycle (planning, design, construction, operations, maintenance and monitoring):

- → Road and street infrastructure and signage (lane markings, signage, geometry, infrastructure, specific treatments, etc.).
- → Active transport (infrastructure and signage).
- → Transit infrastructure (stations, bus stops, pedestrian access, etc.).
- → Transit service standards.

6.6.7 PROFESSIONAL TRAINING

Of course, this will require the continued support improvement and development of training programs at all-levels from technical courses to university level training to train professionals, managers, maintenance and construction workers and drivers. The more technical aspects related to transport can be administered by either the new regional urban and transport planning agency or the MTPTC's "*Agence technique départementale (ATD)*" which assists communes with technical services, mostly with construction related aspects.

The development of professional training is an opportunity to better train professionals on the importance of active transportation and transit in the development of projects.

The management of the region's transport infrastructure will require additional training of professionals and other staff in ministries, departments and communes by using existing materials and adapting them to the Haitian context, such as:

- → The International Road Assessment Programme's (IRAP) Road Safety Toolkit;
- → Access Management Guidelines;
- → Pedestrian and Cycling Planning Facilities (e.g. FHWA's Pedestrian Safety Action Plan Webinars);
- → Transport infrastructure maintenance;
- → Transport and land-use planning introduction;
- → Development and implementation of traffic calming measures;

- → Driver training;
- → Vehicle inspection training;
- → And others.

Certain professionals should be proficient enough to give these training sessions to others. Infrastructure standard training done in conjunction with the planning and implementation of applicable measures would be more beneficial than classroom training.

6.6.8 PRIORITY ACTIONS

In terms of institutional reinforcement, the following priority actions are recommended:

- → Establishing a regional planning agency to assist in local planning efforts. Initiate certain tasks when opportunities arise and compile information on the region gradually as it is made available.
- → Developing urban plans and reinforcing technical and financial resources of communes in the study area, especially the fastest growing ones. Determine what infrastructure is currently required and what is planned to be needed in the future and ensure that sufficient space for right-of-ways are protected and enforced.
- → Technical expertise should be reinforced in the region's fastest growing communes, and then expanded to the others.

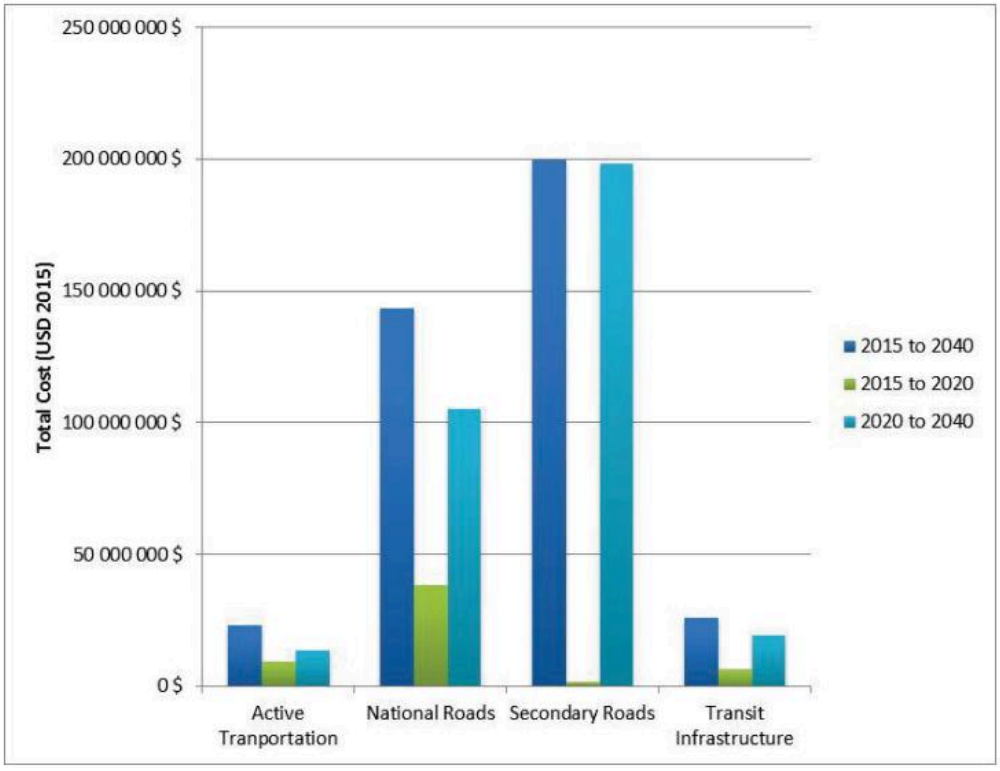
6.7 COST ESTIMATION AND PHASING OF MEASURES

A detailed cost estimate and phasing of projects is available in appendix G.

6.7.1 COST ESTIMATION

Preliminary high-level capital costs were estimated for the measures of the plan. These are based on typical general construction costs in Haiti in 2015 US dollars (per km, per station, per structure, etc.). Estimated long-term capital requirements are estimated at approximately $US 365 M. These will not necessarily be financed by the IDB. The breakdown by type of project (active transportation, transit, national roads and secondary roads) and by phase (short- [2015-2020] and long-term [2020-2040]) is shown in figure 6.7.

Figure 6.7 Breakdown of Capital Costs



Note: there are exclusions to the capital costs shown above.

Cost estimation assumptions and details are provided in appendix G.

The following elements are not included in the capital costs:

- land acquisition and relocation of residents, businesses, buildings, etc.
- unusual site conditions (soils, erosion, etc.)
- non-transport improvements such as adding electricity distribution or sewers
- local projects (improvements to local streets, development of major streets in developing communes)
- inflationary risks and increase in wages

- → distances could vary since alignments are not all defined and many projects require further evaluation and refinement
- → cost estimation of elements in mountainous zones since the final alignment has not been defined.

The costing of all of these projects will need to be refined as part of the design exercise.

6.7.2 PHASING AND SHORT-TERM MEASURES (2015-2020)

Although the overall capital program is daunting, the short-term focus should be on minor infrastructure improvements and planning such as: the development of urban plans for all communes in the study area, institutional measures, improvements to transit stations and, especially, safety improvements for pedestrians and cyclists along major roads. Improvements to the capacity of major roads are not required in the short-term, except in the center of Cap-Haïtien and possibly the center of Ouanaminthe. These short-term measures are identified in figure 6.8.

Development of the transport network will be required after 2020 according to the rhythm of the region's development. This includes the construction of bypasses/urban arterials around Cap-Haïtien and Ouanaminthe, new and improved secondary roads and transit infrastructure. A detailed phasing and costing list of projects is provided in appendix G.



Figure 6.8 **Interventions à court-terme recommandées** *(infrastructure)* **/ Recommended Short-Term Interventions** *(infrastructure)*

141-15934-00_Fig3-8_RegRoadNet_20141223.ai

En partenariat avec : / In collaboration with : WSP IBI DAA

6.8 IMPLEMENTATION

The development of the transportation system and the implementation of the Master Plan is a gradual and continual process. The measures and policies will need to be adapted over time according to successes, failures, economic and population growth.

6.8.1 REGIONAL AND MULTIMODAL COORDINATION OF TRANSPORTATION

Regional and multimodal coordination of transportation is required between all involved institutions to ensure the success of the Sustainable Mobility Plan. This coordination should extend through all means of travel: road, freight, active transport, collective transportation and others.

Successful models have been developed elsewhere where decisions are centralized into one agency and others where multiple agencies coordinate, each with a clear and defined role: planning, maintenance, regulation, etc. (UN-Habitat, 2013).

Coordination with land-use is also required; this could be done through the regional planning agency. This could take the form of committees or planning agencies.

6.8.2 DEVELOPMENT OF URBAN PLANS FOR ALL COMMUNES

Urban plans, subsequent land-use regulations and enforcement should be implemented by all communes in the study area. Transportation should be a key concern in their development, especially:

- → Creating street grids with good connectivity and allowing the development of a cycling network;
- → Creating major streets that can accommodate transit services as well as walking and cycling facilities;
- → Allowing for urban development around transit stations to create activity spaces;
- → Creating urban areas that are sufficiently dense and mixed to support transit services;
- → Avoiding informal development in undesired areas;
- → Locating various services and major land-uses in close proximity to the transportation network.

The development and implementation of these plans will require planning expertise and financial resources for each of the region's communes. The development of urban plans for the communes in proximity to the PIC (Limonade, Trou-du-Nord, Terrier-Rouge and Caracol) is necessary, but it is also a priority to develop these plans for Ouanaminthe and Cap-Haïtien to determine where new transport infrastructure should be located.

6.8.3 FURTHER DEVELOPMENT OF PROPOSED MEASURES AND POLICIES

Most projects and policies contained in this Plan will require additional planning.

The Sustainable Mobility Plan is a long-term policy document that guides future decisions about the region's transportation system. As such, the implementation of specific measures over the long-term will require some or all of the following before implementation:

- → Identification of a responsible agency (ministry, department, commune, non-governmental organization, etc.).
- → Public consultation, especially those most impacted by projects.
- → Consultation of relevant governmental and nongovernmental stakeholders.

- → Development of specific designs for new corridors.
- → Preliminary and detailed designs, taking into consideration site specific constraints.
- → Regulatory approvals (environmental, etc.).
- → Identification of project financing and partners.

The development of new standards, guidelines and policies will require the development of technical expertise.

6.8.4 ENFORCEMENT

The development of transportation in the region will also require proper enforcement of traffic, vehicle condition, environmental and land-use regulations. Existing institutions will need to be reinforced to increase their capacities.

6.8.5 MONITORING OF MEASURES AND PERIODIC REVIEW OF TRANSPORTATION PLAN

A monitoring program should be implemented to review the implementation progress and the effectiveness of the measures of the Master Plan over time. Periodic reports should be prepared outlining implemented measures and policies and selected indicators, including:

- → Accomplishments to date (implemented, under construction, in planning stage, etc.)
- → Progress on planned projects (studies, public consultation, financing, etc.)
- → Latest available indicators
- → Other relevant information

Projects should be monitored post-implementation to review their effectiveness. If necessary, modifications should be done to ensure that a project's objectives are achieved. Some users can sometimes change their travel behavior after changes are made to the transportation system and it is important to alleviate any unanticipated consequences.

A review of the sustainable mobility plan should be undertaken every five to ten years or when there are significant changes to the Plan's underlying assumptions, such as accelerated urban growth or economic development.

The regional planning agency should be responsible for this monitoring, in collaboration with other ministries, departments, communes and other actors.

7 CONCLUSION

7.1 CONTEXT

In 2011, the Inter-American Development Bank (IDB) launched Emerging and Sustainable Cities Initiative (ESCI) to support emerging urban areas—cities with demographic and economic growth above national averages—in Latin America and the Caribbean (LAC). ESCI's work contributes to the betterment of quality of life in LAC's city-regions along environmental, urban, and fiscal dimensions, through its assessment methodology (identification, prioritization, and funding of specific actions conducive to sustainability). By 2016, ESCI will have partnered with over 50 fast-growing cities in the LAC.

In mid-2013, the IDB's ESCI launched the implementation of an adapted version of its methodology in Haiti's Northern Corridor, currently home to 650,000 residents in the country's Nord and Nord-Est departments. The Corridor includes the communes closest to the Caracol Industrial Park (PIC), a flagship economic development project that may bring up to 20,000 new jobs to the region in the next few years, unlocking rapid demographic and urban growth and adding pressure to the region's services and resources. Overall, rapid and significant growth in urbanization and demography, particularly after the rehabilitation of RN6 in 2006, have led to increased development and therefore induced traffic. Indeed, mobility will be a key component for sustainable urban development in Northern Haiti, as demand for an improved transportation network connecting strong urban cores will grow with the further success and growth of the PIC, and the implementation of other new commercial, agricultural and housing developments within the region. In partnership with strategic actors in Haiti, such as the Interministerial Committee for Territorial Planning (CIAT) and the Ministry of Economy and Finance, ESCI is working to help mitigate urban development impacts and catalyze interdisciplinary planning processes in Northern Haiti.

In this context, in 2014 the IDB appointed WSP, in collaboration with IBI (since renamed to DAA | Lemay), to produce a Sustainable Mobility Plan for the region which should define the principles that will guide the desired mobility in the region. The study area is focused on three overlapping geographies: the Caracol Industrial Park, the regional perimeter surrounding the PIC, and the entire region extending from Cap-Haïtien to Ouanaminthe. The Sustainable Mobility Plan is intended to establish a detailed understanding of existing mobility patterns within the region and how these will affect and be affected by future development within the region. This baseline understanding will in turn enable the identification of opportunities and constraints for increasing accessibility and affordability of alternative modes of transport, and ultimately strengthen the link between transportation and land use planning to inform the sustainable development of the PIC and the overall development of the Northern Development Corridor.

This plan builds on existing planning exercises, documents focused on the region, sets out a framework for development within the context of existing and future mobility patterns, and gives overall guidance for the region.

To formulate the Sustainable Mobility Plan, it was necessary to gain a clear understanding of the socio-economic context of the Northern Corridor and mobility patterns throughout the region. This document has therefore been based upon a series of detailed preliminary activities, consultations, interviews and empirical data collection exercises. The key piece of empirical data collection was the elaboration of an origin and destination (OD) survey and a traffic count campaign to establish a comprehensive picture of mobility patterns throughout the region—a task that had not yet been carried out in this particular region. Stakeholder consultations were undertaken in May-June 2014 and May 2015. Theses analyses are the basis for the elaboration of a comprehensive multimodal diagnosis of the region's transportation system. The plan is focused on all forms of land-based transportation modes carrying people and goods, whether by foot, bicycle, motorcycle, tap-tap, bus, truck or other modes. This multimodal diagnosis is then used as the basis for elaborating demographic and transportation scenarios for both short (5 year) and long term (25 year) horizons which are evaluated using a travel demand model.

The Sustainable Mobility Plan is a long-term road map to elaborate the development principles and policies, guide future transportation decisions and, as such, does not detail localized measures at the township level, i.e., street corner by street corner. Instead, the plan focuses on resolving key strategic issues within the Northern Development Corridor and presents plans of specific interventions. Most notably, three pre-investment projects are developed. It is also intended to be a living document which should be reviewed and if necessary, revised according to future developments.

7.2 INSTITUTIONAL AND LEGAL FRAMEWORK

This plan builds on existing planning exercises and documents, the most notable the Plan d'aménagement du Nord et du Nord-Est (CIAT, 2012), the Cap-Haïtien – Ouanaminthe Development Corridor Comprehensive Regional Plan (AIA, 2012) and a previous Urban Development and Climate Change Study (ERM, 2014). These studies laid the groundwork by laying out a framework for future development. A critical information was the location of future development and population projections. The Strategic Plan for the Development of Haiti also identified a framework for the development of a national road network.

Many organisations are involved in transportation and development, and many of these responsibilities are fragmented into multiple entities, none of which is actively managing land-use and transportation planning in the region. Haitian planning authorities are well aware of the challenges and opportunities tied to the PIC and other economic development projects. However, local administrative capacities face a common problem: a small tax base, dependence on national-level distribution of fiscal resources, no long-term funding, and limited technical capacity for planning, managing, building and operating the transportation system.

Concerning the legal framework, many land-use, traffic and environmental regulations do exist, but the main challenge is application since very few are usually followed or applied. In some cases, it is not clear who is responsible for their enforcement (e.g. the condition of tap-taps, etc.). There is a general disregard of most traffic regulations and land-use laws are also often not applied. Most communes do not have an urban plan and land-use controls to guide their development. Little guidance exists on transportation policy in the region.

7.3 CURRENT CONDITIONS

Overall, rapid and significant growth in urbanization and demography, particularly after the rehabilitation of RN6 in 2006, have led to increased development and therefore induced traffic. Indeed, mobility will be a key component for sustainable urban development in Northern Haiti, as demand for an improved transportation network connecting strong urban cores will grow with the further success and growth of the PIC, and the implementation of other new commercial, agricultural and housing developments within the region. This rapid growth has also strained some important natural features, notably a coast mangrove now partly protected by the Parc des Trois-Baies. The Cap-Haïtien-Ouanaminthe Corridor has a number of physical barriers with few links that cross them (hills, mountains, rivers). The region is vulnerable to natural events and the lack of alternative links reduces its resiliency. A large scale natural event would likely paralyze the region. The poor quality of most road infrastructure also reduces the completeness and connectivity of the network. Where national roads cross through built areas, the road design has not been adapted for its use: there are no sidewalks for pedestrians, merchants crowd the side of the road and there are no stops for buses and tap-taps. The region has little transport infrastructure for the size of its population (197 km/streets per 100,000 capita) and what little infrastructure is provided is skewed towards cars (just over 5% of streets have sidewalks and there is no cycling or transit infrastructure even though these modes are used by the vast majority of travellers).

Although improvements to the RN6 have enhanced the transportation of goods in the region, there are few alternative links for shipping goods as side roads are impracticable to trucks. There are no roads usable by trucks to and from the South of Haiti: the RN1 and the RN3 are impassable to larger trucks. In addition, all goods transport to the rest of the country and the port must go through the center of Cap-Haïtien, an increasingly congested sector since there are no alternative routes.

Cap-Haïtien is the most important generator in the region, partly due to its large population and its larger range of available services. Ouanaminthe also attracts a vast number of trips including Ouanaminthe/Dajabon Binational Market. The center of Cap-Haïtien is often heavily congested throughout the day from Monday to Saturday as well as the center of Ouanaminthe on market

days. This congestion is due to high volumes, the lack of alternative routes, narrow streets where there are numerous deliveries and stopped tap-taps.

An origin-destination survey and a traffic count campaign were undertaken by WSP in May and June 2014 which were then used to quantify travel behavior and establish a comprehensive picture of longer-distance mobility patterns throughout the region. According to this survey, the PIC attracted roughly 5,000 trips per day in May 2014 when there were 2,500 employees (there were over 8,000 employees in early 2016). There are approximately 153,000 regional trips over a 15 hour period on an average weekday and 15,700 during the peak afternoon hour (4 to 5 PM). Since the peak hour is only 10% of the 15-hour travel, travel is relatively spread out throughout the hours of the day for most modes of travel, except for walking and buses. The tap-tap is the most widely used travel mode in the region accounting for over 55% of trips throughout the day. Moto-taxis and motorcycles, even with their low occupancy rate, account for 44,000 trips. Pedestrians and cyclists accounted for approximately 14,000 trips, although the survey locations were mostly in areas with less pedestrian activity and the actual figure is likely much higher. Some areas see upwards of 20,000 pedestrians and cyclists per day.

Trip purposes were widely distributed between all types. Work and business were the most prevalent trip purposes (37% combined). Personal business, shopping, visiting family/leisure and studies take up approximately 10% each. Travel times are much longer and travel costs much higher to reach communes south of the RN6 such as Sainte-Suzanne, Perches and Capotille. The shortest average travel times were for those in relation to the PIC, but this is partly due to the survey methodology. Travelling can be very expensive: a return tap-tap fare within Cap-Haïtien can represent over 30% of daily income for a household in the lowest quintile.

No information on fatalities was available, even though stakeholders mentioned that fatal injuries are common, a number of which occurred during the weeks when our staff was on-site. Considering that motorization rates are relatively low in the country, it can be expected that the number of accidents, including injuries and fatalities will increase further in the coming years. That said, numerous safety deficiencies were observed including: lack of pedestrian facilities, bad road conditions and lack of signage.

The analysis of current conditions was supplemented by consultations with stakeholders and surveys of transport users as part of the origin destination survey. The principal issues identified by the transportation consultation exercise relate to the poor condition of transport infrastructure, lack of coordinated land use planning and development control, and a lack of organized freight services. The construction of the RN6 in 2006 facilitated rapid, but uncoordinated, growth along the corridor. The absence of formal land use planning has resulted in many different developments being constructed directly on the roadside which has in turn created lots of pedestrian activity on an important arterial road. Given that there are no sidewalks or bicycle paths, inevitable conflicts were created between freight vehicles, general traffic, public transport boarding and alighting activities, cyclists and pedestrians, and free roaming cattle. The fragile socio-economic conditions within Haiti were also noted by many stakeholders. With the exception from the PIC, which enjoys comparatively good transport links within its walls, transport infrastructure of economically important industries such as agriculture, natural resources and tourism are lacking. In particular secondary roads are noted to be in poor condition and are prone to flooding and do not provide sufficient access to market for farmers. Transport users gave similar feedback: poor road conditions (most cited concern for all of modes used except for walking and cycling), the lack of infrastructure, security, the high cost of travel and long travel times.

7.4 TRANSPORT DEMAND SCENARIOS

The region's urban population is expected to increase by an additional 350,000 (+50%) to 700,000 (+110%) by 2040, up from the current 650,000. These population projections were refined in the Urban Growth Study (ERM, 2014, commissioned by the IDB's ESCI) and based on the American

Institute of Architects *Cummulative Impact Assessment* and the CIAT's *Plan d'Aménagement du Nord et du Nord-Est* Master Plans elaborated in 2012. The growth estimates assume a low institutional ability to control and direct urban development. The high growth scenario assumes that most planned development projects will be implemented (PIC, institutional reform, development of the transportation system, etc.). Also, original estimates showed that, should current growth patterns continue, the Caracol Industrial Park could to grow to 20,000 employees by 2020. The bulk of growth is expected in urban areas in the communes of Cap-Haïtien, Limonade, Trou-du-Nord, Fort-Liberté and Ouanaminthe; this will cause a significant strain on the region's road network.

The future travel demand was assessed using a regional transportation forecasting model that was developed with the VISUM software and calibrated and validated against the existing May-June 2014 conditions measured in the OD survey used to quantify travel behavior and mobility patterns throughout the region. This demand forecasting model was developed using the sequential four-step (trip generation, trip distribution, modal split and trip assignment) transportation planning methodology. Three development scenarios were modelled for both the 2020 and 2040 horizons: 1) high population growth (+700,000 residents by 2040), 2) low population growth (+350,000 residents) and 3) adjusted population growth (+700,000 residents). The adjusted growth scenario corresponds to the high growth scenario, except that a number of travel behaviors are modified linked to the PIC which will become one of the largest regional generators. The use of this type of model is based on a number of assumptions on demographics, economic activity and other factors. As such, it also comes with a number of limitations. It should also be reminded that this model is foremost a decision making tool and not a precise prediction of the future.

If these increases in demand occur without improving the transport network, general congestion can be expected in all of Cap-Haïtien and in Ouanaminthe. The centers of Limonade and Terrier-Rouge are also expected to be congested but on a lesser scale. This will lead to decreased travel conditions for all modes. A significant increase in the number of transport-related injuries and fatalities can also be expected based on the increase in vehicular travel. Most roadway capacity issues are expected in the long term, except for the center of Cap-Haïtien which is already heavily congested. The RN6 and the RN3 between the center of Cap-Haïtien and Terrier-Rouge would have very high transit passenger loads (5,000 to 10,000 passengers per hour in the peak direction). High capacity vehicles and transit priority measures will be required (especially between Limonade and the center of Cap-Haïtien) will be required along this corridor. Such measures could include implementing a Bus Rapid Transit (BRT) system, which would be an innovative and still plausible proposition in Haiti. This is expected for all three scenarios, although to a lesser extent in the minimal growth than the two other scenarios.

To alleviate this, a well-meshed network of streets will be required in urban areas. For Cap-Haïtien, a number of measures will be required: the construction of a BRT Corridor along the RN3, the widening of the RN3 and the creation of alternative major streets to better distribute traffic. That said, there are currently few opportunities to place east-west links except south of the airport. For Ouanaminthe, the widening of the RN6 would have major impacts on its center, but the city still has manageable size to immediately create a network of urban boulevards that will frame future development. For the centers of Limonade and Terrier-Rouge, solutions to reduce travel on the RN6 and new tap-tap stations should be examined as part of the development of their urban plans.

A second series of consultations was undertaken in May 2015 and some of the comments included: a need for an alternative link to the RN6 that can be used in cases of emergency and the futility of implementing bypass roads around towns since urban development usually follows any new road.

7.5 KEY MEASURES AND RECOMMENDATIONS

A sustainable mobility plan should not only be focused on mobility and accessibility, but its success is also dependent on the overall institutional and territorial development context. Non-transport measures are an integral part of solving existing and future transportation challenges since they are interrelated. The development of urban plans and social and economic development are essential, and intertwined, preconditions to ensure the success of the plan.

The measures and policies were based on the data collection, the evaluation of transport scenarios, document review, stakeholder consultations, best practices and firsthand observations by professionals.

7.5.1 ACTIVE TRANSPORTATION

Currently, a high proportion of adults have mobility impairments in Haiti, especially among women and people with lower-incomes, the study area has little functional facilities for pedestrians and cycling and when provided they are often inadequate.

Active transportation, mainly walking and cycling, is an integral part of the transportation system. Walking is the start and end point of any trip: either to access collective transportation services, a car or cover the entire distance by foot. Active transportation also has the advantage of being the least costly form of transportation (both for the infrastructures required and the user's costs) and is already widely used in the region. It is also the most sustainable and environmentally friendly mode of transport. The region, although surrounded by mountains, has a relatively level plateau where it could be easy to walk or cycle if appropriate infrastructure was available.

A wide-range of policies and actions are proposed, the most critical being:

- → Improving the safety of pedestrians and cyclists by improving conditions for pedestrians and cyclists and accessible to all through the center of cities and towns along the RN6, especially: Cap-Haïtien, Quartier-Morin, Limonade, Terrier-Rouge and the west entrance of Ouanaminthe. Examples of safer pedestrian crossings and traffic calming devices were developed as one of the three pre-investment projects.
- → Creating connected street grids in all developing urban areas and enforcing the right-of-way required to build these grids. This will be a key policy to implement as part of developing urban plans.
- → Developing a walking and cycling network in the vicinity of the PIC to connect it to adjacent communes. A walking and cycling network was developed as one of the three pre-investment projects.
- → Building appropriate active transport facilities as part of all new roads and anticipate urbanization. Any new major travel generator should have proper active transportation facilities connecting it to adjacent areas on opening day.

7.5.2 COLLECTIVE TRANSPORT

Bus and tap-tap services form the backbone of the region's transportation system and carry the majority of regional travel. The region's urban centers and important generators are all clustered along the RN6/RN3 corridor. For this reason, it is proposed to use this structure as the backbone of the region's transit system from Station Madeline in Cap-Haïtien to Ouanaminthe. Frequent bus routes would travel between a network major transit stations located in each urban center to serve the region with a number of local stops since this is where the bulk of demand is concentrated. A typical tap-tap and bus station was developed as one of the pre-investment projects. Local transit services serving urban areas (using a network of major urban streets) and rural areas would

operate from these stations. Interregional transit services should also use the region's major transit stations to increase connectivity. Transit priority measures, including dedicated infrastructure such as a BRT, are recommended for the RN6 and the RN3 between station Madeline and Limonade due to the very high passenger volumes that are expected. A regional planning agency is required to plan and regulate transit services. Import duties for transit vehicles should be reviewed to favor the import of vehicles in better condition and the network of private operators should be consulted regularly to ensure the effectiveness of new measures and regulations.

7.5.3 ROAD NETWORK AND URBAN STREETS

The road network is underdeveloped, often heavily congested in Cap-Haïtien and Ouanaminthe and few alternative links exist.

A network of urban streets is required in urban centers, especially in Cap-Haïtien and Ouanaminthe to alleviate congestion, reduce travel times and reduce travel distances, especially by foot and bicycle. A secondary east-west road is proposed south of the RN6 to provide an alternative link to the RN6 in case of an unforeseen closure while also avoiding cutting through the environmentally sensitive mangroves along the coast which are part of the Trois-Baies Park. A coastal road is not recommended due to its environmental impact, particularly from the potential impacts on the mangrove and likely urbanization of the corridor. This secondary road would also be beneficial to develop various industries such as farming and provide better all-weather access to isolated communes.

Safety improvements along the RN3 and the RN6 are required in urban areas, especially for pedestrians, cyclists and tap-tap users in urban areas, especially when considering that both the urban population and traffic levels are increasing. This can be done through providing proper facilities for pedestrians and cyclists, traffic calming measures and urban design in combination with proper access management guidelines. Careful consideration of merchants and motorcycles should also be undertaken. Areas with safety problems identified along the RN6 should be improved, but these do not require large-scale improvements. The development of National Roads to the rest of the country will improve access

A cultural shift is required to incorporate all road users into the design and construction process of all new roads, whether they are urban or rural. This recommendation is based on the lack of consideration of active transport as part of previous interventions.

7.5.4 INSTITUTIONS

The integration of urban planning with multimodal transportation planning is a key element to ensure the success of this plan. This requires a regional urban and transportation planning agency which mission would be to integrate multimodal transport planning, urban planning, monitor transit network, provide expertise to local communes and coordinate funding. This agency would bridge the capacity gaps of various existing institutions and clarify roles. The geographical scope could cover the study area and also communes to the west of Cap-Haïtien. This new authority would coordinate closely with existing communes and ministries.

The development of technical expertise at the communal level, fostering the development of Haitian engineering and construction capabilities and enforcement are also necessary.

The development of urban plans and reinforcing technical and financial resources of communes in the study area, especially the fastest growing ones, is a priority action. Establishing future street grids and identifying the location of key infrastructure such as bus stations is vital to providing sustainable mobility. After the adoption of these plans, ensuring that sufficient space for right-of-ways are protected and enforced will be an ongoing challenge.

7.5.5 NEXT STEPS AND IMPLEMENTATION

Most projects and policies contained in this Plan will require additional planning before they can advance. The development of the transportation system and the implementation of the Master Plan is a gradual and continual process. The measures and policies will need to be adapted over time according to successes, failures, economic and population growth.

Although the overall program is daunting, in excess of $US 365M over 25 years, the short-term focus should be on minor infrastructure improvements and planning such as: the development of urban plans for all communes in the study area, institutional measures, improvements to transit stations and, especially, safety improvements for pedestrians and cyclists along major roads. Improvements to the capacity of major roads are not required in the short-term, except in the centers of Cap-Haïtien and possibly Ouanaminthe.

A review of the Sustainable Mobility Plan should be undertaken every five to ten years or when there are significant changes to the Plan's underlying assumptions, such as accelerated urban growth or economic development. A monitoring program will also be required to monitor the implementation of measures.

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A ACRONYMS

A1 ACRONYMS

AAN	Autorité Aéroportuaire Nationale (National Airport Authority)
AASHTO	American Association of State Highway and Transportation Officials
AIA	American Institute of Architects
APN	Autorité Portuaire Nationale (National Port Authority)
AT	Active Transportation (Walking and Cycling)
ATC	Automatic Traffic Count
ATN	Association des transporteurs du Nord
BME	Bureau des Mines et de l'Énergie (Mines and Energy Bureau)
BRT	Bus Rapid Transit
CARICOM	Caribbean Community and Common Market
CCI	Chambre de Commerce et d'Industrie (Chamber of Commerce and Industry)
CIAT	Comité Interministériel d'Aménagement du Territoire (Inter-Ministerial Committee for Territorial Development)
CIP	Caracol Industrial Park (also known as PIC in Creole and French)
CO2	Carbon dioxide
CODEVI	Compagnie de développement industriel
DR	Dominican Republic
EDF	European Development Fund
ESCI	Emerging and Sustainable Cities Initiative
FED	Fonds Européen de Développement (European Development Fund)
GDP	Gross Domestic Product
HTG	Haitian Gourde, the national currency (45 HTG is approximately 1 USD)
IDB	Inter-American Development Bank
IHSI	Institut Haïtien de Statistique et d'Informatique (Haitian Institute of Statistics and Computers)
IMF	International Monetary Fund
IRAP	International Road Assessment Programme
ITE	Institute of Transportation Engineers
LAC	Latin America and the Caribbean
MARNDR	Ministère de l'Agriculture des Ressources Naturelles et du Développement Rural (Agriculture, Natural Ressources and Rural Development)
MAST	Ministère des affaires sociales et du travail (Social affairs and labour)
MDE	Ministère de l'Environnement (Environment)

MEF	Ministère de l'Économie et des Finances (Economics and Finance)
MICT	Ministère de l'intérieur et des collectivités territoriales (Interior and Local Authorities)
MINUSTAH	Mission des Nations Unies pour la Stabilisation en Haïti
MPCE	Ministère de la Planification et de la Coopération Externe (Planning and External Cooperation)
MSPP	Ministère de la Santé Publique et de la Population (Public Health and Population)
MTPTC	Ministère des travaux publics, transports et communications (Public Works, Transportation and Communications)
NGO	Non-governmental organization
NMT	Non-Motorized Transportation
OAVCT	Office Assurances Véhicules Contre Tiers
OD	Origin-Destination
OTSAGA	Organisation de transport des salariés
PANNE	Plan d'Aménagement du Nord et du Nord-Est
PCU	Passenger Car Unit
PIC	Caracol Industrial Park (Parc industriel de Caracol)
PNH	Police Nationale d'Haïti (Haitian National Police)
PSDH	Plan Stratégique de Développement d'Haïti
RN	Route Nationale (National Road)
ROW	Right-of-way
SAE-A	South Korean Textile Company
SONAPI	Société Nationale des Parcs Industriels (National Society of Industrial Parks)
UCE	Unité Centrale d'Exécution
UEH	Unité d'État d'Haïti
UN	United Nations
USAID	United States Agency for International Development
USD	United States Dollar (1 USD is approximately 45 HTG)
UTE	Unité Technique d'Exécution
VISUM	Modelling Software
VKT	Vehicle Kilometers Travelled
WEF	World Economic Forum
WEO	World Economic Outlook (prepared by IMF)

B STAKEHOLDER CONSULTATION

INITIAL STAKEHOLDER CONSULTATION MEETINGS (MAY 14TH TO JUNE 9TH 2014)

The table below presents a summary of discussions and issues by stakeholder.

Table Summary of key issues discussed at stakeholders and institutional consultations

#	Date	Stakeholder/ Institution	Key Issues Discussed
1	May 14th, 2014	Unité Centrale d'Exécution (UCE) and First Secretary of Commerce of the Canadian Embassy:	**General Considerations:** • Proposed meeting with Bureau of Mines. • The CODEVI industrial park should be considered in the study • UCE to assist in field visit.
2	May 18th, 2014	Ministère de la Planification et de la Coopération Externe (MPCE)	**General Considerations:** • First flights associated with Cap Haïtien airport expansion scheduled for October. • Strategic Development Plan of Haiti (PSDH) and the Development of the North / Northeast Plan (PANNE) should be reviewed. • most developments within the study corridor are not coordinated with a master plan. • 10 micro planned micro agro-parks are included within the study corridor **Planned projects:** • Toll planned on RN6 • New bridge linking boulevard Secteur Petite-Anse to allow freight trucks to bypass the center of the city. Vehicle restrictions to be considered. • Study area is located in floodplain. Soil bearing capacity assessments required.
3	May 20th, 2014	UCE Field Visit	**Transport issues:** • Main problem is increase in freight traffic between Cap Haïtien and the Dominican Republic boarder. • Uncoordinated developments along the corridor disrupt traffic flows and due to associated high frequency stopping activities at the roadside. They also restrict opportunities for road widening. •Slow realization of projects allows residents to reclaim properties if work not started within two years • No extensive works planned on RN6 until 2031 however the UCE recommends adding reinforcing layer on the roadway by 2021. • Planned project to build a road between Pepillo Salcedo port and Ferrier which will connect to the RN6 at Carrefour Chevry. • Freight access to the port is problematic. The entrance to Cap Haïtien is very difficult, interventions are provided on the NR3 between the new bridge and Carrefour La Mort. **Planned projects:** major irrigation project of the Ibidao plain
4	May 20th, 2014	University of Haïti Roi Henri Christophe (Limonade) Campus	**Planned projects:** banana plantation irrigation works and long term expansion of the university. **General issues:** • Concerns regarding the potential creation of a slum at a recently completed residential complex intended for students and employees near the university. This is because there is a lack of local services/shops within the development. **Transport issues:** • RN6 has conflicting uses as it acts as a bypass road, arterial road between the port and Cap Haïtien, a commercial street (market place) and a residential street. Problems created with frequent stopping activities (tap-taps & shopping), presence of speed humps and traders wandering in the roadway. • Traffic lighting focused on the RN 6 only which draws activity to this area, particularly because adjacent town centers (where activities usually occur) are unlit. • No master plan for development, land use planning or transport in place. **Potential Solutions:** • Revitalize centers to create activity and reinforce function as a livable area, regulate permissions for stops along the RN6, creation of extra width, and creation of

#	Date	Stakeholder/ Institution	Key Issues Discussed
			transportation hubs. Create Air Quality and Services Centers.
5	May 21st, 2014	Chamber of Commerce, Industry and Professions of North-East Region	**General:** Most containers destined to the port of Cap Haitien originate from the Dominican Republic via Ouanaminthe and the RN6. The majority of goods from the CIP head to the port of Pepillo Salcedo in the Dominican Republic. **Transport issues:** • North road is a major concern as it represents a bottleneck to the port of Cap-Haïtien. Only 300 to 400 containers per month get though although the port has a capacity of 1,000 containers per month.
6	May 23rd, 2014	Unité Technique d'Exécution (UTE)	**Transport Issues:** Difficulty connecting workers residing outside of 4 towns served by CIP bus services because people of Cap Haïtien, Fort-Liberté and Ouanaminthe must pay for transportation. **Planned Projects:** • UTE to launch study for the realization of a development on the periphery of CIP (radius of 5km). • Provision of bicycle lanes connecting the CIP to the 4 adjacent localities. • Provision of bicycles to businesses (as a cheaper alternative to bus services); • Identification of land uses for the realization of the park des Trois-Baies to the north of the CIP. **Potential Solutions:** • Build another road giving access from the north in case of problems on RN6. • Possibility of refurbishing the road connecting Limonade and Caracol, and access roads to population of Caracol and Jacquezy. • Residential developments aimed for new employees should be limited to the 4 communes served by employee bus services (Caracol, Trou-du-Nord, Terrier-Rouge and Limonade). • New supply of public transport buses with higher standards of comfort and a fixed schedule should be considered.
7	May 27th, 2014	SAE-A Trading Co., Ltd	**General:** • Currently 3,000 employees with projected increase to 20,000 employees by 2015-2016. • Administrative complexities, socio-economic problems (qualified staff) and political customs system inhibit expansion. • 17 buses managed by SONAPI serve 4 towns (Caracol, Trou-du-Nord, Terrier-Rouge and Limonade). An additional 22 buses are to be provided in June 2014. **Freight:** Incoming materials transit via the Dominican Republic, outgoing goods to port of Cap Haïtien (for Old Navy, Wal-Mart and Target), and to Puerto Plata/ Pepito Salcedo for Nicaragua (textiles). **Issues:** • Workers travelling from outside of served towns must pay for their transport. (eg. Cap-Haïtien, For-Liberté and Ouanaminthe); • Social problems (electricity supply and low minimum wage) have an impact on the safety and reliability of freight transportation (road blockades, protests and vandalism on RN6). **Possible solutions:** provision of bicycles (to be validated by SONAPI);
8	May 28th, 2014	Institutional Consultations (mayors and departmental directors)	**Transport Issues:** • Road safety issues caused by regular protests and blockages and vandalism/sabotage; increase of trucks and motorcycles; and free roaming cattle. • No dedicated parking zones creating frequent stops on the roadway and a public transport stations • Inadequate signage and education; lack of enforcement; inadequate structural capacity; roadside activities restrict placement and visibility of signage. **Potential solutions:** • Develop and enforce development zoning plans; • Rehabilitate the colonial roads; • Increase distance of pylons (electric, communications) from roadside; • Provide communes with resources to enforce laws and development plans.
9	May 28th,	Philippe Mathieu from Avance Project	**General:** Project is funded by USAID Agriculture and focused on five crops: cocoa, banana, rice, corn and peas.

#	Date	Stakeholder/ Institution	Key Issues Discussed
	2014		**Transport issues:** • Safety issues on the RN6 include poor (and unregulated) condition of vehicles, inadequate road design, no traffic enforcement. The RN6 also attracts people in evening and night as it is the only lit area • Lack of accident data. Records from early 2000's were presented at the meeting for consideration within the transportation study *(WSP Note: This data was from one hospital in Port-au-Prince and was not considered for this study).* • Tap-taps and moto-taxis are often in poor condition. • Services and shops tend to set up near tap-tap stops. Passengers do not want to walk very far to access the service or home and it is extremely difficult to change travel behavior. **Potential solutions:** More street lighting in rural areas, not just along the RN6. Improve the management of bus and tap-tap stations and formalize services.
10	May 29th, 2014	Cap Terminal S.A	**General:** • The terminal in Cap-Haïtien receives 2 boats per week from Miami with 30 containers: 300 containers per month. Port Expansion project to receive 2,000 to 2,500 containers per month in 25 years. The port is used at about 30% capacity. • Truck traffic is prohibited in the city between 7 and 9 AM. Deliveries are regional. Most trucks are from Port-au-Prince and the Dominican Republic. **Transport issues:** • The CIP will increase the activity of the port. • Streets of Cap-Haïtien are too narrow for truck traffic. • Speed humps are not visible and can cause problems for trucks. **Potential solutions:** • Warehouses should not be located in the city. • Scheduling of the CIP activities would enable optimization of schedules for the transport of goods through the port.
11	May 29th, 2014	La Société Nationale des Parcs Industriels (SONAPI)	**General:** • The SONAPI provides free transport for CIP employees from Terrier Rouge Limonade, du Bout, Caracol and Trou-du-Nord. • Two stations are served in Cap-Haïtien from Limonade for a charge of 10 gourdes: Samari and Barrière-Bouteille. **Transport issues:** • Not enough vehicles to have only one bus trip per destination; delays mainly due to mechanical failures, manifestations or roadblocks. • Frequent stops on the RN6 interrupt traffic flows; • Secondary roads are in very poor condition; • Fords are problematic as they slow down traffic and often flood; • Lots of accidents, • Road signs and regulations are not well understood by most users of the road. • Increase in traffic problems (above) anticipated because of the expansion of the port of Cap Haitien. **Planned projects:** • 4,500 employees in the CIP by December 2014. • Provision of bicycles to employees and construction of bike paths to the CIP is being considered by SONAPI. • 22 buses of 44 seats will be given by SAE-A. **Potential solutions:** • Regular maintenance of the road to the CIP is required. • Require dedicated space (outside the traffic lanes) for buses, tap-taps and motorcycle taxis to stop. • Training for bus drivers and other modes of transport is required. • Regulation of motorcycles and other modes that are uncontrolled and in rapid expansion.
12	June 4th, 2014	Organisation des paysans du Nord-Est	**General:** Main crops are rice, fruits/vegetables and eggs. The merchants collect rice directly from the cultivation sites. Eggs are delivered by truck or motorcycle to Cap-Haitien, the CIP, Fort-Liberté and Ouanaminthe. **Transport issues:** Lack of farm roads to get the goods from the plain to the RN6.

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			Ministry of Agriculture has a redevelopment plan for roads, but there is no funding. **Planned Projects:** A rice treatment plant is under construction (1st plant of its kind in the area).
13	June 4th, 2014	Chambre de commerce et d'industrie du Nord	**Economic Issues:** • Lack of business education amongst entrepreneurs. Many companies need to improve their organization and promotion of their business. • Tourism could be developed in the region, but there is currently a lack of infrastructure to accommodate it. **Transport Issues:** • Concerns about poor driver behavior, safety and landscaping on the RN6 • Poor state of secondary roads make access to agricultural land and mountain towns difficult. • Lack of organized freight services (no insurance, poor vehicle conditions and unreliable services, etc.). **Potential solutions:** Development plans should consider infrastructure required to facilitate tourism. **Potential solutions:** • Need to establish and enforce certain regulations / minimum standards (vehicle safety, driver training, implemented standards, etc.). • Need to establish and enforce certain regulations / minimum standards (vehicle safety, driver training, implemented standards, etc.) • Need to complete the RN3 to improve access to the rest of the country and the development of the port much give consideration to facilitating tourism. • Transportation is a key element for the economic development of the region
14	June 5th, 2014	Bureau des mines	**General:** Several mining development prospects are waiting for funding (Roche Plate, Mont Pelé, La Miel, Limbe Camp Coq) but the site access roads are also deficient or missing. **Transport issues:** • The RN6 road is dangerous and poorly maintained. • 2 lanes insufficient in some sectors. • No towing service for broken down vehicles on the roadside. • Signage is deficient. No emergency service or traffic police. • Some buildings are built too close to road. • Insufficient lighting encourages crime and anti-social behavior (theft) **Potential solutions:** • Free roaming livestock should be monitored and shoulders should be maintained (tree-cutting) • Bus stations with toilets and merchants kiosks would be desirable to better centralize operations of public transport (minibus and tap-taps)
15	June 5th, 2014	Autorité portuaire nationale	**Transport Issues:** • Location of the port of Cap-Haïtien is enclosed making access difficult. Problems with electrical power supply • Port not ready to accommodate the additional demand that the CIP will generate • Nighttime security issues prevent the transport of goods during this period **Planned projects:** • The new bridge connecting the boulevard du Carénage (seaside roadway serving the port) and the RN6 next to station Madeline will facilitate access to the port but questions remain about access to it; plans are not clear. • USAID study on relocation of the port of Cap-Haïtien in progress (Petite Anse) but no decision yet **Potential Solutions:** • The Cap-Haïtien Market should be moved to limit trucking in the streets of the city. • Night transport would more efficient and would have less impact on daytime traffic if it could be considered as an option. • A strong commitment and collaboration between stakeholders is needed in order to provide an efficient land use plan and population education.
16	June	CIAT	**General:**

#	Date	Stakeholder/ Institution	Key Issues Discussed
	5th, 2014		• Caracol Industrial Park result of urbanization "Caracol Triangle" between Caracol and Trou-du-Nord (whose project EKAM) • Improving the RN6 resulted in very rapid urbanization along the main road between Cap-Haïtien and Limonade and the Industrial Park area. • Similar development expected between Cap-Haïtien and Milot following the improvement of RN3. **Transportation issues:** • Many safety issues created because businesses and developments such as schools are located close to the RN6 roadside, encouraging lots of pedestrian activity. • The design of the road is not suitable for users' behavior (tap-tap stops, lack of sidewalks and bike infrastructure, heavy vehicles, etc.) and many developments located directly onto the roadside. • Speed humps are not a good traffic calming solution on the RN6 since it is a national road. • Flooding and free-roaming cattle also disrupt traffic and create safety issues. **Potential solutions:** • Need to formalize and anticipate urban development, otherwise the problems observed will worsen considerably. Control of urbanization of agricultural lands (protection of mangroves, forests, etc.) is also required. • Geometric highway improvements required at the connection between the RN3 and Carrefour La Mort should anticipate increased future demand. Consideration should be given to roundabouts, the location of shoreline accesses, and bus stations etc. • Access roads to southern towns and villages along the hills to the south are required; • Potential routes for new road could be between Ferrier and the Dominican Republic or between the CIP and Cap-Haïtien; • RN6 corridor would be a suitable place for a new bicycle path (flat/ low cost) • Greater anticipation and **control of development along new roads** • Empowerment of local municipalities to improve land use planning • Modernization of transportation equipment (vehicles and infrastructure) and implement minimum safety standards for vehicles and drivers. • Improve management of motorcycles and moto-taxis. • Improve access to credit for freight companies and service providers **Considerations:** • Measures to encourage residents to live in village centers which are not located directly on the RN6? • Design of a functional bus station for consumers, traders, passengers and transport operators.
17	June 6th, 2014	Aéroport international du Cap-Haïtien	**General:** • Number of international passengers passing through the airport is 36,000 / year at present and is expected to triple by 2015. Local flights bring 40,000 passengers / year (Port-au-Prince, Port-de-Paix) • Cargo flights to Nassau and Turks and Caicos (fruits, clothing and handicrafts). • In the long term, a new terminal would be built with the goal of 200,000 to 300,000 passengers / year. A Venezuelan bank already finances a portion of the cost. **Transport issues:** • Runway is not marked/lit making it impossible to fly at night. Traffic flow problems on Cap-Haïtien route to/ from the airport render land access complicated. • The CIP has the effect of increasing demand for cargo flights. **Planned projects** : • The airport is currently undergoing a expansion to accommodate a new departure hall. Completion by early October 2014. • A charter project for one-day tourist trips from Turk and Caicos is being studied • A checkpoint is planned along the access road to the airport to limit access (street vendors, beggars and animals). **Potential Solutions:** • Cap-Haïtien has potential to attract tourism, however access to the Cap-Haïtien route is problematic and creates a negative image for tourists.
18	June 6th,	USAID:	USAID aims to improve environmental sustainability of food processing and linkages to farmers markets. Financed projects include watershed, slope stabilization, irrigation, farm to market roads, etc. Focus on farming of bananas, corn, rice, beans

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	2014		and cocoa. **General Issues**: • Rapid development of region along the Cap-Ouanaminthe Corridor after completion of RN6; • Secondary roads that are used to connect agricultural farms to markets are in poor condition and require improvement • Need to protect coastal mangroves as its destruction would have a net negative loss on the regional economy. • Many new developed areas are "slums" with inadequate living conditions. • Various safety issues on the RN6. • Need all weather roads to access communities within the area. **Potential Solutions:** • Incentives and enforcement/disincentives when developing measures and strategies (carrot and stick). • Establishment of road user groups to manage various road segments (similar to watershed management groups) • Improve key secondary roads in rural areas – all weather roads required to remove problems with ford flooding etc. • Consideration of protection of mangroves and other sensitive areas, when planning new infrastructure due to their importance to regional economy. • The sustainable mobility plan should consider the impacts of the completion of RN3, and significant migration of population from the countryside to cities.
19	June 9th, 2014	Peintures Caraïbes	**General:** Peintures Caraïbes employs approximately 50 employees at CIP and live mostly in Caracol. Significant expansion planned including the production of brushes. Paint is produced locally for local consumption in Haiti. Some imported raw materials arrive via the port of Cap-Haïtien. **Transport issues:** • Insufficient road widths, and high vehicles speeds in urban areas, with no dedicated space for pedestrians. • The alternative roads which run parallel to the RN6 are in very poor condition and impossible to use for the transport of goods. • Night transport difficult due to safety issues including animals on the road, and vehicles traveling without their headlights. • Routes to access Cap-Haïtien (RN1) are not suitable for trucks (difficult to use the Port-au-Prince and access to markets in the south and center of the country). • Few alternative freight routes for the CIP. No bypass option during road blockages. • Social perception of transport projects needs to be considered. Projects should not only benefit the industrial park, but also the surrounding communities. **Potential solutions**: • Refurbishment of the RN3 would improve access to the domestic and international markets (via Port-au-Prince). • Improved surfacing would provide a considerable reduction in travel times to the north. It would also provide the ability to import/export goods via Port-au-Prince. • Improving the SOS road would improve access to the region and relieve traffic conditions in the center of Cap-Haïtien.
20	June 4th, 2014	Tap-tap owners and drivers Transport organization of employees (OTSAGA) and Transport Association of the North (ATN)	**General:** • ATN represents 50 individuals who own the majority of vehicles: • 72 trucks, 30 mini-buses (18 seats) and 6 bus (36 seats). No motorcycle taxi. All drivers are unionized. • 9 lines leave from station Madeline, number of passengers are controlled by ticketing system. **Transport Issues:** • Vehicles are too expensive due to a monopoly on vehicle sales and imports • Some areas are not accessible due to the poor quality of roads (Mont-Organisé, Sainte-Suzanne) • Tap-taps are also used to carry freight for deliveries. • Issues on RN6 such as insufficient width for trucks, maintenance is deficient, some clearance of shoulders is required, signage is often missing. • Free roaming cattle is problematic – many collisions occur at night. Animal carcasses need to be collected in the morning. • Disembarking passengers often disrupt traffic flow. Education of all users is

#	Date	Stakeholder/ Institution	Key Issues Discussed
			required. **Possible solutions:** • Desire to have better vehicles to serve tourists visiting Milot. • Moto-taxis need to be limited to a maximum of 1 passenger. • Government support required to strengthen their association with tap-taps and facilitate lines of credit. • The addition of formal intermediate stations would enable the number of additional passengers waiting at downstream bus stops to be identified. This would allow a vans to leave without being full and avoid overcrowding or passengers waiting for buses with no capacity.

SECOND STAKEHOLDER CONSULTATION MEETINGS (MAY 2014)

The table below presents a summary of discussions and issues by stakeholder.

#	Date	Stakeholder/ Institution	Key Issues Discussed
1	May 12th, 2015	BRN/MAST, MTPTC, MEF, MARDNR, MPCE, BROTHE MAST, Maires de Terrier-Rouge et Limonade	-Preoccupation about the growth of motorcycles and moto-taxis in the region and the lack of formalized transport -Preoccupation about the lack of signage and enforcement (no traffic police force, towing service, maintenance in the region) -Discussion about road safety at the intersection of the RN6 and the Trou-du-Nord Road -Discussions about a roadway along the sea and about its potential environmental impacts -Lack of planning tools and capacities at the local level -Need to give more responsibilities (and resources) to the local level (deconcentration) -Lack of alternative roadways to avoid areas during protests, events, etc. (resiliency of the road network) -Recommended building a bus/tap-tap station in Trou-du-Nord close to the RN6 to avoid congestion in the station (WSP note: this is a few kilometers away from the center of town and not very practical for users) -Need for facilities for drivers and truckers travelling along the RN6 (rest stops) -Need to build outside of areas at risk of being impacted by natural hazards -Suggestion to widen paths and improve existing paths -Location of meeting: Cap-Haïtien
2	May 12th, 2015	UEH, SONAPI, Bureau des Mines, CCI, MPCE	-Some doubts about the population figures in Cap-Haïtien (no census undertaken since 2003) -The role of institutions is critical to organize transport -Suggestion to discourage tap-taps (use fiscal measures to improve the quality of transit vehicles) -Suggested building a truck only road from the PIC to the port of Cap-Haïtien -Need improvements to the Port of Cap-Haïtien -Need to increase the state's capacities (resources, responsibilities, etc.), especially at the local level -Suggestion to build bypass roads -Location of meeting: Cap-Haïtien
3	May 13th, 2015	UTE	-Preoccupations about the location of workers (PIC statistics on worker location could be biased since employees living close are favored in the hiring process) -A sanitary landfill is planned in Limonade to manage residual material from the PIC, Limonade, Caracol and parts of Cap-Haïtien -Already examined building a bike path to the PIC -There are few services around the PIC -Examining building a rest stop outside the PIC -Questions about who should manage and maintain bus and tap-tap stations -Many bypasses have been built in the past, but the city often followed the new road -It is difficult to change workers schedule's (wages are much higher after 5 or 6 PM) -Need to control motorcycle transportation -About the Limonade tap-tap station site: a festival and football games are often held there -Location of meeting: Port-au-Prince
4	May 14th, 2015	IDB	-Discussion about some of the issues raised by local stakeholders (resiliency of the road network) -Discussions about the evolution of mobility, underlying assumptions of the plan -Suggestion to include a list of all of the projects (old and new) related to transport -Discussion on the location of the tap-tap station in Limonade, but no final recommendation on the location -Discussion about the use of bike paths (risk that they are used by motorcycles, etc.) -Location of meeting: Port-au-Prince
5	May 14th, 2015	World Bank	-World Bank is working on resiliency and disaster management (risk assessment, reconstruction, mitigation, seismic behavior of buildings, etc.) -Recommended adding trees along bicycle paths (shade) -Location of meeting: Port-au-Prince

#	Date	Stakeholder/ Institution	Key Issues Discussed
6	May 22nd, 2015	CIAT	-Favors avoiding bypasses around certain communities (not necessarily effective) -Discussion about the location of a tap-tap station in Limonade (CIAT needs to be sure they are going ahead before they can obtain the information on the name of the property owner) -Recommended building a higher quality station than the one at Mirabelais (one of the pictures shown) -Technical solutions should be favored when locating facilities -Need for access management along the RN6 (sent by email after the meeting) -Location of meeting: online
7		UCE	• Did not attend meeting on May 13, 2015 • Did not provide a date afterwards or a person
8		MTPTC	• Were not available to meet during the week of May 11 to May 14 • Did not attend confirmed online meeting on June 5, 2015 (no answer phone after)