

Republic of Nicaragua  
Ministry of Transport and Infrastructure

# The Project for the Study of National Transport Plan in the Republic of Nicaragua

## Final Report

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**Project Location Map**



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## ACRONYMS AND ABBREVIATIONS

AADT	: Annual Average Daily Traffic
AAGR	: Average Annual Growth Rate
AASHTO	: American Association of State Highway and Transportation Officials
AECID	: Spanish Agency of International Development Cooperation
AEO	: Authorized Economic Operator
ALBA	: Bolivarian Alternative for the America
APAS	: Arlen Siu Port Management
APBB	: Bluff Bluefields Port Management
APC	: Corinto Port Management
APPC	: Puerto Cabezas Port Management
APRL	: Regional Lake Port Management
APS	: Sandino Port Management
APSYS	: San Juan Del Sur Port Management
APX	: Xolotlan Port Management
BCN	: Central Bank Nicaragua
BRICs	: Brazil, Russia, India and China
BRT	: Bus Rapid Transport
C/P	: Counter Part
CABEI	: Central American Bank for Economic Integration
CAGR	: Compound Annual Growth Rate
CBP	: Cross Border Point
CONASEV	: Road Safety National Committee
CDM	: Clean Development Mechanism
CELAC	: Community of Latin American and Caribbean States
CENAGRO	: National Agricultural Census
COCATRAM	: Central America Marine Transportation Committee
COCESNA	: Central American Corporation for Air Navigation Services
COERCO	: Corporation of Regional Construction Firms
COSEP	: High Council for Private Enterprise
CPS	: Country Partnership Strategy
CR	: Costa Rica
CRT	: Regional Transport Council (Consejo Regional de Transporte in Spanish)
DANIDA	: Danish International Development Agency
DGA	: Director General of Custom Office
DGTA	: Director General of Water Transport
DGTT	: Director General of Land Transport
DSF	: Debt Sustainability Framework
DTI	: International Declaration of Transit
DWT	: Deadweight tonnage
EAAI	: Empresa Administradora de Aeropuerto Internacional: Administrator Company of Internationals Airports
EAS	: Environmental Assessment System
ECLAC	: Economic Commission for Latin America and the Caribbean
EIA	: Environment Impact Assessment
ENABAS	: Staples Nicaragua
EPN	: National Port Authority
EU	: European Union
FAA	: Federal Aviation Administration
FDI	: Foreign Direct Investment
FOMAV	: Fondo de Mantenimiento Vial in Spanicsh [Road Maintenance Fund]
FSO	: Fund for Special Operations
FTA	: Free Trade Agreement

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GDP	:	Gross Domestic Product
HDI	:	Human Development Index
HO	:	Honduras
ICAO	:	International Civil Aviation Organization
IDA	:	International Development Association
IDB	:	Inter-American Development Bank
IDR	:	Institute of Rural Development
IEE	:	Initial Environmental Examination
IFC	:	International Financial Cooperation
IGV	:	General Sales and Service Tax
IIC	:	Inter-American Investment Cooperation
IMF	:	International Monetary Fund
INAC	:	Instituto Nicaragüense de Aeronáutica Civil: Civil Aviation Institute of Nicaragua
INAFOR	:	National Forestry Institute
INEC	:	National Institute for Statistics and Censuses
INETER	:	Nicaraguan Institute for Territorial Studies
INIDE	:	Nicaraguan Institute of Development Information
INIFOM	:	Institute of Municipal Development
INIFOM	:	Nicaraguan Institute for Municipal Development
INPYME	:	Institute of Small and Medium Sized Enterprises
INTA	:	National Agricultural Technology Institute
INTUR	:	Institute of Nicaraguan Tourism
INVUR	:	Institute of Urban and Rural Housing
IVA	:	Value Added Tax
JETRO	:	Japan External Trade Organization
JICA	:	Japan International Cooperation Agency
JICA-PNT	:	JICA National Transport Plan
JST	:	JICA Study Team
LPI	:	Logistics Performance Index
MAGFOR	:	Ministry of Agriculture, Livestock and Forestry
MARENA	:	Ministry of Environment and Natural Resources
MCA	:	Millennium Challenge Account
MDG	:	Millennium Development Goals
MEFCCA	:	Ministry of Family, Community, Cooperative and Associative Economy
MEM	:	Ministry of Energy and Mineral
MHCP	:	Ministry of Treasury and Public Credit
MIF	:	Multilateral Investment Fund
MIFAN	:	Ministry of Nicaraguan Families
MIFIC	:	Ministry of Industry and Trade
MINED	:	Ministry of Education, Culture, and Sports
MINREX	:	Ministry of Foreign Affairs
MINSA	:	Ministry of Health
MTI	:	Ministry of Transport and Infrastructure
NDF	:	Nordic Development Fund
NGO	:	Non-Governmental Organization
NIC	:	Nicaragua National Road Number
NTP	:	National Transport Plan
OD	:	Origin and Destination
ODA	:	Official Development Assistance
OECD	:	The Organization for Economic Co-operation and Development
PAHO	:	Pan American Health Organization
PNA	:	National Food Program
PNAIR	:	Rural Agro-industry National Program
PNDH	:	National Human Development Plan

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PNF	:	National Forestry Program
PRGF	:	Poverty Reduction and Growth Facility
RAAN	:	North Atlantic Autonomous Region
RAAS	:	South Atlantic Autonomous Region
S/C	:	Steering Committee
SEA	:	Strategic Environmental Assessment
SICA	:	Central American Integration System
SIEPAC	:	Central American Electrical Interconnection System
SINAP	:	National System of Protected Areas
SINAPRED	:	National System for Disaster Prevention
SMEs	:	Small and Medium Enterprises
SWOT	:	Strengths, Weaknesses, Opportunities, and Threats
TEU	:	Twenty-foot Equivalent Unit
TIM	:	Mesoamerican International Transit System
TOR	:	Terms of Reference
UN	:	United Nations
UNDP	:	United Nations Development Program
UNESCO	:	United Nations Organization for Education, Science and Culture Organization
USA	:	United states of America
W/G	:	Working Group
WB	:	World Bank
WCO	:	World Customs Organization
WHO	:	World Health Organization
WTO	:	World Trade Organization



## Project Brief

<b>Country:</b>	Nicaragua
<b>Study Name:</b>	The Project for the Study of National Transport Plan in the Republic of Nicaragua
<b>Study Period:</b>	December 2012 to June 2014
<b>Executing Agency:</b>	Ministry of Transport and Infrastructure (MTI)
<b>Implementation Agency:</b>	Ministry of Transport and Infrastructure (MTI)
<b>Study Area:</b>	The study covered the entire area of the country. Likewise, target modes of transport include land, maritime and aviation.

### Objectives of the Study:

The study aims to formulate a National Transport Plan with a target duration of 20 years (2033) that includes a long-term strategy for multimodal transport system, a short-term investment plan, and execution of a technology transfer to improve capability of the counterparts during the study implementation.

### Scope of the Study:

The Study is consists of the following activities:

- Review and analysis of current status and issues of the transport sector
- Review and analysis of current status and issues of PPP projects in transport sector
- Screening of the candidate PPP Road Projects and selection of the priority PPP Road Projects
- Preparation of roadmap for PPP Project Implementation and demarcation of responsibility and role of the related organizations
- Assessment of needs of technical supports and recommendation

### Background

Nicaragua, bordering Honduras to the north and Costa Rica to the south, is the largest country in Central America with shorelines on the Atlantic and the Pacific Oceans. One peculiar development characteristics of the country is the imbalance development of the coastal regions in favor of Pacific coast. For instance, in terms of transport infrastructure, the Pacific coast is reasonably well-supplied with road transport whilst the Atlantic coast still lacks adequate transport corridors to connect its ports to the Pacific.

The country's road network has a length of over 23,647 km of which only 13.2% is paved. During rainy season only 68% of the total road network is passable leaving some communities isolated during this period. This breakdown of network has also huge economic implication which further derails development of the country. Road is the leading carrier of both freight and passenger traffic which accounts for 68% and 98% respectively.

The country's infrastructure challenge is not limited to road transport. Corinto Port which is located along the Pacific coast and the only international container terminal of the country is also facing a similar challenge in the form of lack of adequate facilities to support port operations. Added to the problems facing the maritime transport is the lack of international port at the Atlantic coast.

Regarding aviation sector, the country has 19 airports with a lone international airport located in Managua. This international airport, Augusto Cesar Sandino, has been experiencing rapid increase of passenger number at a rate of 8.2% per year since 2005.

## **Current Situation and Issues of Transport Sector**

### International and Regional Cargo Transport Corridors

The international freight volume is estimated to increase at an annual average rate of 5.3% for the next 20 years (2033) which means that the volume of international freight is 2.8 times larger to the current volume. Without improvement of the cross-border customs facilities and systems, they are unlikely to handle the increasing freight and will cause serious bottleneck to the logistics system. The essential problems of Nicaraguan logistics service are summarized below.

- Freight handling capacity shortage at ports and harbors not only lower the export competitiveness but also increase import prices.
- Reliance for international freight logistics to port and harbors in neighboring countries is high. Likewise this practice increases transportation distance thus increases land transportation cost.
- The interregional trade volume handled by cross-border customs clearance facilities is 3.2 million tons in 2013, which is equivalent to 37 % of all the trade.
- Survey results carried out by the JICA Study Team revealed that trucks average waiting time for customs clearance facilities is 12 hours on the El Guasaule border and 24 hours on the Peñas Blancas border.
- The annual domestic freight transportation volume is estimated to be 13 million tons and this is forecast to increase by 2.8 times in 2020 compared to its current volume. Because domestic consumption concentrates in Managua, smooth freight flow in the city needs to be promoted.

### Road Transport and Infrastructure

Roads in the country are classified based on (i) administrative responsibilities, (ii) functions and (iii) design/construction types. The total road length of Nicaragua is 23,647 km of which 6,018km (25.4%) is trunk roads and collectors and the remaining 17,630 km (74.6%) is local roads. In terms of road supply, missing links particularly at the East-West corridor still exists which causing isolation to some municipalities. Similarly, temporary bridges which accounted to 14 along the secondary trunk and secondary collector roads put to risk the reliability of the network.

Poor pavement conditions (only 13.3% of 23,647 km road is paved), vulnerability to flood due to poor drainage system and fragile road bed, and poor maintenance due to limited budget are among the challenges confronting the road administrators in the country.

### Passenger Transport

The public bus network connects departmental capitals and municipalities via trunk and collector roads and covers the entire nation. 29% of the 485,000 daily passengers are concentrated in Managua. By 2033, this is estimated to increase by 20% resulting to 585,000 daily passengers. Survey carried out by the JICA Study Team reveals that most bus terminals are in poor condition with the exception of a few located in the capital and Granada. Some of serious problems and issues confronting the passenger transport can be summarized as follows:

- Expansion of public bus service is hindered by legal system which does not respond to current situation
- Poor road condition of some road sections where bus is operating causing a spike in operation cost and contributing to poor services
- Substantial number of old buses with poor inspection record due to insufficient number of inspection facility.

### Water Transport (including port and inland waterways)

Ports under the jurisdiction of EPN (National Port Authority) are classified as a major port in Nicaragua. Others ports are either administered by local government or by private sector. There are six international ports of which three are located along the Pacific Coast (Puerto Corinto, Puerto Sandino,

Puerto San Juan del Sur) and the remaining three are situated along the Atlantic Coast (Puerto Cabezas, Puerto El Bluff, Arlen Siu Port or El Rama). Of these, only Puerto Corinto is the lone international port capable of handling all type of cargoes thus the only ‘real’ international port. However this port is experiencing various issues that would have wider implication to international trade of the country. These include lack of space immediately behind the port for future expansion, inability to meet future cargo demand, shortage of cargo handling facility, frequent calls of international cruise ships undermine capacity of the port to handle freight activities.

Similarly, rivers, canals and waterways are important means of mobility for people and goods particularly those in the Caribbean area where land transport is undeveloped. However the lack of clear demarcation regarding water transport management among the MTI, RAAN, RAAS and other municipalities hinder development of the sector. Likewise, budget formulation for the water transport services and facilities is not appropriately executed at the national level, and no particular subsidies are granted to service providers, either. In such circumstances, the development, maintenance and management of infrastructure still depend on international aid fund.

### Air Transport

There are 16 airports in Nicaragua, which are classifiable into international airports, regional airports, domestic airports, private airports and other types of airports. Augusto C. Sandino International Airport is the only international airport. Eight airports handle regular domestic flights, which are Puerto Cabezas (Bilwi) Airport, Bluefields Airport, Corn Island Airport, Bonanza Airport, San Carlos Airport, Siuna Airport, Waspam Airport and San Juan de Nicaragua Airport.

Growth of international passengers is promising and projected to reach 1.3 Million in 2015 and 4.1 Million in 2033 which the current international airport will struggle to handle. Added to this issue is the low capacity of domestic passenger terminal of Augusto C. Sandino Airport which could not even meet the present demand. Over the Caribbean side, both Bilwi Airport and Bluefields Airports are located near seaports and it is important to improve them as a part of the multi-modal transport system in the future. This integrated development would support high value sea products to be exported efficiently to international markets such as the USA.

### **Long Term Development Vision**

A long-term development vision is established to serve as edifice to anchor vision, policy, and strategy of the NTP. In establishing the said vision, considerations into the following were made: (i) policy analysis of the PNDH, (ii) analysis of socio-economic condition of the country and existing sector development strategy and (iii) analysis of inter and intra-regional spatial structure. The transformation of country’s spatial diagram from present to 2033 is illustrated in two maps.

The vision statement towards 2033 is as follows:

*“Contribute to the achievement of National Human Development Plan of Nicaragua through the regional and spatial development vision in order to achieve poverty reduction and correction of regional disparity, while protecting basic human rights, utilize existing resources to the utmost extent for creating a better nation, reduce transport cost based on better strategies, and ensure well-balanced socioeconomic activities, authorities and identities of all regions and people’s safety.”*

### **Transport Sector Development Strategy**

The development vision for transport sector towards 2033 is as follows:

*“Growing and Greener Transport for Nicaragua: Provide effective, reliable, stable and fully integrated transport network and level of service, which will assist sustainable economic growth; contribute to reduce poverty and regional disparity; improve accessibility, mobility and safety; ensure environment sustainability.”*

Similarly, five policies were formulated designed to respond to key challenges related to transport infrastructure planning, development and management, legal, institutional and regulatory framework, safety and security, funding, and environmental considerations including climate change, among others. After establishing these policies, Transport Sector Development Strategy for each transport

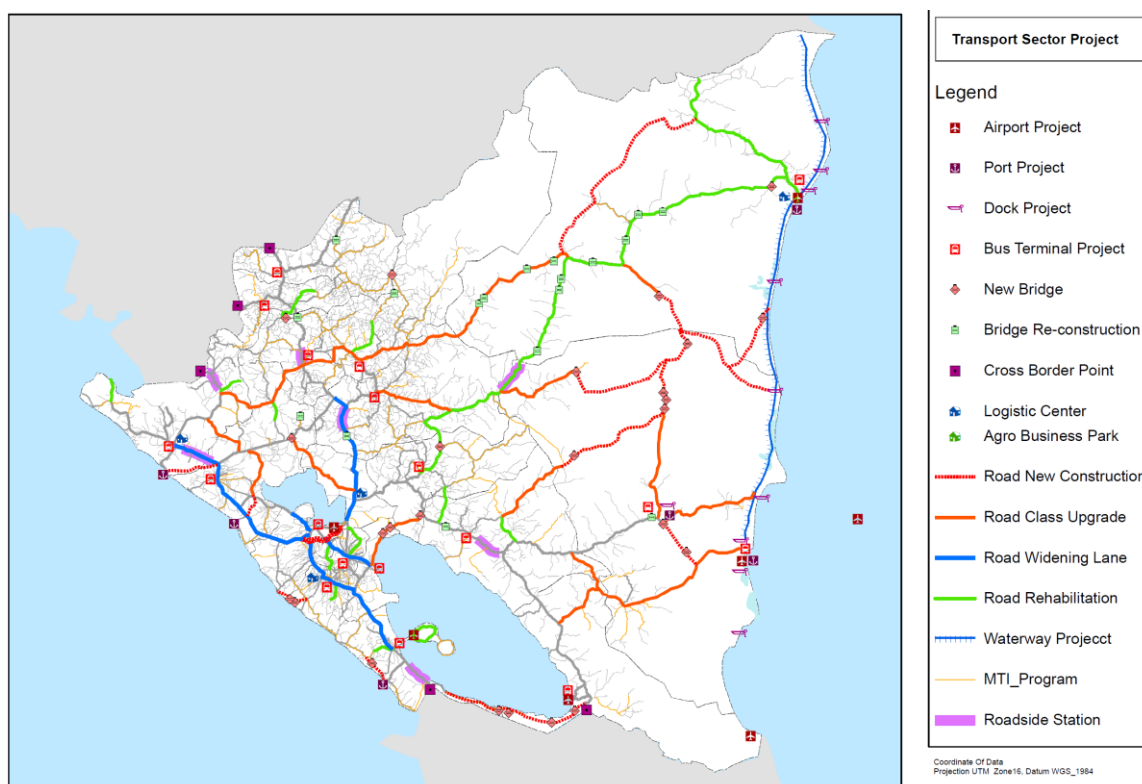
mode (road - including logistics, road transport facilities and passenger transport- ,water transport, and air transport) was then formulated. Transport Sector Development Strategy served as basis for Development Plan.

Transport Sector Development Policy	
TP-1	Secured and efficient international transport network and operation to support economic growth
TP-2	Reliable national transport network and operation to assist social and economic activity and development
TP-3	Stable national passenger transport network and operation to assist social and economic activities
TP-4	Organized transport institution, regulation and human capacity to support transport sector development
TP-5	Greener transport system to ensure environmental resilience and address climate change and natural calamity

### National Transport Plan (NTP)

The National Transport Plan is composed of the following development plans and reflected in the succeeding figure:

- Road Development Plan
- Transport Corridor and Logistics Development Plan
- Public Passenger Development Plan
- Water Transport Development Plan
- Air Transport Development Plan



**Proposed Projects in the NTP**



## High Priority Projects

A multi-criteria analysis was employed to determine high priority projects. Based on this analysis, the top 10 priority projects are as follows:

### Top 10 High Priority Projects by Multi Criteria Analysis

High Score	Group	Code	Project Name	Department	Total Score	Economic Score	Social Score
Total Score Top 10	Rehabilitation (Re-classification)	R_IR1	Granada - Tecolostote (NIC-39)	Granada /Boaco	73.0	38	11
	Rehabilitation (Re-classification)	R_IR2-1	Nueva Guinea - Bluefields (NIC-71)	RAAS	71.5	35.5	18
	Rehabilitation (Re-classification)	R_IR12	Pajaro Negro - El Triunfo (NN-114)	Rio San Juan	69.5	32	15
	Rehabilitation (Re-classification)	R_IR8-1	NIC 54&Int. of NIC-21B (NIC-57,54&5)	Jinotega /RAAN	69.0	25.5	20
	Improvement (Reconstruction)	R_IC3	Rio Blanco - Puerto Cabezas (NIC-21B)	RAAN	68.5	34	20
	Rehabilitation (Re-classification)	R_IR11	Empalme San Ramon - Matiguas (NIC-33)	Matagalpa	67.5	32	13
	Improvement (Reconstruction)	R_IC1	Boaco - Muy Muy (NIC-9)	Boaco /Matagalpa	65.0	34	13
	Improvement (Reconstruction)	R_IC2	Muy Muy - Rio Blanco (NIC-21B)	Matagalpa	65.0	34	13
	Rehabilitation (Re-classification)	R_IR10	Lapazcentro - Malpaisillo (NIC-22)	Leon	62.0	29	7
Rehabilitation (Re-classification)	R_IR8	Int. of NIC-24B- End of NIC 54 (Various)	Chinandega / Esteli	58.0	24.5	11	
Economic Score Top 10	Improvement (Widening)	R_IW8	Tipitapa – San Isidro (NIC-1)	Managua / Matagalpa	59.0	37.5	6
	Improvement (Widening)	R_IW1	NIC-2 Int. - Leon (NIC-12A)	Managua /Leon	56.0	37.5	2
	Improvement (Widening)	R_IW2	Leon - Chinandega (NIC-12A)	Leon /Chinandega	60.0	36.5	7
	Improvement (Widening)	R_IW6	Nandaimé - Rivas (NIC-2)	Granada /Rivas	59.0	35.5	7
	Improvement (Widening)	R_IW7	Jean Paul Genie Rd. - Masaya (NIC-4)	Masaya /Granada	56.0	32.5	7
	Improvement (Reconstruction)	R_IC11	Esquipulas – La Concepcion (NIC-20B1)	Managua /Masaya	52.5	32.5	2
	Improvement (Widening)	R_IW4	NIC-12A Int. – Jinotepe (NIC-2)	Managua /Carazo	51.0	32.5	2
Road Construction	R_PR1	Chiquilistagua (NIC-12) - San Benito(NIC-	Managua	46.0	32.5	2	
Social Score Top 10	Rehabilitation (Re-classification)	R_IR7	El Elpalme - Alamikamba (NN-288)	RAAN	60.5	14.5	22
	Road Construction	R_NR9	La Cruz De Rio Grande - Alamikamba	RAAS /RAAN	52.0	17.5	22
	Road Construction	R_NR8	Point B - Prinzapolka	RAAN	47.5	13.5	22
	Rehabilitation (Re-classification)	R_IR6	Rio Blanco - San Pedro del Norte (NIC-13C)	RAAS	61.5	17.5	20
	Improvement (Reconstruction)	R_IC4	Cosiguina - Potosi (NIC-12B)	RAAN	59.5	21.5	20
	Rehabilitation (Re-classification)	R_IR5	Las Esparanza - El Tortuguero	RAAS	56.5	14.5	20
	Road Construction	R_NR11	Suina - Bonanza	RAAN	54.0	18.5	20
	Rehabilitation (Re-classification)	R_IR3	El Rama-Kukra Hills-Laguna de Perlas	RAAS	53.5	13.5	20
	Road Construction	R_NR5	El Tortuguero - La Cruz De Rio Grande	RAAS	53.5	17.5	20
	Road Construction	R_NR4	El Ayote - El Tortuguero	RAAS	52.0	16.5	20
	Road Construction	R_NR12	Bonanza - Point C	RAAN	52.0	15.5	20
	Road Construction	R_NR6	San Pedro Del Norte - La Cruz de Rio	RAAS	51.0	16.5	20
	Road Construction	R_NR7	Makantaka - Karawala	RAAS	44.0	12.5	20

## Implementation Plan

The total cost of proposed projects is USD 8,826.00 Million. To reduce the burden of the government, a staging plan was formulated to spread the project implementation into short, medium and long-term.

### Project Cost by Staging (Short, Medium and Long Term)

Sub-Sector	Short Term	Medium Term	Long Term		Total
	2014-2018	2019-2023	2024-2033	After 2034	
Land Transport (Road)	737.1	1,867.3	2,650.7	2,557.5	7,812.7
Land Transport (Bus)	99.1	28.8	10.3	0.0	138.2
Maritime Transport Sector	190.6	190.6	0.0	0.0	381.2
Water Transport Sector	18.2	18.2	5.3	15.9	57.5
Aviation Sector	0.0	236.5	95.9	0.0	361.0
Logistic Sector	10.6	26.0	39.0	0.0	75.6
Total	1,055.5	2,367.3	2,801.3	2,573.4	8,826.1
(Share %)	12%	27%	32%	29%	100%

Note: Cost unit is in USD Million

## Capacity Development Programme

The proposed Capacity Development Programme is in line with the Transport Policy No. 4 (Organized transport institution, regulation and human capacity to enhance transport development (TP4)) which calls for the following objectives to pursue:

- To reinforce the capacity of transport related organizations
- To strengthen skills of personnel in transport sector

- To strengthen coordination among key players in transport sector
- To create a framework for private sector to participate

### **Conclusion**

The National Transport Plan (NTP), formulated by the JICA Study Team and designed to assist sustainable economic growth and to contribute in reduction of poverty and regional disparity is composed of the following plans and programs:

- Long Term Development Vision targeting the year 2033
- Transport sector analysis based on the extensive transport survey
- Transport Sector Development Vision targeting the year 2033
- Multi-modal National Transportation Plan covering land, water and air transport targeting the year 2033
- Transport Sector Action Plan and Investment Plan, stage-wising by short, middle and long-term development
- Implementation Structure and Capacity Development Plan to execute the proposed plans and programs

The study took into account the transport situation and development strategy not only in Nicaragua but also in Central America Region in the analysis and planning stages. A total of six stakeholder meetings have been held during the study. The broad opinions on the transport sector were collected and reflected on the plan. In addition, technical transfer from JICA expert to the Counterpart Team was executed by On-the-job training and workshops. Capacitated MTI staff are expected to carry out updating of the NTP.

### **Recommendations**

To facilitate early realization of the NTP and to ensure that long term recommended projects are still effective and justifiable in the coming years, the following are some of the recommendations:

- The National Transport Plan should be authorized by the Government as the country's national transport plan.
- Only 67% of the required investment budget for transport sector is covered over the next 20 years. This means that 33% are budgeted after 2034. The transport sector development, along with the other sectors such as energy, water and others, is an important sector for economic and social development of Nicaragua. Recognizing this, flexible public investment allocation for the transport sector should be considered.
- Private sector investment to transport sector development through PPP should be introduced. Organizational and institutional environment for private sector investment should be formulated immediately.
- This study proposes a step-wise development plan composed of short, medium and long term plan. As far as medium and long term plan is concerned, implementation schedule should be made flexible depending on the future changed of social and economic condition.
- The Long-term Development Vision and socioeconomic framework which are the foundation of the NTP have to be adjusted depending on the future economic and social circumstances of Nicaragua. Periodic update by MTI is necessary to reflect changed in social and economic conditions.
- Nicaragua Grand Canal is not considered in the NTP due to lack of details (engineering, financial and environmental considerations). However, once the Grand Canal is built, its impact on the transport sector and economy of the country is very huge. Thus, when firm plan for Grand Canal is committed, the NTP should be updated.

## Chapter 1 Outline of the Study

### 1.1 Background of the Project

According to statistics for domestic and overseas transport in 2011 published by the Ministry of Transport and Infrastructure (MTI) of the Republic of Nicaragua, land transport accounted for 68% of cargo, marine transport for 31% and air transport for 0.2%, while land transport accounted for 98% of passenger transport, marine transport for 0.3% and air transport for 0.8%. Nicaragua's road network extends to 23,647km (2011) of which a mere 12% is paved, so only 68% of the network (including low-cost paved roads) is available for traffic in the rainy season between June and December when 95% of the annual precipitation concentrates. For goods transport, marine transport is the second most predominant next to land transport, and other transport activities take place at the Puerto Corinto Port, the country's largest Pacific port that can manage international cargo, but the port has a number of issues including insufficient and decrepit port facilities, and handling capacity.

In 2000, with the support of the Inter-American Development Bank (IDB), the Government of Nicaragua formulated the National Transport Plan for 20 years (2000-2019), but the plan is insufficient in [1] that it was drawn up without taking into full account demand forecast and other economic and social analyses; [2] that it unrealistically planned road development costing USD 200 million each year, more than twice the actual annual budget of USD 80-100 million; and [3] that the plan only covers major arterial highways (of 8,000km) out of the nationwide road network (of 22,111km), ignoring major roads in production areas to which the MTI has particularly paid attention in recent years because they are indispensable for promotion of agriculture and stock farming, the sector which accounts for 30% of Nicaragua's GDP.

In November 2005 the National Development Plan (PND) 2006-2010 was released. This was reviewed by the new administration which formulated a new National Human Development Plan (PNDH) 2009-2011. It should be noted that the "human" element in the plan was introduced by the Ortega administration (PND becomes PNDH).. Subsequently, in August 2012 a draft National Human Development Plan for the new target period 2012-2016 was published. The PNDH 2012-2016 aims, with the recognition that 22 years have passed since the end of the civil war and the country has achieved economic revival to a certain extent, to encourage all classes of the people and achieve stable economic growth. More specifically, the plan aims to attract foreign investment, improve social and economic capital, reduce the poverty through sustainable economic growth, realize a stable society and restore the basic human rights that have been lost.

Under these circumstances, the Government of Nicaragua has requested its Japanese counterpart to launch a technical cooperation project for a development planning survey. The project, entitled the "Project for the Study of National Transport Plan" (the JICA-PNT), is expected to perform technical transfer so that Nicaragua will be able to formulate long-term strategies and short-term investment plans, and improve the implementation capacity for multimodal transport (efficient transportation of goods and people under a single system but performed by two or more means of transport) which has been incorporated in the revisions to the existing National Transport Plan. The project is expected to contribute to improvements in Nicaragua's measures and systems for development of the road network and other transport systems for poverty reductions and industry incubation, as well as to long-term investment planning that can maintain and manage the existing infrastructure and build new infrastructure within limited financial resources.

JICA, representing the Government of Japan, accepted this request and conducted a fact-finding survey on the transport sector in March 2012. JICA dispatched a study team in May 2012 to formulate a detailed study plan, and the team discussed the framework of the project based on items requested and site surveys, and signed a Record of Discussion (R/D). Accordingly, this Plan will revise the National Transport Plan of Nicaragua with a target year of 20 years from now (2033), formulate an action plan for priority projects, formulate a plan for capacity development the promotion of the plan, and perform technical transfer through the Project.

## **1.2 Objectives of the Project**

The Project will revise Nicaragua's National transport Plan that aims to reduce poverty through the development of a multimodal transport system by 2033, and formulate an action plan and an investment plan. It will also perform technical transfer and provide recommendations to enhance the implementation structure and capacity of the agencies concerned with the transport sector in order to make effective use of the study results and promote the realization of the policies established for the sector.

## **1.3 Scope of the Study**

This Study is implemented upon the request of the Government of Nicaragua and according to the Record of Discussion (R/D) signed in May 2012 by the Government and JICA. The JICA Study Team studies matters stated in "Study Implementation Method" presented in the Inception Report created and approved in December 2012, create reports according to the progress of the study, and give an account to and discuss with the Government of Nicaragua.

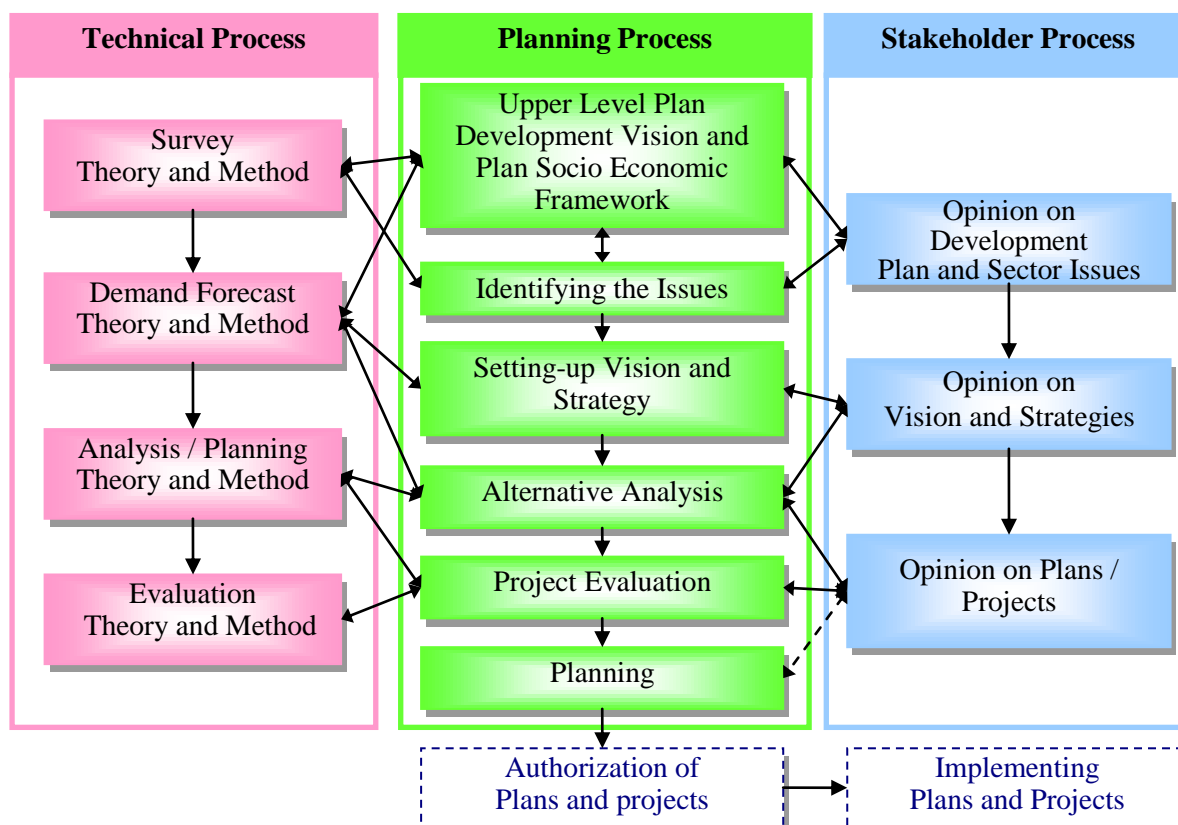
## **1.4 Study Area**

The study area of the JICA-PNT covers the entire territory of Nicaragua. Likewise, the study covers land, marine, and air transport.

## **1.5 Study Implementation Method**

### **1.5.1 Basic Approach to the Study**

Figure 1.5.1 shows three approaches to formulation of the National Transport Plan: that is, "planning", "technical" and "stakeholder" processes. These approaches are adopted for higher transparency, objectivity, rationality and fairness of the planning process. The planning process covers activities ranging between the commencement of planning and decision-making; the stakeholder process is interactive communications between the planner (the Government of Nicaragua) and stakeholders of the Project; and the technical process is consideration of the National Transport Plan from the highly specialized and technical perspectives. The planning process is chiefly carried out by a steering committee; the stakeholder process by stakeholder meetings; and the technical process by counterpart meetings and workshops.



**Figure 1.5.1 Three Approaches to Formulation of the National Transport Plan**

Source: JICA Study Team

### 1.5.2 Study Schedule and Flow

As shown in Table 1.5.1, this study is carried out for approximately 19 months from December 2012 to June 2014. It is largely divided into two phases: Phase 1 is devoted to establishment of a long-term development vision for the National Transport Plan, and Phase 2 to drafting of the National Transport Plan. The first half of Phase 2, Phase 2-A, covers an analysis of the current transport sector, logistics and traffic surveys; forecasts of future traffic demand, and drafting of strategies for the transport sector development, and the latter half, Phase 2-B, is devoted to formulation of a specific transport sector plan.



Table 1.5.1 Study Flow for the National Transport Plan in Nicaragua

Year/ month	2012				2013									2014						
	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	
No. of months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Phase	Phase I Long-term vision formulation A				Phase II-A National Transport Plan formulation A									Phase II-B National Transport Plan formulation B						
Study category	Work in Japan				Work in Nicaragua				Work in Nicaragua				Work in Nicaragua				Work in Nicaragua			
Report	▲ IC/R				▲ IT/R-1				▲ IT/R-2				▲ DF/R				F/R▲			
Work items and processes	2.1.1 Advance preparations (work in Japan) and explanatory discussion for Inception Report	2.1.2 Ascertaining current conditions and reviewing relevant information based on fact-finding and verification studies of the Nicaraguan transport sector	2.1.3 Analysis of the long-term development concept for the National Human Development Plan and establishment of a long-term development concept for the National Transport Plan (1) Analysis of long-term development concept for the National Human Development Plan (2) Establishment of long-term development concept for the National Transport Plan		2.1.4 Creation and discussion of Interim Report 1	2.2.1 Implementation of study on current conditions in the transport sector and analysis of study results		2.2.2 Implementation of surveys on actual conditions of transportation and distribution	2.2.5 Establishment of a socioeconomic framework	2.2.6 Future traffic demand forecasting (1) Reviewing means of transportation (2) Future transport forecasting and creation of a transport network model (3) Forecasting future traffic demand for each mode of transportation		2.2.7 Restructuring the development strategy for the National Transport Plan (proposed)	2.2.8 Creation and discussion of Interim Report 1	2.3.3 Formulation of the National Transport Plan (2014-2033) (draft) (1) Restructuring the National Transport Plan development strategy (2) Formulation of the Land Transport Plan, Marine Transport Plan, and Air Transport Plan (3) Formulation of the National Transport Plan (4) Implementation of Strategic Environmental Assessments for the National Transport Plan (5) Proposals for plans and projects (6) Implementation of Strategic Environment Assessments for plans and projects (7) Evaluation of the Project (8) Formulation of a phased action plan (9) Formulation of a short-term (2019) investment plan and proving relevance (10) Economic and financial analysis (11) Formulation of a plan regarding the implementation system and enhanced operation and management system for the National Transport Plan (2014-2033) (12) Creation of a capacity development plan for the transport sector				2.3.13 Compilation of conclusions and recommendations	2.3.14 Creation, explanation, and discussion of the Draft Final Report	2.3.16 Creation of Final Report
JICA meeting	▲			▲								▲							▲	
S/C meeting	Around Dec. 10 ▲ 1st			▲ 2nd								▲ 3rd							▲ 4th	
C/P meeting	▲ 1st	▲ 2nd	▲ 3rd		▲ 4th	▲ 5th	▲ 6th			▲ 7th	▲ 8th	▲ 9th								
Stakeholder meeting (Original)	▲ (MTI)		▲ 1st		▲ 2nd					▲ 3rd		▲ 4th							▲ 5th	

Source: JICA Study Team



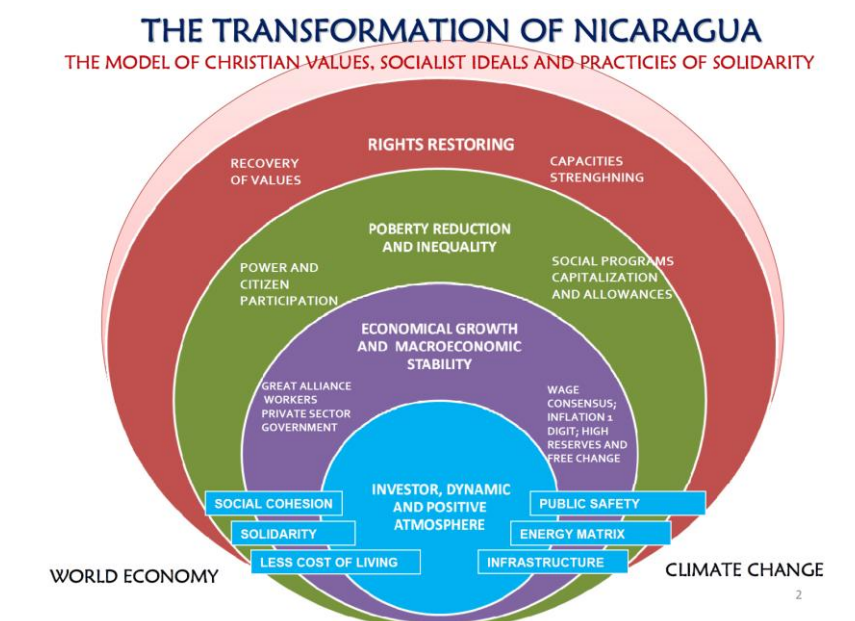


## Chapter 2 Outline of the PNDH (2012-2016)

### 2.1 The Basic Principle of the PNDH (2012-2016)

Nicaragua is one of the Heavily Indebted Poor Countries (HIPC) and a Poverty Reduction Strategy Paper was prepared in September 2001, based on which the parties concerned discussed debt relief. In 2002, the Government of Nicaragua signed an agreement with the International Monetary Fund (IMF) on the Poverty Reduction and Growth Facility (PRGF). In 2003, the country formulated a National Development Plan, which was later updated in the forms of the National Development Operational Plan and the New National Development Plan before the country shifted its focus on the Poverty Reduction Strategy Paper-2 (PRSP-2). In 2005, it formulated the PNDH, and the then governmental administration came to an end when the fourth version of the PNDH in April 2009. The current Ortega administration formulated and published the draft PNDH (2012-2016) in 2012 as the replacement of the PRSP-2.

The PNDH (2012-2016) formulates a vision for the national development with an eye to the year 2016 and beyond. It states that realization of a stable and rapid economic growth will bring about shifts in social and economic structures and subsequently result in a fair distribution of wealth in all segments of the country. It also emphasizes that continued and stable economic growth will stimulate dynamic investment in industries, which will back up the social and economic infrastructure, and that active investment in industries will enhance added-values of the industrial economy of the country, improving the productivity and streamlining the economy. Figure 2.1.1 illustrates the logical structure of the PNDH (2012-2016).



**Figure 2.1.1 Logical Structure of the PNDH (2012-2016)**

Source: PNDH(2012-2016)

Based on the basic structure described above, the PNDH (2012-2016) lists the following matters as its major strategies and policies.

- (i) Economic growth and macroeconomic stability with increasing work and reducing poverty and inequality.
- (ii) Strengthening of Grand Alliance between workers, farmers and government.
- (iii) Foreign Policy and External Cooperation, which are sovereign, independent and open to all countries of the world in the fight against poverty for the benefit of Nicaraguan households.
- (iv) Central American Integration, unification of ALBA and Latin American and Caribbean States through CELAC.

- (v) Public security and the fight against drug trafficking and organizational crime.
- (vi) Comprehensive Development of the Caribbean Coast Region.
- (vii) Participatory public administration under the direct democratic system.
- (viii) Realization of the welfare and social equality for Nicaraguan households.
- (ix) Enlightenment of science, technology, innovation and entrepreneurship for transformation of Nicaragua.
- (x) Strengthening of production sectors prioritizing family, community and cooperative economies and self-sufficiency and food security
- (xi) Development of social, transport, energy and production infrastructures for transformation of Nicaragua.
- (xii) Protecting Mother Earth and Climate Change Adaptation.

### **(1) Economic reform**

Where the economic reform is concerned, the PNDH refers to economic growth that continued for 17 years, with some exceptions, since 1992, and increases in foreign reserves, overseas remittance and foreign direct investment (FDI, about 3.5 times as much as the amount in 2007). It states that an expected increase in FDI – that is, investment in construction of oil refinery plants, the telecommunication industry, dam construction and renewable energy sources – prompts economic reforms. Presenting the figures showing the continued economic growth, the PNDH emphasizes that Nicaragua has moved on to a new development stage where the next issue is to reduce poverty by investment effects.

### **(2) Social reform**

The PNDH does not give any target figures for the coming five years in relation to the Millennium Development Goals such as poverty reductions and primary school attendance rate. On the other hand, it presents target figures during 2012-2016 for “the number of children having school food services”, “the number of students in technical education who have been granted scholarships”, “the number of students in foreign language education who have been granted scholarships”, “the number of beneficiaries of the ‘Amor Program’, care services for children and the elderly”, “the number of beneficiaries of assistance from Cuba”, “the number of beneficiary households of social housing”, “the number of beneficiary households of land registration”, “the number of beneficiaries of water supply and sewerage services”, “the number of beneficiaries of microcredit” and “the number of beneficiaries of the zero famine program”.

### **(3) Major impediments to transformation**

Analyzing estimated damage and other issues caused by climate change, the PNDH concludes that Nicaragua is the fourth most vulnerable country to climate change, stating that the country is on its way to implementing the following eight measures.

- (i) Integral Planning for disasters and for development
- (ii) Policy and national strategy of risk integral management
- (iii) Generating new variety of seeds resistant to drought and dampness
- (iv) Transforming the energy matrix of 25% renewable in 2007 to 94% renewable in 2017
- (v) Basins management
- (vi) Reforestation in all ways and community forestation
- (vii) Improvement of use of the soil, implementation of agroforestry and silvopastoral projects
- (viii) Management of water resources

### **(4) Fund-raising for development**

The PNDH forecasts that exports will continue to grow until 2016 to 35% of GDP and that FDI will reach a peak in 2014, some 35% of GDP, and fall to 18% of GDP towards 2016. It also forecasts that the amount of overseas remittance will remain the same and that inward investment will also remain the same at 23% of GDP. As for international assistance, the PNDH estimates that the ratio to GDP, despite the latter showed downtrend, will recover and maintain the current level

of 7% sustained by the expectations for the socio-economic recovery. In other words, the PNDH analyzes that only export and FDI will continue to expand among five income sources.

## 2.2 Major Sectors subject to Investment under the PNDH

### (1) Major projects in leading sectors

Table 2.2.1 lists destination sectors of large-scale direct investment of the private sector presented in the PNDH. These investment sectors are expected to implement these investment projects while respecting the PNDH principle, some of which have already been implemented. These designated and planned projects cover the electricity, telecommunications, agriculture, processing of agricultural products and manufacturing among other sectors. On top of these, some projects for harbor and port development in the coastal areas on the Atlantic Ocean, which had been underdeveloped for many years with no appropriate commercial harbor. These projects include ultra-long-term projects that, for example, start after 2016 and are scheduled to end in 2033.

**Table 2.2.1 Sizes of Investment in Leading Sectors**

<b>Investment project (2012-2016)</b>	<b>Investment amount USD million</b>
Refinery (A part of chemical industrial complex)	3,939
Hydrocarbon Industry	386
Power Generation/Transmission	2,166
Telecommunication	2,018
Manufacturing	600
Mining Exploration	350
Sea Ports	370
Agro-industries	270
Total	10,099

Source: the PNDH (2012-2016)

These projects will be based on the PNDH principle, serve as the bases of the national economy, build a stable foundation of the economy and constantly support Nicaragua's macroeconomy. Moreover, in line with the philosophy of the PNDH, the implementation of these projects in manufacture and processing of agricultural products will create new employment and thus contribute to economic reform and poverty reductions.

As for the tourism development sector, the PNDH does not give any specific investment amount, though domestic investment capitals account for a substantial portion of the entire funds in the sector. But investment in tourism in Nicaragua, which has abundant tourism resources, will certainly create a large number of new jobs and produce substantial impacts on the economy, so that tourism will be regarded as a key sector when the "long-term development vision" is examined under this Project.

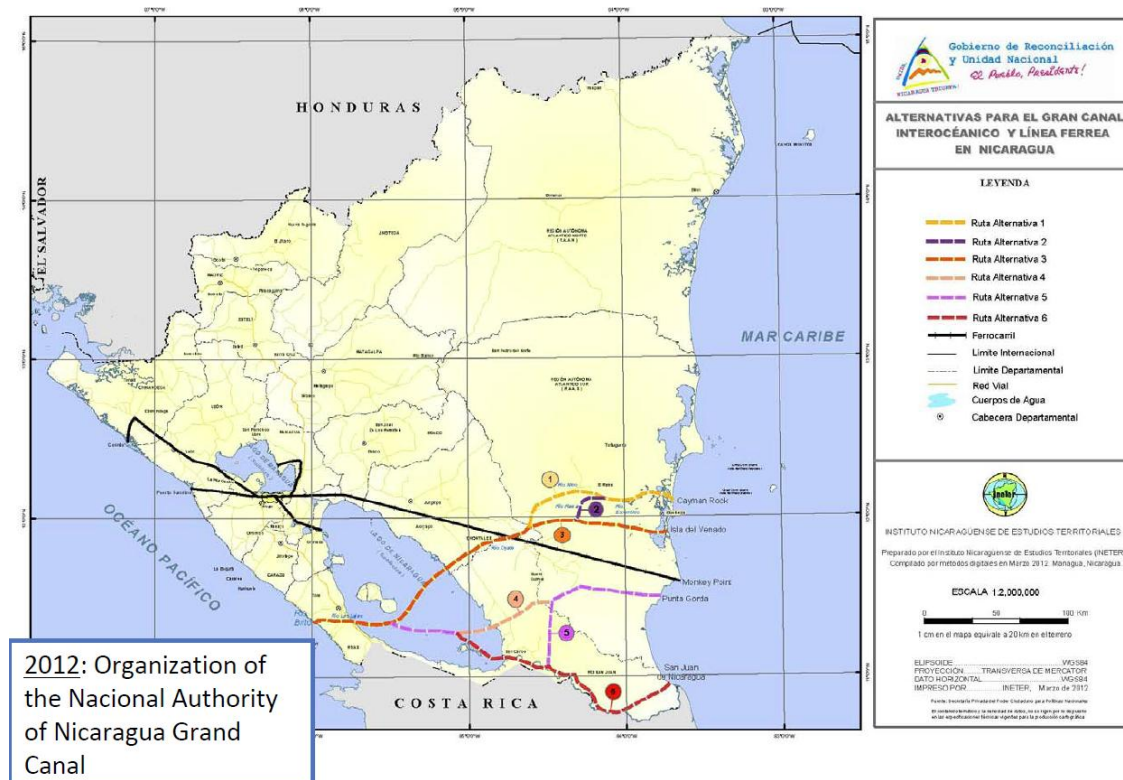
### (2) Project for the Grand Canal of Nicaragua

#### 1) Current status of the Project for the Grand Canal of Nicaragua and the position of the project in the PNDH

Where the Project for the Grand Canal of Nicaragua is concerned, a Spanish consultant proposed six routes for comparison and conducted concrete feasibility studies in 2004. In August 2006, the Nicaragua Canal Commission for the Canal between the Atlantic and the Pacific Oceans of the Nicaraguan Government created and published a summary report on the Grand Canal of Nicaragua, in which the commission conducted more detailed comparative studies on the six routes proposed in 2004, decided to make all the routes from the Pacific ocean pass by El Britto River and cross Lake Nicaragua but take different routes on the course from the lake to the Caribbean ocean. The report recommended Route 3 – the route from Kukra River to the upper stream of Mahogany-Creek, Rama River, Oyate River, Lake Nicaragua, Rivas Isthmus (Las Lajas River, the Rio Grande (El

Britto River) and to the Pacific ocean – as the most promising route (the construction cost of USD 1,700 million). In June 2012, Route 6 was recommended, which starts with San Juan River which is a river bordering Nicaragua with Costa Rica and having the river mouth to Caribbean ocean, passes Lake Nicaragua and reaches the Pacific Ocean. However, it was pointed out that Route 6 would require difficult environmental consideration and difficult construction work on thick sedimentary layers. It was also questioned about the technical feasibility of securing the canal depth of 25m or more on Lake Nicaragua, and maintaining and managing the canal because the planned canal was for tankers that are too large to travel the current Panama Canal.

At the time of this survey, the construction period was planned to be 10 years with the total construction cost of a maximum of USD 30 billion, and 49% of the cost was planned to rely on foreign capitals. The construction was scheduled to be completed in 2019 at the earliest and 416 million tons of cargos (some 3.9% of the cargo volume in the world) were planned to travel the canal. It was also estimated that the cargo volume would increase to 537 billion tons (some 4.5%) in 2025.



**Figure 2.2.1 The Six Proposed Routes of the Grand Canal of Nicaragua**

Source: Presentation materials in 2012, the PNDH

In the framework of the PNDH (2012-2016), the Project for the Grand Canal of Nicaragua is considered to be a project that Nicaragua ought to consider continuously with all the wisdom it possesses. The project has a considerable impact not just on the country but widely on the international society. The recognition that the global ocean transport route is necessary and important is the very basic understanding and drive for the project. Thus the Government of Nicaragua must build and keep such an international ocean transport route constantly, peacefully, legally and unbiasedly. At the moment, the Government of Nicaragua aims to pass the bill for establishment of a governmental agency responsible for the Grand Canal at the Congress and engage in research activities for planning, construction, procurement, operation and other activities related to the canal.

## 2) The position of the Project for the Grand Canal of Nicaragua in the National Transport Plan

The role of the Grand Canal of Nicaragua is to offer an international cargo route peacefully, legally

and unbiasedly to larger vessels than those traveling Panama Canal. Because most cargos traveling the Grand Canal are international and thus transshipment at the entrance/exit of the canal is not frequent unlike the existing canals, it can be concluded that the Grand Canal will have minimal impact on the domestic cargo transportation in Nicaragua. But the construction of the canal has a substantial indirect impact on the society and economy, and perhaps also on GDP and population distribution.

Despite all this, the findings of technical, economic and environmental studies on the Plan for the Grand Canal of Nicaragua have not been published the timing of publishing is uncertain, so it is difficult to assess the plan in this Project. Therefore, this National Transport Plan will not take the Plan for the Grand Canal of Nicaragua into account. It will do so when the latter plan takes clearer shape.

## **2.3 Outline of Sector Development Visions in the PNDH and Other Plans**

### **(1) Development visions for the agriculture and livestock, forestry and fishery sector**

The PNDH (2012-2016) sets out the agriculture sector development visions harmoniously with the Productive Strategy 2012-2016, and the visions prioritize (1) linking investment with promising agricultural activities; (2) reducing poverty by supporting family, community and other forms of minute agriculture and stimulating the growth of sectors in which the underclass participates; and securing food security.

The Productive Strategy 2012-2016 is a set of visions set out chiefly by the MAGFOR, prioritizing the agricultural economy that can deal with climate change on the initiatives of families, communities and cooperatives, food security and sovereignty of the agriculture sector. The strategy presents major policies and strategies as listed below.

- Food and nutritional sovereignty and security,
- Agriculture, livestock and forestry strategy,
- Development of family, community, cooperative and associative economy, which at the same time includes four axes of action:
  - Agriculture of family-based economy,
  - Small and medium-sized agro industrialization,
  - Promotion of small and medium-sized enterprises (hereafter called as SME), and
  - Promotion of forming various associations including cooperatives.
- Industrial policy and promotion of small and medium-sized agro-industry, and
- Small-scale aquiculture and fishery promotion policy

### **(2) Development visions for the tourism sector**

The development visions for the tourism sector in the PNDH (2012-2016) are based on the National Sustainable Tourism Development Plan (PNDTS, 2011-2020) formulated by the National Tourism Institute (INTUR). The PNDTS (2011-2020) presents three development guidelines leading to integration of development activities and human development.

- Preservation of the cultural values of national identity and the human development at all levels from the municipalities to the local communities;
- Promotion of a sustainable tourism development activity aiming at generation of economic benefits in sustainable manner through industrial development of the tourism with MIPYMEs; and
- Conservation of an environment, biodiversity and the implementation of disaster mitigation to adopt the climate changes.

The strategic objectives of the PNDTS (2011-2020) are:

- Increase the degree of participation of the touristic activity in the economy of Nicaragua through an improvement of competitiveness of tourism products;

- Increase an income of population who relates to the tourism through the creation of job opportunities; and
- Conserving and revitalize the natural and cultural heritages that are the most valuable elements of sustainable tourism development in particular.

### **(3) Development visions for the mining and energy sector**

The PNDH (2012-2016) presents the following development visions for the mining and energy sector.

- Poverty in depressed areas is to be eliminated by fully utilizing potential resources while sustainably preserving the natural environment of the nation, and reallocating the benefits of the nation and people in a fair manner.
- A clear geographical economic disparity is to be narrowed by linking two distinct areas of Nicaragua namely the Pacific Coast side and the Atlantic Coast side. The role of development of mining and energy in RAAN and RAAS is substantially important in view of poverty alleviation, and this will be continuously so toward the future.

### **(4) Development visions for the educational sector**

Prior to the Sandinista Revolution in 1979, Nicaragua's rural population accounted for between 75% and 90% of the total population. In rural areas, there was no comprehensive concept of adult literacy education and the activities in this regard were not developed. The illiteracy rate at that time was estimated around 50% of the national population. Thus, from the year 1980, the government of Nicaragua has conducted literacy campaign to remedy this situation. Overall, illiteracy had reduced by about 38.8% with about 7.0% illiterates in the industrialized Pacific and 26.0% in the less developed regions by such campaigns programmed for eradication of illiteracy. In 2010, the literacy rate of adult (15+) is 78.0% and the same of youth (15-24) is 87.0%.

These days almost 93% of boys and girls are in elementary school and 43% of boys and 49% of girls are in secondary school. As such the coverage of education has expanded rapidly in a rather short period. Education in Nicaragua is free for all Nicaraguans. Elementary education is free and compulsory although this is not strictly enforced and many children are not able to attend due to their families need to have them work. Communities located on the Atlantic Coast have access to education in their native languages in both Spanish and the languages of the native indigenous tribes that live in the more rural areas of Nicaragua. However, the education expenditure accounts for mere 3.1% of GDP which is ranked 130th in the world.

The human resources is the foundation of building the nation. In this view points the education is the most important infrastructure to be developed not only today but toward the future continuously. It might be a permanent issue to be addressed by the government. As the economy grows the need of education will increase further in both quantitative view and qualitative view. The opportunity of education is needed to be equal to all the population and the development of education sector would reinforce the solidarity of the nation as envisioned in the PNDH.

### **(5) Development visions for the health sector**

Nicaragua offers high-quality health care with several highly specialized health care centers and hospitals in the greater Managua area. However, 58% of the total populations are unable to access adequate healthcare and treatment due to poverty and social exclusion from health services. The Caribbean Coast regions (RAAN and RAAS), Jinotenga, Matagalpa and Rio San Juan were the areas where the population has least access to medical attention. Twenty percent (20%) of children under five years old suffer from chronic malnutrition and 6.3% from severe chronic malnutrition. The areas where the child population is most affected are the RAAN and RAAS, Jinotenga and Madriz. As such the people of the Caribbean Coast regions were identified as the people under the worst quality of life in Nicaragua.

The access to sanitation of Nicaragua is merely 34% (114<sup>th</sup> in 129 countries in 2008). The maternal mortality rate is 95 deaths per 100,000 and infant mortality rate is 21.7% per 1,000 lives. The life

expectancy in average of both sexes is 72.2%. The number of hospital bed is 0.9 per 1,000 people (58<sup>th</sup> in 149 countries) according to the report by the WHO.

Although the profile of health conditions of Nicaragua has been improving rapidly, the level of service availability has been still low in comparison with the world standards. The readiness for preventing infectious diseases is not sufficient thus the occurrence of endemic is quite high especially in RAAN and RAAS regions when the natural calamity occurs such as powerful hurricane, flood, etc.

#### **(6) Development visions for the health sector**

The infrastructures are to be developed and provided for the benefits of the nation in line with the visions set out in the PNDH (2012-2016) and can be summarized as follows:

- The public investment program is needed to be prepared aiming at reducing the cost for the business and trade thereby promote the private investment and support to increase the productivities of all economic sectors;
- The development, rehabilitation and improvement of basic infrastructures that improve the accessibility between the production areas and markets especially for the promotion of agriculture in the rural areas, generating powers needed in the rural areas and rural electrification is to be given a high priority;
- The road networks comprising secondary road and bridges as basic transport infrastructures is to be developed and provided for easier access to the educational and health facilities especially in the rural areas;
- The basic infrastructure is to be provided to increase the productivity of production sector as well as to contribute to increase the number of job opportunities thereby eradicate poverty;
- The economic potentiality of each area and region is to be maximized by means of optimum utilization of endowed but unexploited resources;
- The basic infrastructure is to be developed, rehabilitated and improved to enhance the human resource development aiming at strengthen the most important economic foundation of the nation; and
- The basic infrastructure including the institutional organization is to be provided and reinforced to ensure the safety and welfare of all citizens.





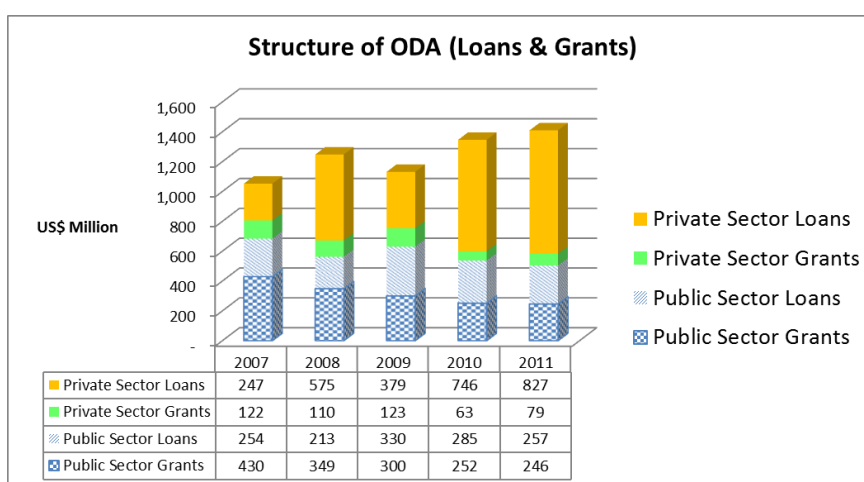
## Chapter 3 Trend in Assistance from International Organizations

### 3.1 The status of Official Development Assistance

#### (1) Official development assistance in Nicaragua

The amount of Official Development Assistance (ODA) to Nicaragua has been in a range between USD 1,000 million and USD 1,400 million in the previous five years, which accounts for some 18-20% of Nicaragua’s GDP. The amount of development aid has been more or less constant but the structure and contents changed substantially in the previous five years.

Figure 3.1.1 illustrates the structure of public sector loans and grants and private sector ones in the previous five years. The amount of ODA from the public sector decreased 43% in the five years, but the amount of private sector loans increased 235% over the period. Meanwhile, the amount of public sector grants decreased, while that of public sector loans increased.

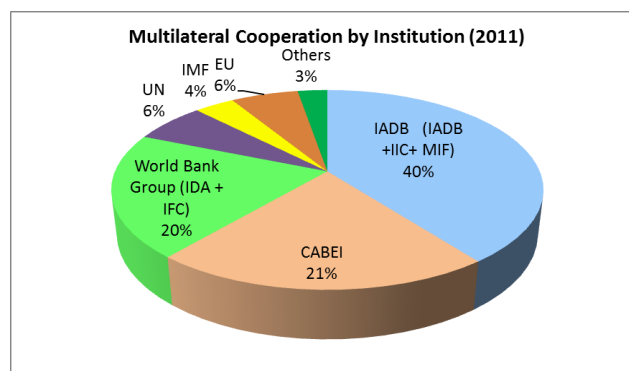


**Figure 3.1.1 Structure of ODA (Loans and Grants)**

Source: “Informe de Cooperación Oficial Externa 2011”, Central Bank of Nicaragua (BCN)

#### (1) The status of development assistance by international financial institution

Development assistance to Nicaragua is chiefly given by the Inter-American Development Bank (IDB), the Central American Bank for Economic Integration (CABEI), the World Bank Group (IDA and IFC), IMF and EU. The assistance by the IDB accounts for 40% of all the assistance from international financial institutions, totaling USD 197.2 million in 2011, followed by the CABEI (21%) and the WB Group (20%).



**Figure 3.1.2 Multilateral Cooperation by Institution**

Source: MINREX and BCN

## 3.2 Assistance Policy of International Organizations

### (1) Assistance policy of the IDB

The IDB Country Strategy 2012-2017 states four priority sectors for the Bank's cooperation to Nicaragua, which are energy, transportation, comprehensive early childhood care, and health. It pays particular attention to development of rural areas in which poverty is concentrated and where there is potential to develop production chains. It also takes into account issues related to gender, diversity and climate change. The IDB also provides Nicaragua with support to strengthen the financial administration and public procurement systems. The cooperation to private sector covers the energy, health and transportation sectors, while the transportation sector shows its intention to adopt public-private partnerships.

The objective of the Bank's cooperation in the area of transportation is to support efforts to build, improve, and rehabilitate highways and rural roads and keep them in a good state of repair, so as to ensure productive sectors have access at all times to both domestic and export markets, with particular emphasis on the Meso-American region. More specifically, the IDB provides assistance in the following manners:

- Investment is made in road networks linking production basis in rural areas with the main corridors and border posts so as to ensure road passability throughout the year. By doing this, constant access for poor regions to social services is ensured.
- Systems and capacity of the MTI and the FOMAV related to technical management and administration are strengthened. Particular emphasis is placed on the planning capacity for various plans that consist of designing, construction, contract management, monitoring and evaluations.
- An investment environment is built for the transportation sector under the public-private partnership. The needs of the sector are so various that the public sector alone cannot satisfy them, thus investment destinations that truly need and can receive investment are clarified under the public-private partnership.

### (2) Assistance policy of the CABEI

The Institutional Strategy 2010 to 2014 of the CABEI states three strategic axes: (1) Social Development Axis, (2) Economic Competitiveness Axis, and (3) Regional Integration Axis. In addition, it also states Environmental Sustainability Axis as a transversal axis. According to these strategic axes, the CABEI sets out the following six priority fields to concentrate its development efforts.

- |  |  |
|--|--|
| a). Production infrastructure                        | b). Agriculture and rural development  |
| c). Energy   | d). Human development and social infrastructure                                  |
| e). Financial intermediation and development finance | f). Industry, urban development and improvements in competitiveness and services |

Of these priority fields, "production infrastructure" is highly associated with the transportation sector in terms of projects for development of road, harbor and airport infrastructures.

### (3) Assistance policy of the WB Group

The Country Partnership Strategy FY2013-FY2017 of the WB Group comprises chiefly of the following two key strategic areas:

- (i) Improving social welfare by improving access to quality basic services, in particular by poor rural households; and
- (ii) Raising incomes by improving productivity, competitiveness and export diversification.

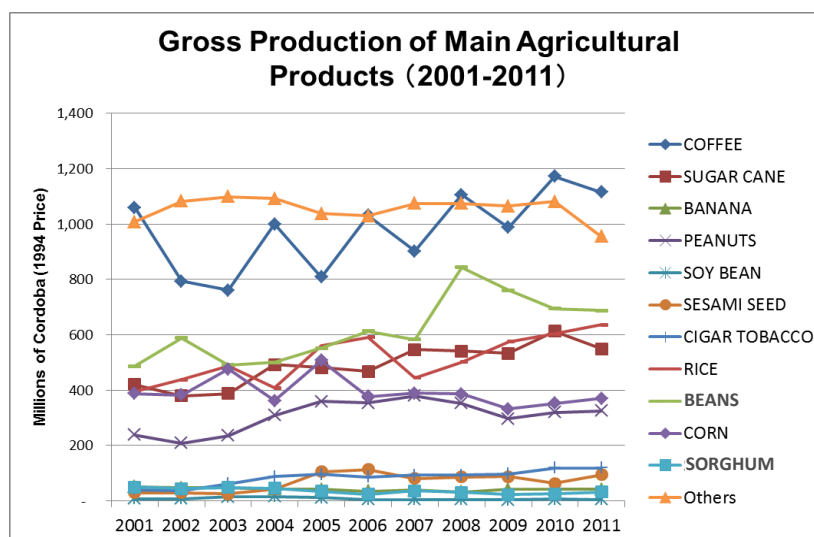
For the strategic area (a), the World Bank Group seeks to accelerate the progress against the MDGs in education, water and health through the implementation of a series of ongoing and future projects in these areas, and in social protection. The International Finance Corporation (IFC) works to develop private sector solutions to critical social needs, in particular by investing in health and education.

## Chapter 4 Long-Term Development Vision of Each Business Sector

### 4.1 Long-Term Development Vision of Agricultural Sector

#### (1) Current Agricultural Sector

Nicaragua's agricultural products are largely categorized into crops for exportation and basic grains (corn, bean, rice and sorghum) and other crops for domestic consumption. In the order of production values, major crops for exportation are coffee, sugar cane and peanuts and those for domestic consumption are bean, rice and corn.



**Figure 4.1.1 Gross Production Values of Main Agricultural Products (2001-2011)**

Source: Compiled by JICA Study Team based on statistics released by Central Bank of Nicaragua

Although the annual production volume of coffee for exportation increased from 60,000 tons to 100,000 tons for the past 10 years, the production scale is only half that of such other Central American countries as Guatemala (approx. 250,000 tons) and Honduras (approx. 220,000 tons).

Major coffee production sites concentrate in Jinotega, Matagalpa and Nueva Segovia departments in northern highlands as they account for 80% of the production volume in total. Main export destinations are the U.S. (43% of total coffee export), Venezuela (9%), Germany (8%), Belgium (7%) and Canada (5%).

As for sugar cane that is also a crop for exportation, the production volume increased at an annual average rate of 7% for the 10 years. However, the production acreage rose only 4%, which shows improved productivity. 84% of the production volume concentrates in Chinandega Department in the northern Pacific region. Of four sugar companies, two are situated in the department and two others are each located in Rivas and Managua departments and it is mainly exported from the Puerto Corinto Port in Chinandega Department. Main destinations are the U.S., Venezuela, Korea and Mexico.

#### (2) Existing Development Vision of Agricultural Sector

The agricultural development vision of Nicaragua is summarized in the “Inclusive Rural Development Sector Plan” (hereinafter referred to as “PRORURAL”). It includes agricultural, livestock, forestry and rural development policies comprehensively to embody the basic concept of the PNDH in rural development.

The agricultural development vision under PRORURAL does not regard the agricultural, livestock and forestry sector as simply that for one sector policy area but it is based on an inclusive perspective with the focus on the improvement of livelihood of families in rural areas. The program aims to achieve equal human development and improvement of livelihood of families in rural areas

by utilizing sustainable natural resources. To this end, it presents the policies below.

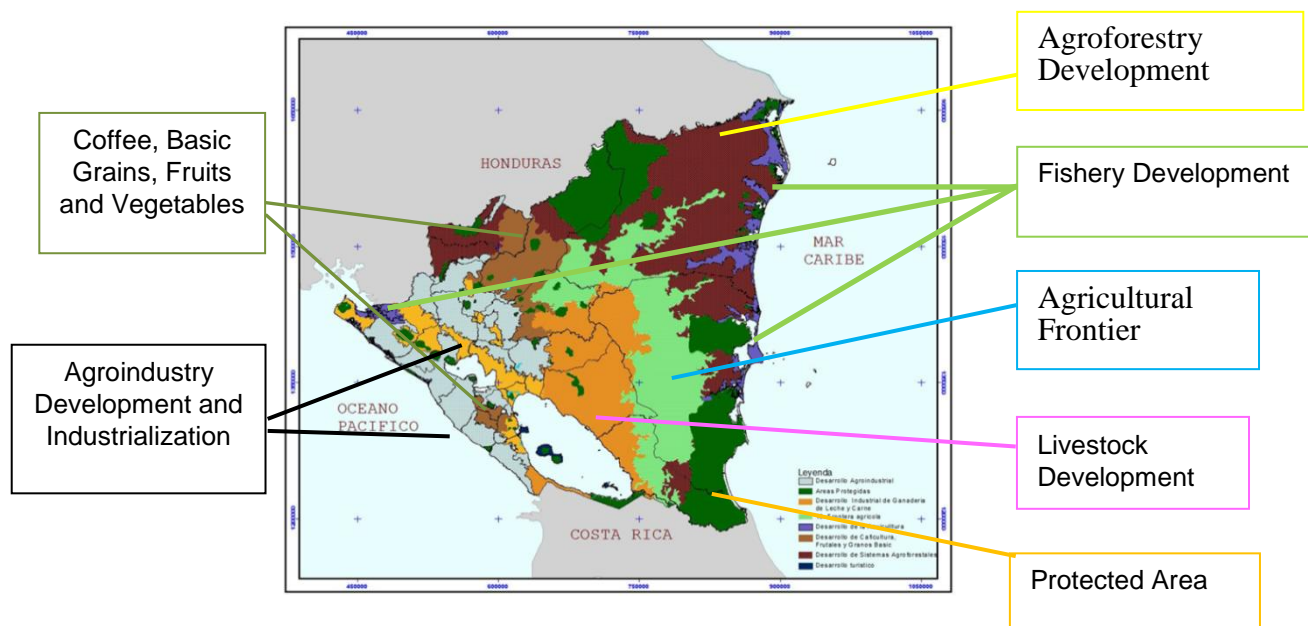
- Improvement of productivity
- Promotion of higher added values to primary products
- Promotion of food safety
- Improvement of market access in the form of inclusion of indigenous people and Afro-Nicaraguans

The PRORURAL also proposes the following 10 issues as the strategic axis:

- Capacity development: public and private sectors
- Improvement of governance : policies and strategies
- Improvement of access to materials, machinery and equipment and financial services
- Technological services: technical assistance, extension and research markets and local technology
- Improvement of food safety and sanitation
- Agricultural, livestock and forestry information provision service
- Support services for sustainable forestry management
- Promoting partnerships: union, cooperative and community
- Investment in conservation and restoration of forest ecosystems
- Facilitating linkages with markets and agro-industrial processes

Three other programs listed below derived from the PRORURAL.

- National Food Program (PNA)
- National Rural Agro-industrial Program (PNAIR)
- National Forest Program (PNF)

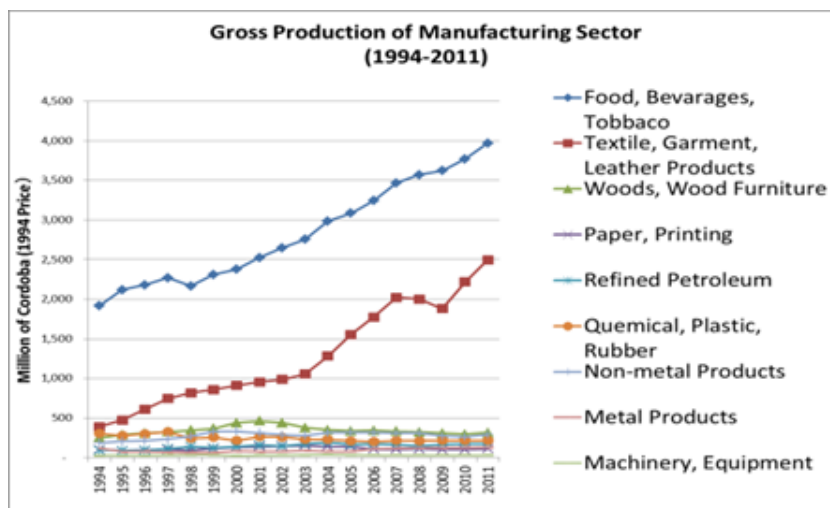


**Figure 4.1.2 Primary Industry Development Plan of Nicaragua**

Source: Compiled by JICA Study Team based on statistics released by Ministry of Agriculture, Livestock and Forestry (MAGFOR) and Ministry of Family, Community, Cooperative and Associative Economy (MEFCCA)

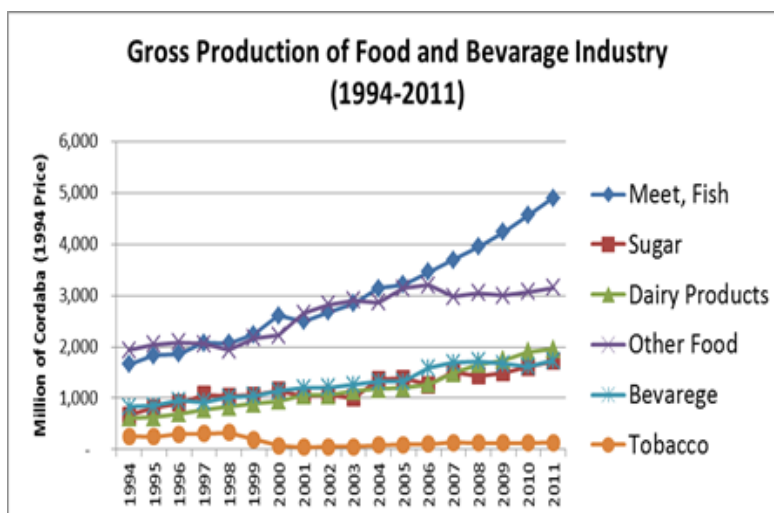
### (3) Long-Term Development Vision of Agricultural Sector

GDP growth over the last 60 years in Nicaragua shows that the primary industry has led manufacturing and commerce. As for the breakdown of manufacturing, food and beverage industry led the sector as they have grown, accounting for 51% of added values in the sector. Main items of the food and beverages are meat, dairy products and sugar.



**Figure 4.1.3 Gross Production of Manufacturing Sector (1994—2011)**

Source: Compiled by JICA Study Team based on information released by Central Bank of Nicaragua



**Figure 4.1.4 Breakdown of Gross Production of Food and Beverage Industry**

Source: Compiled by JICA Study Team based on information released by Central Bank of Nicaragua

Nicaraguan economy has a characteristic of agricultural and livestock products contributing to domestic gross production growth not only in the form of primary products but also promoting the development of food processing industry, linking the primary products and manufacturing industry. It is desired that such an advantageous pattern of economic development be utilized and values be added continuingly to the abundant primary products domestically to maintain and improve the mechanism of leading to further development.

To this end, issues listed below are important while developing and applying the agricultural development vision that emphasizes the improvement of livelihood of rural families that is aimed at in the current PNDH and PRORURAL.

**1) Improvement of Value Chain of Agricultural Products**

Because the agricultural sector of Nicaragua is growing in association with food processing industry part of which leads to exports, it is important, in the long-term vision, to consider measures from the perspective of the value chain of agricultural products in view of food processing industry and export destination markets as well as the upstream downstream industry (seeds and seedlings and agrochemicals, etc.) and downstream industry (outlet stores, etc.) that are directly linked with growers. From this perspective, the following issues are important:

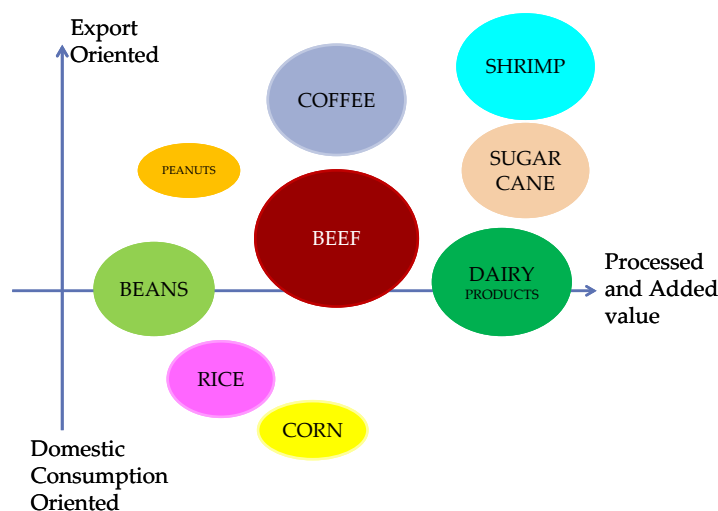
- Improvement of production road: As the agricultural and livestock frontier is developed in the eastern region, underdevelopment of road infrastructure for transporting livestock and

agricultural products produced in the central and eastern regions to processing plants has become a problem. Because agricultural product processing is a key to the economic development of the country, domestic logistics infrastructure development is called for.

- Building of good relationship between farmers and processing companies
- Enhancement of cooperation and collaboration of farmers: For the inclusion of small- and medium-scale farmers in the value chain that is linked up to the export markets, various collaboration including joint shipping, delivery and negotiations with buyers is desirable.

## 2) Multi-lateralization of Agricultural Products

Figure 4.1.5 shows positioning of main agricultural products in terms of “export oriented (upward),” “value addition by processing (rightward)” and “domestic consumption oriented (downward).” Development of new agricultural products and their multi-lateralization toward the three directions will enable long-term sustainable agricultural development.



**Figure 4.1.5 Strategic Positioning of Agricultural Products**

Source: Compiled by JICA Study Team

## 3) Further Development of Agricultural Products for Exportation

Because acquisition of foreign currencies through the exportation of agricultural and livestock products and processed agricultural products is a key to long-term development of the country, further development of agricultural products for exportation is called for. Participation of small farmers in the value chain of export-oriented agricultural products is of particular importance for balanced development of the country. Thus, it is desired that the MAGFOR and other government organizations play the role of providing farmers and food processing industry with such information as international demand trend, export markets and prices on agricultural products and food processing and that they take various measures for building linkage of primary products, processing and exportation.

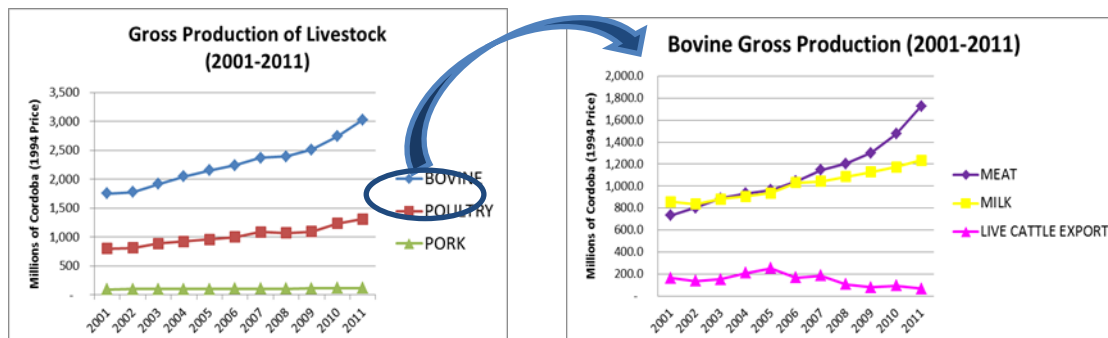
## 4) Development of Agricultural and Livestock Industry by Agroforestry and Forest Grazing

As the production sites of agricultural and livestock products move eastward due to deforestation, development of agricultural and livestock industry while ensuring environmental conservation becomes a serious issue from a long-term perspective. To this end, it is also important to investigate such ways of developing agricultural and livestock industry while maintaining forests as agroforestry and forest grazing. Although this Report contains areas of districts under forest plan management and forest protected areas in main departments in “4.3 Forestry Development Vision”, livestock industry is prohibited in the reserve areas in principle. The MIFAMILIA divided the country into areas for livestock promotion, protected forests, and areas where agroforestry is promoted, etc., based on the forest protection standards, etc., and created a map Figure 4.1.3).

## 4.2 Long-Term Development Vision of Livestock Sector

### (1) Current Livestock Sector

Livestock industry in Nicaragua has grown at an annual average rate of 6% for the last 10 years and 8% for the last 20 years. Bovine production accounts for 68% of the gross production values of the industry, followed by poultry at 29% and pork at 3%.



**Figure 4.2.1 Gross Production of Livestock Products (2001-2011)**

Source: Compiled by JICA Study Team based on statistics released by Central Bank of Nicaragua

As for bovine production, gross production of meat yields the majority of gross production accounting for 57%, followed by milk production at 41%. The remaining 2% is live cattle export. Main bovine production sites are four departments and two self-governing regions in eastern and central Nicaragua, accounting for 70% of nation's total production-RAAS self-governing region (27% of total), RAAN self-governing region(11%), Chontales Department (10%), Matagalpa Department (9%), Rio San Juan Department (6%), and Boaco Department (8%).

The bovine slaughter volume has increased sharply since 2000 from 320,000 tons in 1999 to 900,000 tons in 2011. Although city-run slaughterhouses and private cattle processing companies each accounted for 50% before 2000, the ratio of the latter has increased significantly since 2000 to 78% with the remaining 22% by city-run slaughterhouses in 2011.

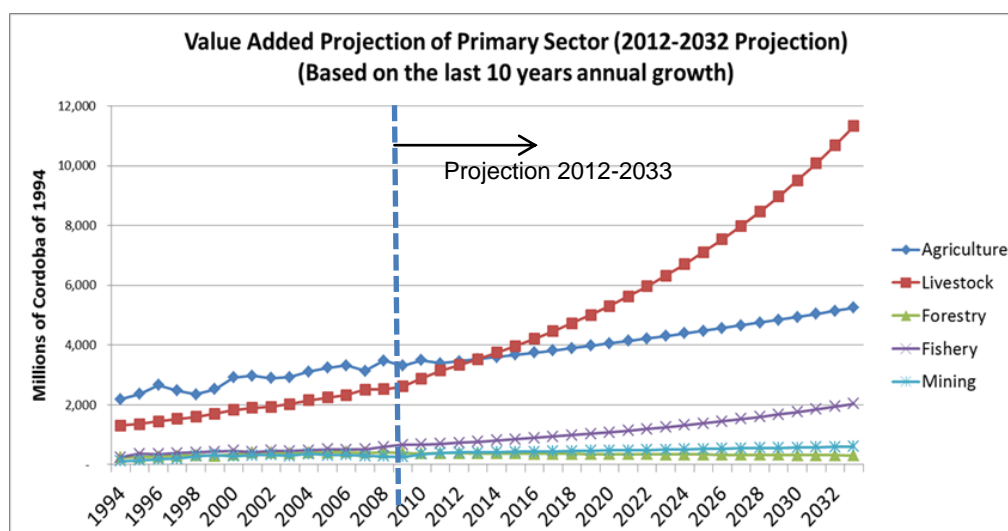
There are four beef processing companies in Nicaragua-Nuevo Carnic and Proincasa in Managua Department, San Martin in Nandaime in Granada Department, and Masesa in Juigalpa in Chontales Department. Nicaraguan beef is exported mainly by their processing plants.

Nicaraguan beef export increased from 59,000 tons in 2007 to 104,000 tons in 2011. Main export destinations used to be the U.S., El Salvador and other Latin American countries until Venezuela took their place in 2008 to account for 44% of exported beef from Nicaragua in 2010.

Most of the beef exported to the U.S. is transported to the neighboring Honduras by land to the Puerto Cortes Port there. Beef for Venezuela is transported to Peñas Blancas Customs in the south by land to enter Costa Rica and then shipped out from the Limon Port in the country. Part of the live cattle exported to Venezuela is shipped out from the Puerto El Rama Port in RAAS.

### (2) Long-Term Vision of Livestock Sector

As the livestock and meat processing industries are growing sharply, pulling the nation's economic development, it is considered as a key industry for its future.



**Figure 4.2.2 Livestock Industry Growth Forecast from 2012-2033**  
based on Annual Growth Rate for Last 10 Years

Source: Compiled by JICA Study Team

Note: The forecast is based on the past growth rate and the Project forecast is separately estimated as GDP by industry.

Current Nicaraguan administration formulated the subprogram on livestock recovery of Nicaraguan cattle and sheep in 2008 and it proposes the following visions for the next 16 years:

- The livestock industry continues to be a major production sector that contributes to GDP growth.
- Exportation of livestock products continues to be an important source of acquisition of foreign currencies for Nicaragua.
- Improvement of productivity per head of cattle and per grazing area is desired.
- The range of technical and financial assistance for small livestock farmers with an area of 17.5ha or less is expected to be widened.
- Per capita consumption of beef and dairy products is estimated to increase.
- Livestock production is operated in consideration of the environment and natural resources.

The livestock visions can be valid in the long-term vision for the next 20 years up to 2033 in principle. The study team proposes the following as the long-term vision of livestock industry based on interviews with stakeholders of livestock industry and the Ministry of Agriculture, Livestock and Forestry (MAGFOR):

### 1) Improvement of Production Roads

A truck usually transports 16 heads of cattle from the ranch to the processing plant and the road can be often unpaved depending on the location of the ranch. The livestock industry has been developed eastwardly in Nicaragua recently and there is no other choice but the unpaved roads. There has been concern over the quality deterioration of beef and weight loss of cattle due to the stress from the transportation via unpaved roads. It is also essential to secure an efficient cold chain for dairy products.

Pavement and improvement of production roads for the transportation particularly from RAAS and RAAN in the eastern region to processing plants in Managua and Matagalpa cities is called for.

### 2) Securing Exit of Livestock Products for Exportation to the Caribbean Side

Currently, most of livestock products are exported to southern and eastern parts of the U.S. and Venezuela via the Puerto Cortes Port in Honduras and Puerto Limon Port in Costa Rica on the Caribbean side. If an export port is secured in Nicaragua to the Caribbean side, they can be transported more efficiently. This will contribute to avoidance of weakening of competitiveness of exported products due to the land transportation cost to a neighboring country, use of commercial



agreements with Europe, export to the east coast of North America, and port call of large cruisers along the Caribbean coast, etc.

### **3) Building Good Relationship between Livestock Farmers and Private Meat Processing Companies**

Although the livestock development vision can be highly evaluated in that it includes small livestock producers in the value chain that leads to exportation, there is increased tension between private meat processing companies and livestock producers as the farmers are dissatisfied with the price setting of the purchase system that emphasizes productivity and efficiency of private meat processing companies as the livestock production increases. It is also important in the long-term development vision to create a mechanism to build good relationship between livestock producers, etc., and private meat processing companies.

### **4) Development of Livestock Products with Higher Added Values**

Leather products in addition to beef and dairy products have begun to be exported gradually to Guatemala and Europe. Development of leather products and other products deriving from livestock is desired.

### **5) Promotion of Forest Grazing**

Although livestock industry development in Nicaragua has been realized by expanding grazing ground to the eastern region, there is also concern over decrease in abundant forest resources there. It is important to promote forest grazing and search for the form of livestock industry in harmony with forest resources in a possible scale in order to achieve sustainable development.

## **4.3 Long-Term Development Vision of Forestry Sector**

### **(1) Current Forestry Sector**

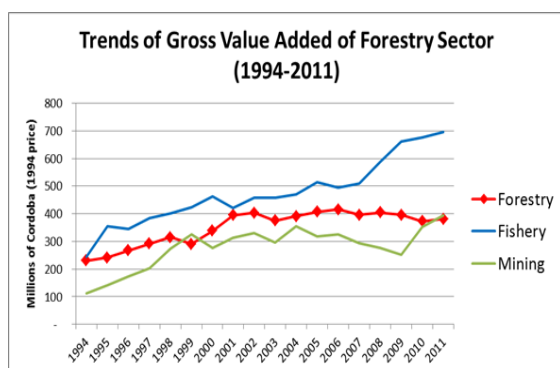
Of national land of Nicaragua, 25%, or 3.25 million hectare, is covered with forests and 98% of the forests are natural forests with artificial forests accounting for the remaining mere 2%. Broad leaf forests account for 87% of the natural forests. The forest resources on the Caribbean side are important, accounting for 62.7% of national forest resources. Particularly, those in RAAN in the northern Caribbean side and those in RAAS in the southern Caribbean side account for 43% and 19% of national forest resources, respectively.

As shown in Figure 4.1.2 in this Report (English version), of 3.25 million hectare of total forests, area under forest plan management, protected forest area, and other protected area cover approx. 130,000 hectare, 990,000 hectare and 1.03 million hectare, respectively. The properties of indigenous people (approx. 2.25 million hectare) mostly correspond with the areas designated as the above three areas.

The forest survey conducted by the Institute of Forestry in 2007 and 2008 shows that forest resources are most used as firewood and wood for both commercial and domestic use. Meanwhile, illegal logging and smuggling of wood are major problems.

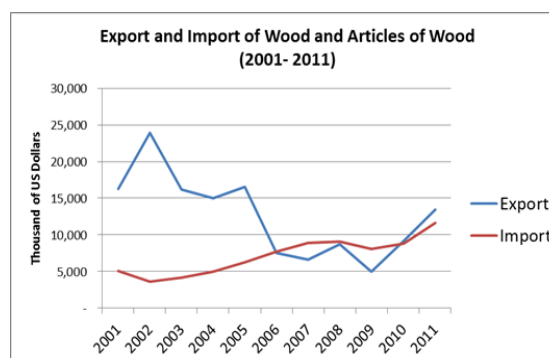
Nicaraguan forestry sector marked a negative annual growth rate of 1% on average for the last 10 years and its added values account for 5% to 7% of total added values.

Export of wood and wood products dropped sharply from 2002 to 2009 and the import increased gradually during the same period to satisfy the domestic demand.



**Figure 4.3.1 Gross Added Values of Forestry Sector**

Source: Central Bank of Nicaragua



**Figure 4.3.2 Export and Import of Wood and Articles of Wood**

Source: International Trade Center (ITC)

Although the main wood for export is the wood with the thickness of 6mm or more, such packaging containers as wooden boxes and wooden building materials are also exported in small quantities. The export to main destinations of the U.S., Costa Rica, Honduras and Dominican Republic has decreased since 2006 and that to China has increased sharply since 2009 and the export value to the country reached 6 million dollars in 2011. Wood export to Cuba has also grown since 2009 to reach 1.3 million dollars in 2011.

Issues the forestry sector face are (1) logging for expansion of arable land, (2) illegal logging, (3) no integration of organizations that manage the sector (NAFOR, MARENA, MAGFOR, etc.) and they have prevented the enhancement of institutional mechanism of the management bodies.

## (2) Long-Term Development Vision of Forestry Sector

The current administration in 2008 formulated the national policy for sustainable development of Nicaraguan forestry. The policy advocates that the development of Nicaraguan forestry “aims to improve livelihood of its families and that a development model that is implemented in the form of promotion of collaboration among various stakeholders of the production chain of forestry, agroforestry and agricultural product processing while giving consideration to food safety, food security and environmental conservation.”

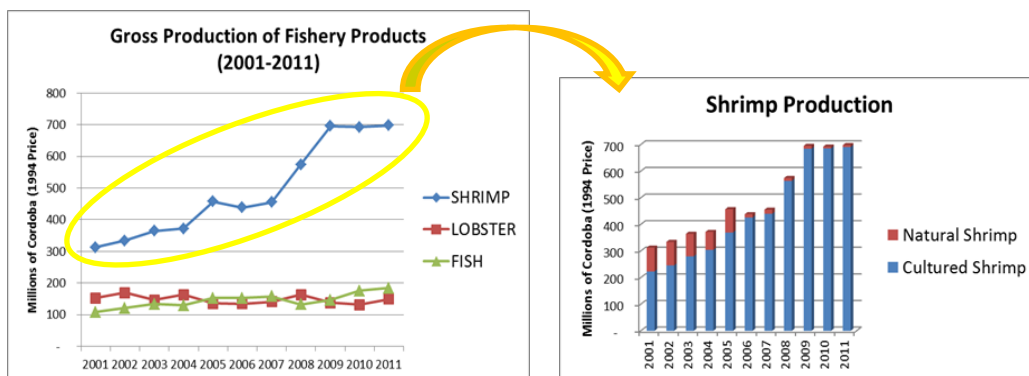
As the Nicaraguan forestry sector has grown very slowly for the last 10 years, the country has clarified no forestry development goal. Meanwhile, forest logging is in progress as the agriculture and livestock industry have moved gradually to the eastern region with abundant forest resources. Against this backdrop, the issue of forestry development is to maintain good balance between the expansion of agricultural and livestock industries in the eastern region and forest conservation.

Although it is not clearly stated in the national forestry policy, forestation to increase artificial forests should be prioritized not depending on natural forests for the long-term forestry development under the current situation. The situation of Japan in which 67% of the national land is covered with forests, and 64% of artificial forests that account for 40 % of all forests are managed by private owners of forests of less than 20 hectare, will be very useful as reference for setting the future forest development vision of Nicaragua. As the organizations and mechanism that manage the forestry sector are insufficient, they need to be enhanced to manage the sector in an integrated manner.

## 4.4 Long-Term Development Vision of Fisheries Sector

### (1) Current Fisheries Sector

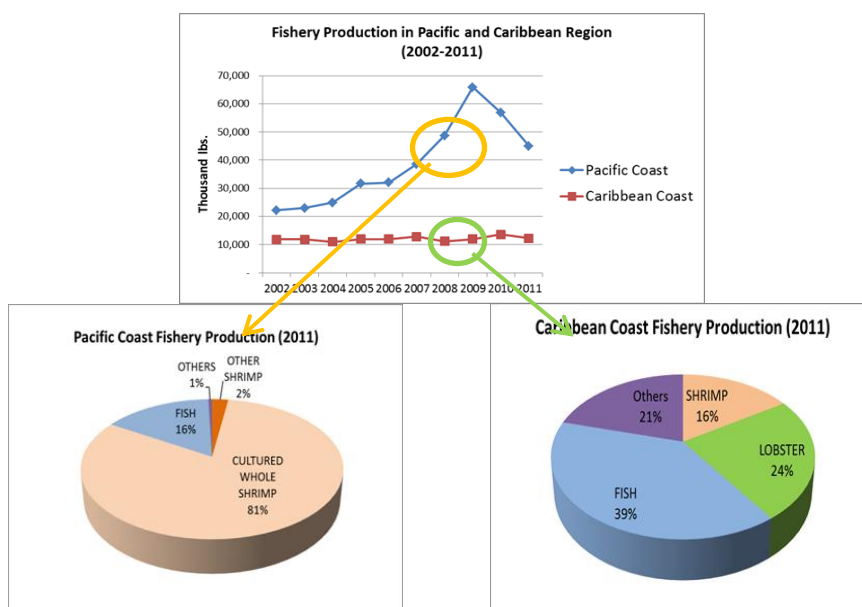
The fisheries sector has grown at an annual average rate of 5% for the last 10 years and 1 % for the last 20 years. The main contributor is the development of cultured shrimps mainly in Chinandega Department on the northern Pacific side.



**Figure 4.4.1 Gross Production of Fisheries Products (2001-2011)**

Source: Compiled by JICA Study Team based on statistics released by Central Bank of Nicaragua

The Pacific Coast accounts for 80% of fish catches and the remaining 20% come from the Caribbean Coast. The annual catch on the Pacific and Caribbean sides in 2009 was 29,870 tons and 5,443 tons, respectively. Cultured shrimps accounted for 81% of the catches on the Pacific Coast in 2011. Of the catches on the Caribbean Coast in the year 2011, fish, lobsters and shrimps accounted for 39%, 24% and 16 %, respectively.



**Figure 4.4.2 Breakdown of Fish Catch on Pacific and Caribbean Coasts**

Source: INPESCA

Fisheries export has grown as the production of cultured shrimps increases. Fisheries export value in 2001 was 42 million dollars and it reached 144 million dollars in 2011. As the import value has been around 1 million constantly, the trade surplus has increased significantly over the last 10 years.

Cultured shrimps, main fisheries products for exportation, are mostly exported to Spain and the U.S. as well as such other countries as Taiwan, France and Mexico in less significant quantities. Fish and lobsters are mainly exported to the U.S. mainly from the Puerto Corinto Port, Guasaule Customs on the border with Honduras, Managua International Airport, and Las Manos Customs on the border with Honduras.

**(2) Long-Term Development Vision of Fisheries Sector**

The importance of Nicaraguan fisheries sector lies mainly on the following:

- (i) Fisheries products, mainly cultured shrimps, are becoming an important source of foreign currencies and the shrimps are ranked fifth on the list of export item behind beef, coffee, gold and sugar.

- (ii) The sector is also socially important for improvement of livelihood of small fishermen, etc. Particularly on the Caribbean coast area where the poverty rate is high, increase in income of small fishermen through the expansion of fish catch is important for both fisheries development and poverty reduction.
- (iii) Although the sector depends on shrimp culture in Chinandega Department on the northern Pacific coast, there are untapped abundant fisheries resources both on Pacific and Caribbean sides and thus there is still ample room for development. According to the Institute of Fisheries (INPESCA), the nation is currently using a mere 3.5 % of catchable fisheries resources on the Pacific side and 6.6 % on the Caribbean side.

The added value in the fisheries sector has increased at an annual average rate of 5% for the last 10 years and 10% for the last 20 years. When the growth rate of each production sector for the last 20 years is applied to that up to 2033, fisheries will become a key industry together with agriculture and mining. Fisheries development for the last two decades largely depended on production increase of cultured shrimps and it is desired that new fisheries resources for exportation be explored while maintaining the existing production.

Particularly, logistics that connect the Caribbean and the Pacific coasts where main consumption sites are located are keys to the fisheries development on the Caribbean Coast. Development of ports and harbors where fisheries products from the Caribbean can be directly exported is also important for the exportation.

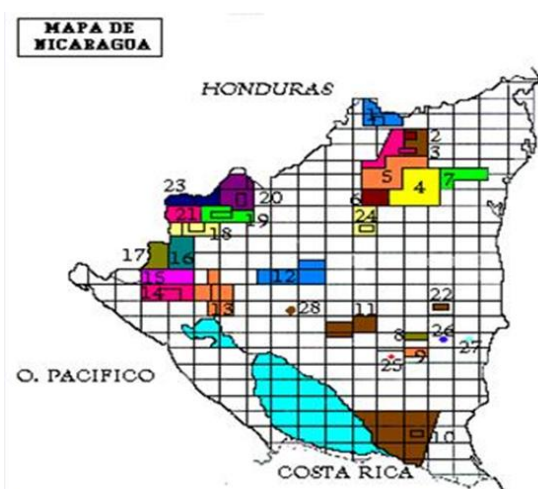
## 4.5 Long-Term Development Vision of Mining and Energy Sector

### (1) Current Mining Industry

Nicaragua has long been known to have gold, silver and other rare metal resources. Although mine sites spread across the country as shown in Figure 4.5.1, gold mining at Borosi Mine in northern-central RAAN is the main mining activities. The gold export value accounts for 11.4% of all exportation (2011), being a key industry for the country.

### 1) Oil and Gas Exploration

As shown in Figure 4.5.2, oil and gas resources are found in waters 120 km to 150km off the coast of Bilwi, the capital of RAAN and 120km to 150km off the coast of Bluefields, the capital of RAAS, stretching 200km north-south, and they are designated as development mine sites (Area in blue in Figure 4.5.2). Appraisal exploitation results show the existence of API38 quality crude oil reserve and Noble Energy Nicaragua, a joint venture with US capital, is conducting resource exploitation.



**Figure 4.5.1 Mine Sites in Nicaragua**  
Source: Ministry of Energy and Mines (MEM)



**Figure 4.5.2 Oil and Gas Development Mines**  
Source: Noble Energy

## **2) Combined Oil Refining and Petrochemical Complex**

A joint venture of Venezuela-based Alba and Nicaraguan state-run Petronic began construction of an oil refinery (initial investment of 3.3 billion dollars) with daily capacity of 150,000 barrels (of which 50,000 barrels are for domestic consumption) in Leon Department. Although it is currently constructing petroleum, oil and lubricants tanks, acquisition of land for the refinery site is behind the schedule. With the completion of land acquisition, construction of a crude refinery plant is slated to complete by 2018. Crude oil is likely to be supplied by Venezuela as it is at present. Most of the produced petroleum and petrochemical products will be exported to neighboring countries. The crude oil is transported via offshore pipeline to be installed from Venezuela to Monkey Point in RAAS in eastern Nicaragua and then transported through overland pipeline to the oil refinery in Leon Department. However, it will be transported by crude oil carriers by sea via the Panama Canal as it is now until the completion of pipeline installation. The project is one of the biggest among the National Human Development Plan (2012-2016) and is regarded as the most important project for creation of employment opportunities.

## **(2) Current Energy Sector**

### **1) Facility Capacity**

Although the total design capacity of power generation plants in Nicaragua is 1,266MW in 2012, the effective capacity is 956MW. Of total generated power of 3,683MWh, 59% is thermal power generation. Nicaragua is equipped with a variety of renewable energy sources, the total of geothermal generation (14.1%), hydraulic power generation (11.2%), biomass power generation (6.8%), and wind power generation (8.9%) is 1,510MWh, which accounts for 41.0% of total power production. The government is focusing on renewable energy use and the ratio is estimated to reach 50% of total power generation in 2013 and aims to reach 94% by 2017.

### **2) Electric Power Demand and Supply Capacity**

Electric power demand is growing at an annual average rate of 4 % and supply capacity needs to be increased. Of total population, 73.7% of families receive power supply service. The target electrification rate of Central America is to reach 90 % in 2020.

### **3) Renewable Energy Use**

Renewable energy development projects on the top priority list include hydraulic power generation (250MW) in Tumarín in RAAN and wind power generation (increase from current 160MW to 200MW) in Rivas Department.

### **4) Regional Electric Power Development Plan**

The Central American Electrical Interconnection System (SIEPAC), a project to develop regional electric power network across six countries from Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica to Panama from north to south along the Pacific with a total length of 1,793km (total construction cost of approx. USD 500 million), has electric power transmission capacity of approx. 300MW. It is mostly completed excluding the 50-km-long power transmission cable installation underway in Costa Rica (land acquisition problem) as of March 2013 and the total system is expected to be in operation in several years. The regional power transmission project is coordinated and managed by the Electrification Board for Central America (CEAC) and the supply-demand balance of the involved countries is to be coordinated. MEM believes that the completion of the SIEPAC will make Nicaragua an electric power exporter.

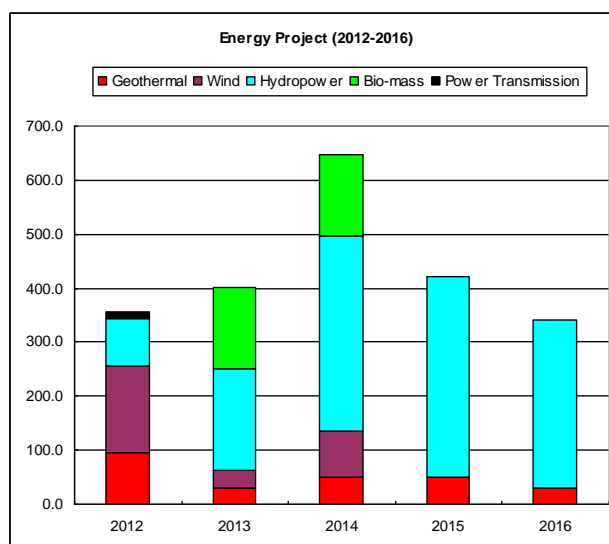
### (3) Priority Development Projects in National Human Development Plan

The National Human Development Plan (2012-2016) includes an electric power development plan for total power generation facility capacity of 532.9MW to meet the total power demand of 679.5MW in 2016 with the total investment of USD 2.2 billion. As shown in Figure 4.5.3, the country focuses more on hydraulic power generation facility development projects.

### (4) Long-Term Development Vision of Mining and Energy Sector

The long-term energy sector development vision can be as follows:

- Vision-M1: Continuation of mines, oil and gas development across the nation, particularly in the northern region
- Vision-M2: Promotion of renewable energy use (hydraulic power, wind power, solar power, geothermal, and biomass) and decrease in imported fossil fuel use
- Vision-M3: Promotion of local production and local consumption of energy in non-central regions to lower power transmission and distribution cost



**Figure 4.5.3 Annual Distribution of Investment in Prioritized Electric Power Generation Projects**

Source: JICA Study Team, PNDH (2012-2016)

## 4.6 Long-Term Development Vision of Tourism and Service Industries

### (1) Current Tourism Sector and Future Trend

The number of foreign tourists is estimated to be approx. 10 million in 2013 in Central America. Costa Rica has the biggest number of approx. 2.7 million. Nicaragua accounts for 13%, or approx. 1.3 million and 64% of them are from within Central America and 25% from North America, with the total from the two regions accounting for 90 % of foreign tourists.

The direct and indirect economic impacts account for 7.2% of GDP as of 2008, which shows that tourism is one of key sources of foreign currencies together with exportation of agricultural products, money remittance from overseas, and exportation of gold, etc. As of 2013, direct employment in tourism accounts for 2.8% of GDP of direct employment. When indirect employment and economic ripple effects are taken into consideration, the sector is estimated to create 8.4% of GDP and also 8.4% of employment.

Tourism in Nicaragua faces a problem of inconsistency of the percentage of tourists and that of tourism income in Central America. It has issues of tourism offers (diversification of destinations and souvenirs, etc.) and development of tourism infrastructure.

The Institute of Tourism (INTUR) in 2010 formulated the National Sustainable Tourism Development Plan/PNDTS-2011/2020 with the target year of 2020 with assistance from the IDB and Spanish Agency of International Cooperation. The plan contains marketing strategies of service sector and a tourist destination development plan. It shows the prioritized development districts in Figure 4.6.1 and their development policies as well as numerical targets of development by 2020. The Survey sets the numerical target by 2033 in line with the plan.

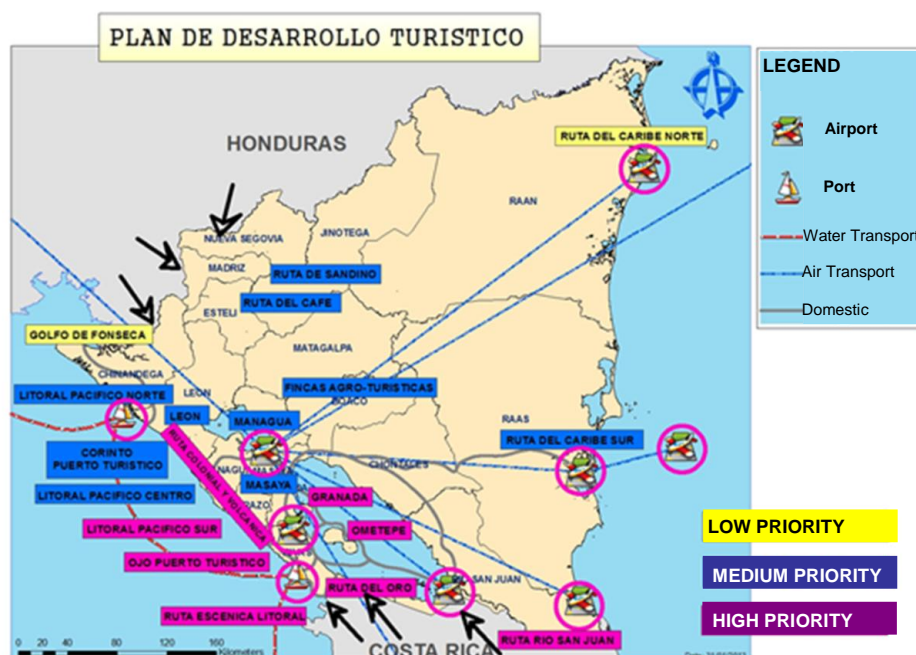


Figure 4.6.1 Prioritized Tourism Development Districts

Source: PNDTS

The survey team estimated the number of tourists until 2023 based on the intermediate value of the maximum development scenario (Max) and minimum development scenario (Min) shown in PNDTS and formulated a tourism development framework of the survey in consideration of characteristics of tourism in Central America and social and economic changes after 2023.

Although PNDTS does not have the plan of domestic tourists, we formulated their future frame and estimated their social and economic impacts in consideration of sharp increase in their number in line with economic development. Table 4.6.1 and Table 4.6.2 below show the estimated number of tourists and their social and economic indicators.

Table 4.6.1 Estimated Number of Foreign Tourists (unit: 1,000)

Year	2013	2033	Increase Rate
Estimated number of tourists (million)	1,295	5,356	4.1 times
Ratio in Central America	12.9%	18.6%	+ 5.7%

Source: INTUR and JICA Study Team

Note: domestic tourists are converted in foreign tourists

Table 4.6.2 Impacts on Nicaraguan Economy

	2013	2033	Note
GDP of tourism sector (1 million US\$)	247	2,109	AAGR : 12.6%
Ratio in Nicaraguan GDP.	3.4%	5.3%	Growth of Tourism sector to GDP
Contribution to Nicaraguan GDP including ripple effects (1 million US\$)	742	5,433	Twice to three fold of tourism sector to GDP
Ratio in GDP including ripple effects	10.2%	13.7%	—
Direct employment generation (1,000 people)	73	220	
Direct and indirect employment (1,000 people)	218	439	Twice to threefold of direct employment

Source: JICA Study Team

Note: Indicators used for the estimate are based on analysis of PNDTS – 2011/2020.

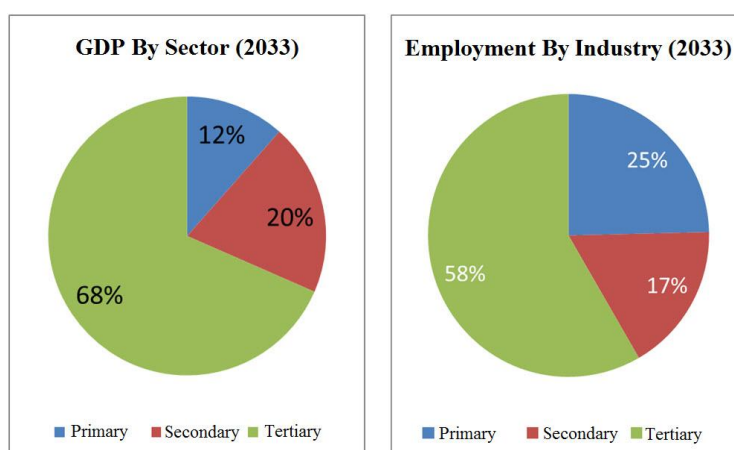
## (2) Current Service Sector and Future Trend

Nicaraguan tertiary industry consists of seven sectors: commerce, hotels and restaurants, government services, transport and telecommunications, financial services, energy and water supply, housing and real estate development, and other services. The growth rate of the tertiary industry during 10 years from 2001 to 2010 is 5.3 %, with primary industry at 6.7 % and secondary industry at 6.1 %. Meanwhile, it accounts for 54 % of GDP as of 2013. That of other Central American countries also accounts for more than 60 % of GDP. Nicaraguan growth was led by major overseas investment in agriculture and its related industries for the last 10 years.

As for the growth rate of each sector in the tertiary industry, the government services and energy and water supply showed 6.3 % and 6.9 % increase, respectively, from 2006 to 2011, whereas the growth rate of transport and telecommunications and housing and real estate development is 4.3 % and 4.5 %, respectively, lower than that of GDP growth rate. Generally, in the process of industrialization and modernization of a country, the growth rate of tertiary industry is higher than the average growth rate of all industries. It is because development of all industries cannot be achieved without the growth of service sector that supports growth and modernization of industries. Particularly, the tertiary industry serves as the infrastructure sector for each industry and it provides social services for the people, supporting economic development in both human and physical aspects.

The commerce and hotels and restaurants sectors are at the center of tourism industry and they support national consumption. The tertiary industry needs to mark higher growth rate for the future economic growth of the country.

The energy and water supply sector, transport and telecommunications sector, and financial services sector need to grow further for the development of primary and secondary industries and improvement of social services (education, healthcare, etc.) for the people who support national economy is essential. GDP and employment composition in 2033 based on the assumption that the national economy continues to grow in line with the improvement and development of the tertiary industry is estimated and the results are shown in Table 4.6.2.



**Figure 4.6.2 Future Trend of GDP and Employment of Nicaragua by Industry**

Source: Estimated by JICA Study Team

## (3) Long-Term Development Vision of Tourism Sector and Service Industry

In this Project, we set the development vision of tourism sector with 2033 as the target year as follows based on the analysis results:

- **(Diversification of tourism products):** Develop global-level tourism products in accordance with the development priority order stated in PNDTS of Nicaragua. As for the tourism resources development, further continue advancement of eco-conscious sustainable development. Tourism development particularly on the Atlantic side is desired to be further enhanced and promoted. (This is slated to be studied with EU assistance.)



- **(Local participation):** Give consideration to both local economy and tourism sector, paying attention to promotion of local employment and development of workforce in tourism services.
- **(Tourism infrastructure development):** Provide such tourism-related transport infrastructure as airports and tourism access roads and immigration control offices consistent with investment in such tourism sector as hotels, restaurants and amenities and other tourism facilities and the demand for them.
- **(Tourism promotion):** Secure safety of tourists and enhance campaigns and their organizational structure to promote tourism development.
- **(Expansion of related service industries):** Promote further growth and expansion of such sectors in the tertiary industry as energy and water supply, transport and telecommunications and finance and social services (education, healthcare, etc.) for the development of primary and secondary industries that are nation's major industries.

## 4.7 Poverty Reduction Strategies

### (1) Current Poverty Situation

Nicaragua's per capita GDP is the second lowest following Haiti in Latin American and Caribbean countries. According to statistical data released by the UN Economic Commission for Latin America and the Caribbean (ECLAC), per capita GDP of Nicaragua grew from 722 dollars in 1990 to 956 dollars (2005 prices) in 2010. Different from Haiti where it dropped from 601 dollars to 429 dollars during the same time period, Nicaragua is growing steadily after the end of the civil war as is the case in the neighboring country of Honduras.

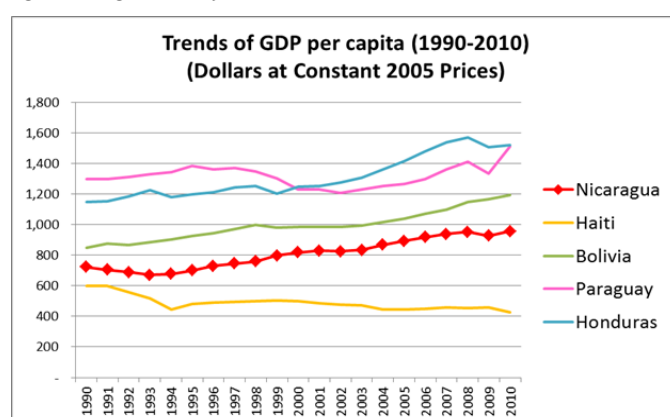


Figure 4.7.1 Per Capita GDP of Latin American Low-Income Countries (1990-2005)

Source: ECLAC

According to the Household Survey for the Measurement of Living Standards (EMNV) in 2009, the ratio of absolute deprivation in Nicaragua is the highest in rural areas along the Caribbean Coast at 30.7 %, followed by central rural areas at 29.3 % and rural areas along the Pacific at 21.8 %.

The Comparative Outline of Poverty in Nicaragua (Perfil Comparativo de la Pobreza en Nicaragua) of the National Institute of Information Development (INIDEI) shows the absolute deprivation ratio in the three areas in 1993, 1998 and 2001. Refer to Table 4.7.1.

Table 4.7.1 Deprivation Ratio in Nicaragua

	1993	1998	2001
Absolute deprivation ratio in rural areas along the Pacific	31.6%	24.1%	16.3%
Absolute deprivation ratio in central rural areas	47.6%	32.7%	38.5%
Absolute deprivation ratio rural areas along the Caribbean Coast	30.3%	41.4%	26.9%

Source: Comparative Outline of Poverty in Nicaragua, INIDEI.

According to statistical data released by the ECLAC, Gini coefficient of Nicaragua declined by 13.63% from 0.53 in 2005 to 0.46 in 2009. The drop rate during the time period is the second biggest following Venezuela in Latin American countries, showing the improvement in inequality of income distribution.

UNDP's human development indexes consist of three indexes of health (longevity), education and income. Although the health index of Nicaragua fluctuated between 0.8 and 0.85, which is relatively high, education and income indexes have been low. Income index is the lowest among the three indexes between 0.4 and 0.42, with little improvement for the last 10 years.

The UN Millennium Development Goals set numerical targets in eight sectors to be achieved by 2015. According to Pan American Health Organization (PAHO) document released in 2003, Nicaragua had yet to achieve much, excluding the gender goal.

The PNDH (2012-2016) advocates the UN Millennium Development Goals and aims at poverty reduction making efforts in various areas comprehensively. The biggest characteristic of Nicaraguan poverty reduction measures is that the country implements a variety of social policies that include the zero hunger campaign and educational solidarity basket while having increase in production capacity of the poor as the main target to achieve. Another characteristic is that it regards the Caribbean coast region where the poverty rate is high as the focal development area. The Caribbean Coast Development Plan advocates balanced development of the region with 2020 as the target year. It sets specific targets in three phases: Phase I (2009-2011), Phase II (2012-2017) and Phase III (2018-2020). The development plan sets three axes of ① improvement of socioeconomic conditions of local people, ② eco-conscious, uniform and sustainable economic development, and ③ development of autonomous organizations.

## **(2) Long-Term Development Vision of Poverty Reduction**

The poverty reduction policies implemented by the current administration through the PNDH (2012-2016) and other sectorial plans are moving toward the better in such matters as correction of income distribution and regional disparity in general. The current PNDH (2012-2016) aims at comprehensive social development with improvement of production activities of the poor as the main target. This vision can be used not only as the mid-term vision until 2016 that is the deadline of the plan but also as the long-term development vision until 2033.

As the long-term development vision of poverty reduction strategies, measures that emphasize the matters below are desired to be implemented while the basic strategy of the current PNDH (2012-2016) is maintained.

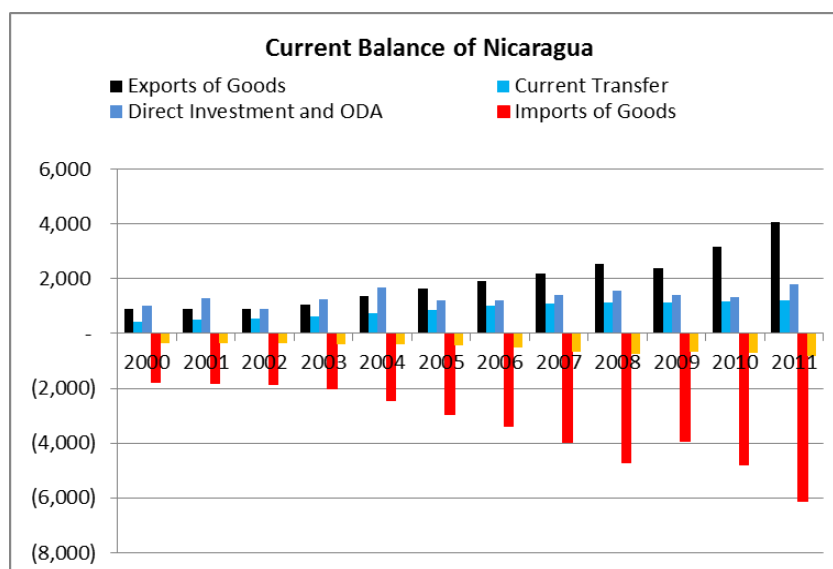
- Improvement of income of the poor: Per capita GDP of Nicaragua is the second lowest next to Haiti among Latin American countries and the income index is the lowest among the three human development indexes (health, income and education). The PNDH (2012-2016) focuses on production activities of the poor and the country is implementing measures with recognition of the heart of the problem. The key also for the long-term development vision up to 2033 is how to improve income and living standards of the poor through such production activities as agriculture, livestock raising and fisheries.
- Correction of regional disparity: 80% of Nicaraguan economy concentrates in the western region and the population living below the poverty line concentrate in rural areas along the Caribbean and in the central region. Such social infrastructure as water and sewerage systems, electricity, roads, schools and public health centers that are basic human needs is in short in the regions. There are many people in different races and with different cultural backgrounds and languages in the regions. The cultural diversity along the Caribbean can be valuable intangible assets. Although social infrastructure development is the primary goal, aiming at more aggressive regional development using the cultural diversity as intangible assets can be effective as a measure to correct the regional disparity.
- Enhancement of educational strategies: Education is very important in examining national long-term development. Primary education is compulsory institutionally in Nicaragua. However, in reality, children in poor families attend school for two years by average. This is

partly because children are workforce in rural areas. Improvement of quality of education and teachers is also a serious issue. For long-term development of the country, it is of critical importance to improve educational and capacity standards of human resources who lead the future in higher education, etc., including training of professional human resources while improving the overall national educational standards by promoting primary education to be received more widely in the poverty regions.

## 4.8 Imports and Exports and Investment

### (1) Current Imports and Exports

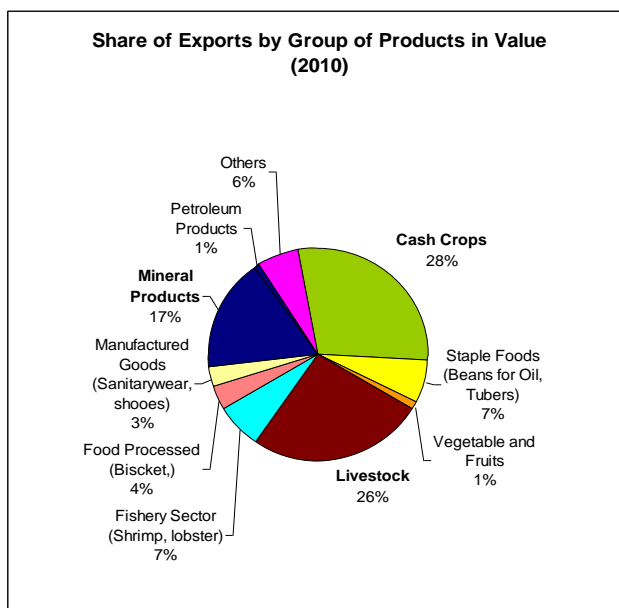
Nicaraguan trade increased sharply for the last 10 years. Exports grew at an annual average of 15.5 % and imports increased also at an annual average of 11.9 % for 11 years from 2000 to 2011. Meanwhile, as for the trade balance, the trade deficit is increasing due to import surplus. Money remittance from overseas labors, foreign direct investment (FDI) and official development assistance (ODA) offset the trade deficit in the current account. Although this trend is likely to continue, they believe that they need to exert their effort to increase export value continually and reduce the trade deficit by lowering energy import value by replacing currently imported energy sources of fossil fuel of imported crude oil and petroleum products with renewable energy (alternative energy).



**Figure 4.8.1 Trend of Imports and Exports and Investment balance**

Source: Analyzed by JICA Study Team based on WB statistics

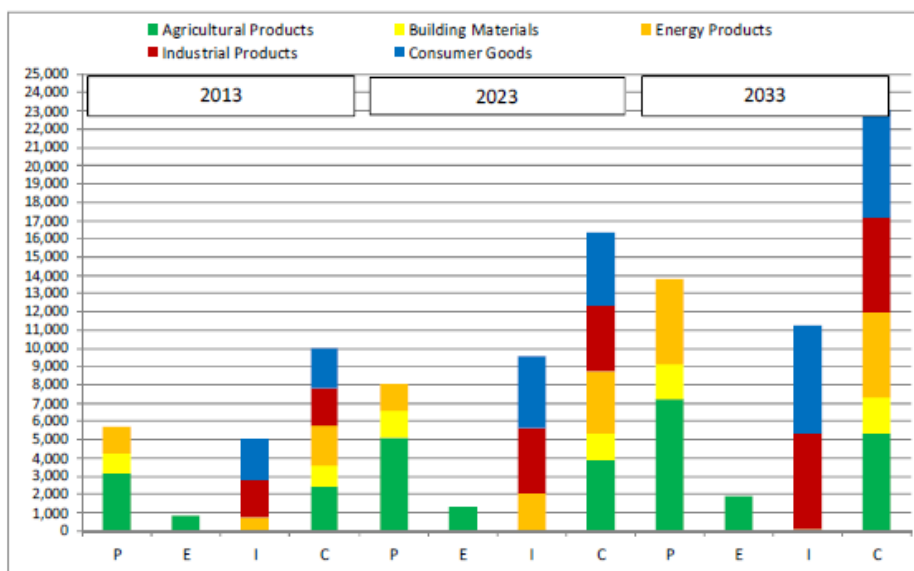
Main export items of Nicaragua include dairy products, mineral products (gold and cast scrap), grains (peanuts, soybean, potato, etc.), agricultural cash products (coffee and sugar), and livestock and marine products (shrimp, lobster, etc.) and the percentage of agricultural products in the total export value is extremely high at approx. 70 % (2010).



**Figure 4.8.2 Export Value by Product Group (2010)**  
 Source: Analyzed by JICA Study Team based on WB statistics

**(2) Future Imports and Exports Trend**

We estimated future production, imports and exports and consumption of 25 main products based on the 2033 population estimates as described afterwards, provisional value of elasticity of GDP and imports and exports (production at 0.98, exports at 1.54, imports at 1.30, and consumption at 0.99 of GDP growth rate). When the annual average GDP growth rate between 2011 and 2033 is assumed to be 6.7 % to 6.9 %, the domestic consumption is estimated to reach 23.0 million tons in 2033, 2.7 times as much as 8.5 million tons in 2010. Imports and exports are estimated to increase from 4.7 million in 2010 to 23.1 million tons, or 280 % increase, in 2033.



Legend: P- Production, E - Exports, I - Imports, C - Consumption

**Figure 4.8.3 Future Forecast of Nicaraguan Imports and Exports and Consumption (provisional value)**

Source: JICA Study Team Estimate

**(3) Long-Term Vision of Imports and Exports and Investment**

The following is set as the long-term vision of imports and exports and investment based on current Nicaraguan imports and exports and future prospects:

- Enhance development and support of small and medium-sized enterprises to promote exports of high-value-added products.
- Create loan and investment schemes that are easily available for development and support of small and medium-sized enterprises.
- Improve facilities across borders to streamline customs clearance procedures to reduce transportation time and cost there.
- Assist establishment of multimodal transportation systems through logistics service provider's operation aiming to increase competitiveness of Nicaraguan products in global market.



## Chapter 5 Regional and Spatial Plans

This Chapter applies the long-term development visions of each sector that are discussed in previous chapters in the framework of region and spatial placement with the policies below in view of trade and economic activities of the entire Central America.

- Based on the spatial placement, development resources and industrial potential of current activities of each sector
- Spatial placement of regional development scenario in light of future development as regional vision
- Consistency between international economic corridors in view of integration of Central America and domestic economic corridors led by regional development
- Examination of domestic and regional consumption putting exports as the primary issue and consideration of regional logistics in relation with current and future transportation network
- Examination of optimal multimodal cooperation partnership for regional development at the spatial development level based on the functional advantages of road transportation, ports and harbors (transportation by water), airports and railways

### 5.1 Overview of Regions and Space

#### (1) Geographic Overview

Nicaragua is situated in the approximate center of Central America sharing borders with Honduras to the north and Costa Rica to the south and facing the Caribbean to the east and the Pacific to the west. As shown in Figure 5.1.1, the eastern region including the Caribbean coast with vast flat land is a nearly tropical forest area with a large quantity of rainfalls. The northern central region is mountainous with relatively little rainfalls and stable climate, suitable to cultivation of such crops as coffee and cacao. It becomes dry highlands towards the south with livestock farming as a main industry. In the western region, a volcanic belt lies along the Pacific, the Lake Managua and Lake Nicaragua (largest freshwater lake in Central America, 12 times the size of Lake Biwa) are situated and hills and small plains spread around the volcanic belt and sugar cane and legume cultivation is popular. Anti-seismic measures and long-time flood control measures are needed in the Pacific region and the eastern mountainous region where there is a large quantity of rainfalls, respectively. Sediment disasters also occur frequently in the mountainous region. Thus, disaster-resistant infrastructure needs to be developed. Rainfalls differ between the eastern and western regions divided by the central mountainous region. The annual rainfalls are around 2,000mm to 3,000mm (in the north), 3,000mm to 4,000mm (in the south) in the eastern region, mainly consisting of R.A.A.N. and R.A.A.S., 1,200mm to 2,000mm in the central mountainous region, and 800mm to 1,600mm on the Pacific side. In Nicaragua with no irrigation facilities, rice is cultivated (mainly rainwater cultivation) particularly in the eastern region and agricultural irrigation measures need to be examined in tandem with flood control measures.



**Figure 5.1.1 Topographic Map of Nicaragua**

Source: INIDE

## (2) Population Distribution

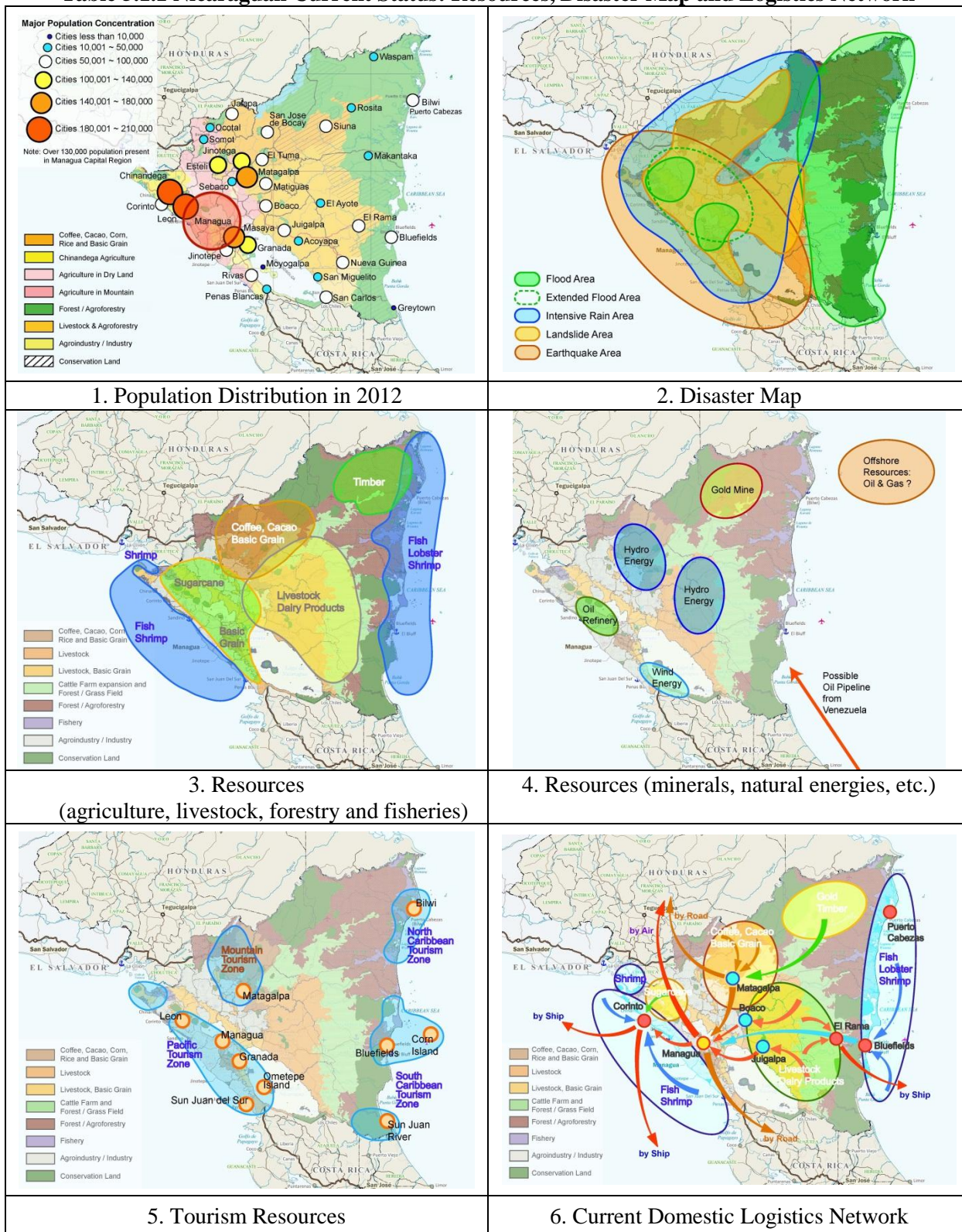
The total population of Nicaragua concentrates in and around cities mainly in the Pacific region. The population of Chinandega, Leon, Managua, Masaya, Granada, Carazo and Rivas departments on the Pacific side is estimated to be 3.17 million in 2013, accounting for 52 % of the estimated national population of 6.03 million. The population of most cities, excluding Managua, the capital, Leon, Chinandega and Granada, is around 20,000 to 50,000. The population density decreases significantly toward the east from the Pacific side. From the perspective of socioeconomic development, the poverty rate in the eastern and Caribbean regions is very high and its improvement is a key issue to be tackled.

## (3) Resources

Main products and financial sources of Nicaragua are agriculture, forestry, livestock and fisheries. In the eastern region, natural environment is preserved in most areas and industrial development is limited to port cities and some other areas. In addition to agriculture, livestock, forestry and fisheries, Nicaragua has various natural resources that include gold mines mainly in the northern mountainous region, hydraulic power generation utilizing abundant water in the central region, an wind power generation in the southern region. In addition, abundant offshore resources (crude oil, gas, etc.) found in the Caribbean can benefit future national finance. Tourism resources concentrate in both the Pacific and Caribbean coastal regions and tourism is promoted in small scales in some historical cities and Corn Island resort and tourists are mainly from North America. Effective utilization of such resources is added to the development vision. Table 5.1.1 shows various resources, disaster map and current domestic logistics.



**Table 5.1 Nicaraguan Current Status: Resources, Disaster Map and Logistics Network**



Source: JICA Study Team (Base Map Source: MAGFOR)

## 5.2 Framework of Regional Development and Spatial Plan

### (1) Statement of Regional Development and Spatial Development Vision

We set a general development vision with the target year of 2033 in formulating the regional development vision based on full examination of the development strategies and guidelines in the PNDH (2012-2016) and departmental and municipal development demand and needs as well as natural environment, geographical conditions and socioeconomic activities.

Based on the analysis of examined issues, the study team defines and aims to achieve the vision statement below for Nicaraguan future regional development that will serve as the basis of national transport plan.

*“Contribute to the achievement of National Human Development Plan of Nicaragua through the regional and spatial development vision in order to achieve poverty reduction and correction of regional disparity, while protecting basic human rights, utilize existing resources to the utmost extent for creating a better nation, reduce transport cost based on better strategies, and ensure well-balanced socioeconomic activities, authorities and identities of all regions and people’s safety.”*

### (2) Priority Issues and Approach Related to Regional Development

With focus on the PNDH (2012-2016) placing poverty reduction and correction of regional disparity as top priorities, the long-term development vision aims to achieve the two issues with emphasis on the development and improvement of North and South Atlantic Autonomous Regions (RAAN and RAAS) on the Caribbean Coast.

Efforts shall be made to increase exports by improving functions of existing ports, expanding their scale and utilizing them to the utmost extent together with development of regional logistics network as development of the Caribbean coastal region. Development of programs that combine regional excellent natural environment with tourism development will also a key to realization of more stable and sustainable socioeconomic activities. Linking socioeconomic activities in the region with those in the Pacific coastal region and connecting regional developmental nodes are of importance in regional development. Figure 5.2.1 shows development image, flow and direction of the Caribbean coastal region.

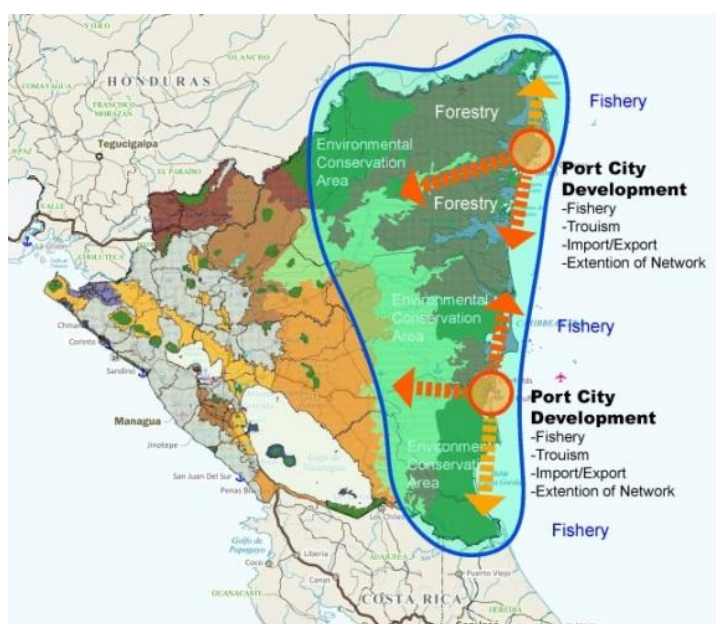


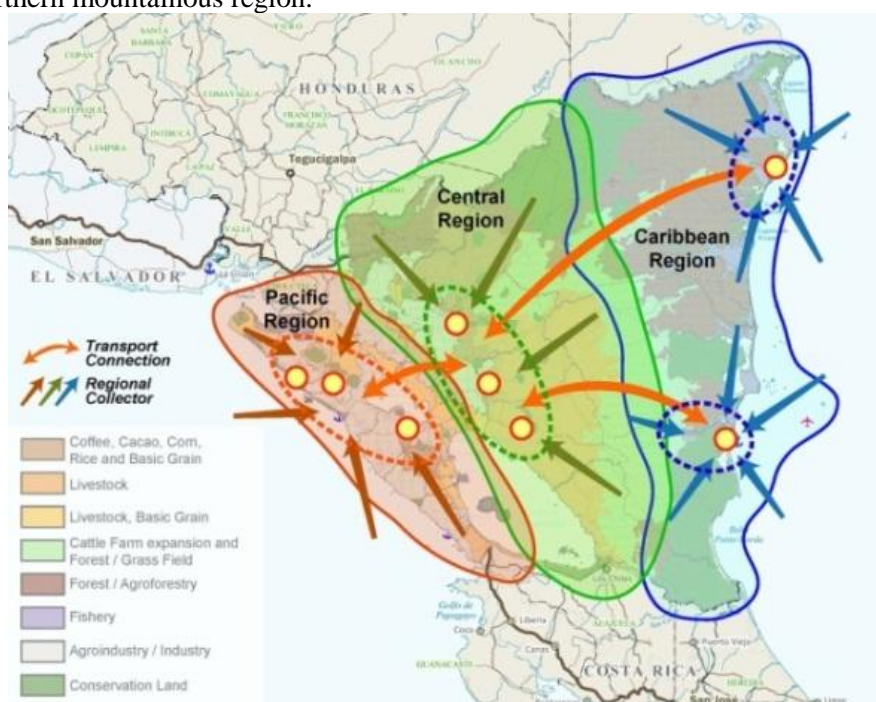
Figure 5.2.1 Development Vision of Caribbean Region

Source: JICA Study Team

### (3) Direction of Regional Development based on Spatial Segmentation

In development, the national land needs to be divided into Pacific, central mountainous and Caribbean regions and national roles need to be assigned to each region. Geographical characteristics are understood and promotion of the primary industry is set at the core of development. As shown in Figure 5.2.2, the nation is divided into the three regions, their role and core region are set and network to connect them in terms of space and social activities is built. Development overview in each region is described below.

- Pacific region: A growth strategy and development plan will be formulated with the secondary and tertiary industries at the core in line with the current industrial development trend and tourism development targeting historical heritage sites will be also emphasized.
- Central mountainous region: Food (meat and dairy products in particular) processing will be promoted with agricultural, livestock and forestry development at the core to improve productivity to satisfy domestic and overseas demand and transport network will be created as the spine of logistics to improve the flow of products across the nation.
- Caribbean region: Promote industrial development with focus on exports of fisheries products to North America and Europe as well as tourism development utilizing natural resources. The regional development will also include exports of wood and gold from northern mountainous region.



**Figure 5.2.2 Basic Logistics Structure in Spatial Development**

Source: JICA Study Team

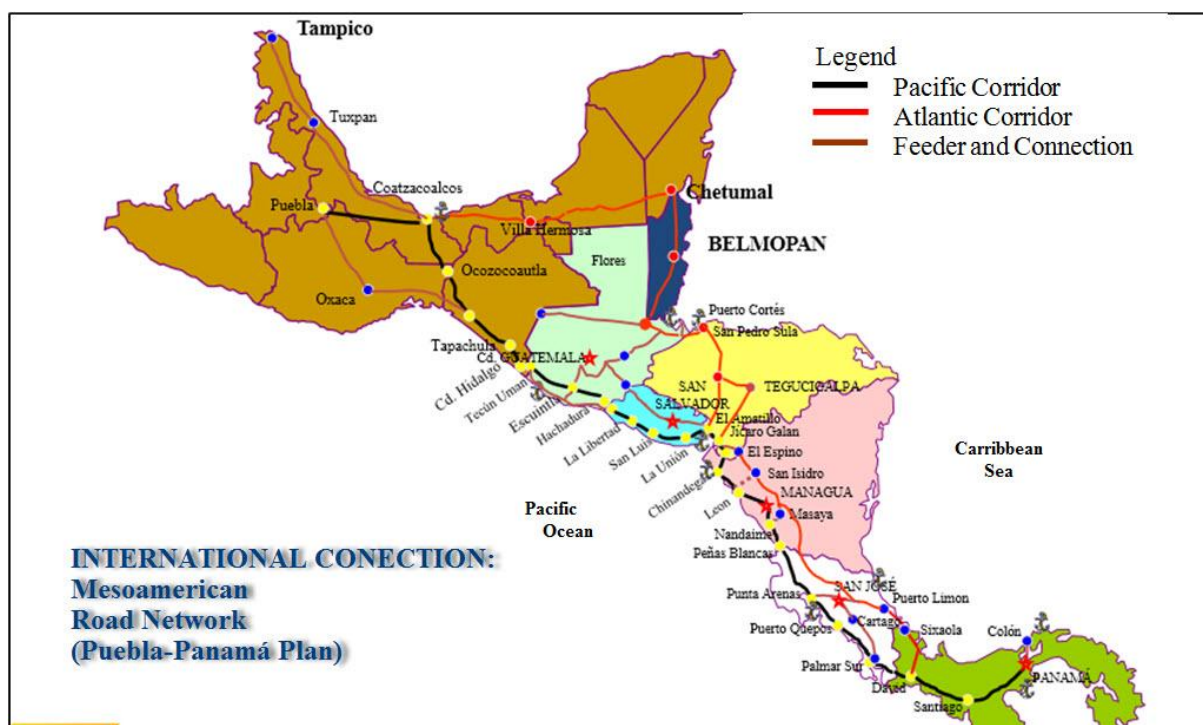
### (4) International corridor network across Central America

#### 1) Overview of Plan Puebla-Panama (PPP)

The Plan Puebla-Panama (PPP) formulated in 2001 under the Central American System of Integration (SICA) is a development plan to promote regional integration and development of 10 countries (Belize, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama and Dominican Republic). It consists of eight major initiatives: 1) integration of electric power market, 2) integration of road network, 3) development and promotion of telecommunications services, 4) trade promotion and enhancement of its competitiveness, 5) human development, 6) sustainable development, 7) mitigation of natural disasters and disaster prevention, and 8) tourism promotion.

The Meso America Project for expansive infrastructure development was planned in 2008 under

the Plan Puebla-Panama (PPP). As a road development project in the Meso America Project, two high-standard highways that run through Central America are proposed—one on the Pacific and the other on the Caribbean sides (See Figure 5.2.3). The Pacific route includes projects for modernization of cross-border facilities and improvement of cross-border cargo and passenger handling.



**Figure 5.2.3 Central American International Corridor Network in Plan Puebla-Panama (PPP)**

Source: Retos Para El Desarrollo De la Infraestructura De Transportes En Costa Rica Adecuación, Mantenimiento y Operación de Tramos Viales del Corredor Pacifico de la RICAM

**2) International Corridor Network in Nicaragua**

Nicaragua is, as an active member of the road program, carrying out a road improvement plan under the Meso America Project along the high-standard highway plan of the Pacific and Caribbean routes. The high-standard highways in Nicaragua are as follows: The Pacific Corridor has a total length of 336km running from Peñas Blancas on the border with Costa Rica to Guasaule on the border with Honduras via Pan American Highway and the Atlantic Corridor has a total length of 500km running from Las Manos on the border with Honduras to San Pancho on the border with Costa Rica along the Lake Nicaragua and via Rt. 1. Improvement work of feeder roads connected to the corridors is also in progress. Figure 5.2.4 shows the Meso America Corridor Network in Nicaragua.

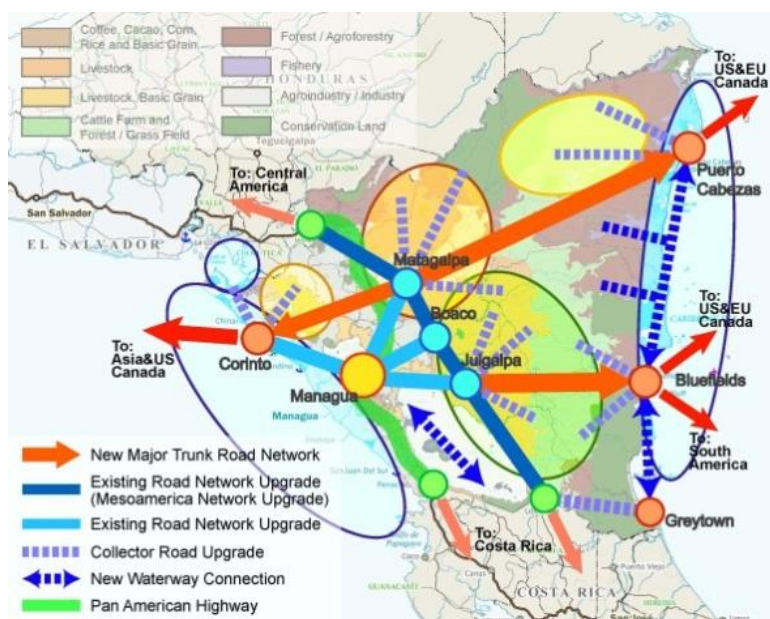


**Figure 5.2.4 Meso America Corridor Network in Nicaragua**

Source: JICA Study Team, Adecuación, Mantenimiento y Operación de Tramos Viales del Corredor Pacifico de la RICAM

**(5) Nicaraguan Spatial Network in Long-Term Development Vision**

Expansion and improvement of ports on the Pacific and Caribbean sides and enhancement of effective and efficient transportation network together with promotion of maximum utilization of existing natural resources and minerals, etc., will help connect the three regions more closely, thereby enabling stable industrial development and formation of market activities with agriculture, livestock, forestry and fisheries as core players. Agricultural, livestock, forestry and fisheries production increase as well as current deprived areas will be assisted by the expanded logistics network to promote increase in exports of Nicaraguan products for healthy development and expansion of socioeconomic activities across the nation to contribute to correction of poverty disparity. Figure 5.2.5 shows development of network that connects each region and main industrial bases in regional development vision.



**Figure 5.2.5 Regional Network Vision**  
Source: JICA Study Team

**(6) Comprehensive Spatial Development Vision**

Based on the discussions above, the development efforts will be carried out as follows: effective utilization of various resources in Nicaragua and further promotion of the primary industry, and development of service sector, particularly tourism, as well as development of the secondary industry with emphasis on processing of products in the primary industry, thereby clarifying the spatial regional roles and promoting growth of production activities and enhancement of logistics structure. Such regional development will help reduce the poor and correct regional disparity and sound and robust socioeconomic activities are expected to take root in Nicaragua. Figure 5.2.6 shows the development vision that integrates Nicaraguan resources, development potential of each industry and spatial network.



**Figure 5.2.6 Nicaraguan Regional and Spatial Development Vision**  
Source: JICA Study Team

## Chapter 6 Summary of Long-Term Vision 2033

### 6.1 Introduction

We, in Phase 1, analyzed the development vision in the PNDH (2012-2016) announced by the Nicaraguan government and set the long-term development vision (2016-2033) to correspond to target years of the national transport plan in the Project through discussions and coordination with concerned organizations.

#### (1) Statement of Long-Term Development Vision

The statement of the long-term development vision (2016-2033) is as follows:

*“Contribute to the achievement of National Human Development Plan of Nicaragua through the regional and spatial development vision in order to achieve poverty reduction and correction of regional disparity, while protecting basic human rights, utilize existing resources to the utmost extent for creating a better nation, reduce transport cost based on better strategies, and ensure well-balanced socioeconomic activities, authorities and identities of all regions and people’s safety.”*

#### (2) Development Goals of Long-Term Development Vision (2016-2033)

The economic, social and environmental development goals in line with the statement of the long-term vision are as follows:

- Economic goal: Increase economic competitiveness and collaboration to support sustainable economic development.
- Social goal: Improve opportunities of social participation and quality of life to contribute to poverty reduction and correction of regional disparity.
- Environmental goal: Pursue development in good harmony with environmental protection and natural environment to promote eco-conscious national growth.

#### (3) Basic Development Strategy of Long-Term Development Vision (2016-2033)

Eight basic development strategies are formulated as listed below to solve basic economic, social and environmental problems and achieve development goals.

<b>Economy</b>	
BS-1	Investment: Build foundation for promoting continuing investment in accordance with concerned guidelines, including ensuring the good balance of development and environmental conservation.
BS-2	Opportunities: Provide employment opportunities to promote lowering of poverty index and correction of regional disparity.
BS-3	Efficiency: Enhance production sector of agriculture and livestock with families and local organizations at the core.
BS-4	Partnership: Promote the economic integration process of Central American and Caribbean countries.
<b>Society</b>	
BS-5	Fairness: Ensure fair opportunities and prosperity through fair redistribution of wealth to all nationals.
BS-6	Correction of disparity: Reduce economic disparity between the Pacific and Caribbean regions.
BS-7	Governance: Improve organizational and human resources capacities through enhancement of local government organizations and human resources development.
<b>Environment</b>	
BS-8	Recovery: Provide a variety of infrastructure resistant to natural disasters.

#### (4) Development Strategy of Each Social and Economic Sector

We set the development vision of each economic and social sector as specific vision below to achieve the purpose of the long-term vision after analyzing the current status of each sector.

<p><b>SS-1: Agricultural, livestock, forestry and fisheries sector</b></p> <ul style="list-style-type: none"> <li>a. Focus on agricultural development in line with rural development programs that benefit all people.</li> <li>b. Ensure national food safety and security.</li> <li>c. Improve productivity in the processes of production, raising and treatment of agricultural products.</li> <li>d. Ensure food safety for domestic consumption and trade.</li> <li>e. Enhance processing and production of high value-added agricultural products.</li> <li>f. Develop international markets and provide access to all markets including domestic ones.</li> <li>g. Enhance institutions and organizations that manage agricultural, livestock, forestry and fisheries sectors in an integrated manner as such organizations and systems are insufficient.</li> </ul>
<p><b>SS-2; Tourism and service sector</b></p> <ul style="list-style-type: none"> <li>a. Promote eco-conscious sustainable tourism development in the Atlantic region.</li> <li>b. Promote tourism development to maximize the synergy effects of creation of employment opportunities.</li> <li>c. Coordinate public and private investment to promote well-balanced tourism development based on public-private partnership.</li> <li>d. Ensure safety and security of tourists and enhance tourism development promotion and organizational structure.</li> </ul>
<p><b>SS-3; Mining and energy sector</b></p> <ul style="list-style-type: none"> <li>a. Develop minerals and energy resources on the Atlantic side.</li> <li>b. Emphasize and promote renewable energy development to reduce dependence on imported fossil fuel.</li> <li>c. Promote well-balanced distribution of electric power generation of fossil fuel and renewable energy.</li> </ul>
<p><b>SS-4; Trade and industrial sector</b></p> <ul style="list-style-type: none"> <li>a. Enhance development and support of small to medium-sized enterprises to promote exports of high-value-added Nicaraguan products.</li> <li>b. Create loan and investment schemes that are easily available for development and support of small and medium-sized enterprises.</li> <li>c. Improve facilities across borders to streamline customs clearance procedures to reduce transportation time and cost at the cross border point.</li> <li>d. Assist establishment of multimodal transport systems through logistics service provider's operation aiming to increase competitiveness of Nicaraguan products in global market.</li> </ul>
<p><b>SS-5; Education sector</b></p> <ul style="list-style-type: none"> <li>a. Provide access to education free of charge for all children for 100% eradication of illiteracy.</li> <li>b. Enhance occupational training to satisfy necessary occupational skills requirements.</li> <li>c. Enhance solidarity and cohesion of the people through solid communication and education.</li> </ul>
<p><b>SS-6; Healthcare sector</b></p> <ul style="list-style-type: none"> <li>a. Provide free and universal access to basic healthcare services.</li> <li>b. Permanently improve the quality of healthcare and medical care services.</li> <li>c. Improve the quality of medical services in rural areas.</li> <li>d. Create healthcare services in RAAN and RAAS where the services are most vulnerable socially and regionally.</li> </ul>
<p><b>SS-7; Poverty reduction</b></p> <ul style="list-style-type: none"> <li>a. Improvement of income of the poor: Improve income and living standards of the poor by improving efficiency of production activities and increasing added values to products of agriculture, livestock and fisheries in which many of the poor are engaged.</li> <li>b. Correction of regional disparity: Promote correction of regional disparity by aiming at more aggressive regional development using the cultural diversity as intangible assets, while social</li> </ul>



infrastructure development is the primary goal in rural areas along the Caribbean and in the central region where the population living below the poverty line concentrate.

- c. Enhancement of educational strategy: Improve the overall national educational standards by promoting primary education to be received more widely in the poverty regions and improve educational and capacity standards of human resources who lead the future in higher education, etc., including training of professional human resources.

## **(5) Spatial Plan and Corridor Development in Long-Term Vision**

Figure 6.1.1 and Figure 6.1.2 each show the current and future spatial diagram in which policies of long-term development vision are placed spatially within Central America and Nicaragua with 2033 as the target year.

### **1) Spatial Plan and Corridor Development in Central America**

North-south international logistics corridors under the Meso America Project that will be constructed in line with the high-standard highway plan consisting of Pacific and Atlantic routes will run through Nicaragua as a member nation of Plan Puebla-Panama Project. With no international logistics base on the Caribbean side, current international logistics depend on the north-south international corridors. It will be important for Nicaragua to develop logistics bases of its own on the Caribbean side and safe and secure east-west logistics corridor.

### **2) Comprehensive Spatial Plan in Nicaragua**

Various resources in Nicaragua will be utilized effectively, the primary industry will be further promoted, service sector, particularly tourism, will be developed, and the secondary industry will be also developed with emphasis on processing of products in the primary industry, thereby clarifying the spatial regional roles and promoting growth of production activities and enhancement of logistics structure. Such regional development is aimed to help reduce the poor and correct regional disparity and sound and robust socioeconomic activities are expected to take root in Nicaragua.

### **3) Comprehensive Corridor Development in Nicaragua**

Expansion and improvement of ports on the Pacific and Caribbean sides and enhancement of effective and efficient transportation network together with promotion of maximum utilization of existing natural resources and minerals, etc., will help connect the three regions more closely, thereby enabling stable industrial development and formation of market activities with agriculture, livestock, forestry and fisheries as core players. Agricultural, livestock, forestry and fisheries production increase as well as current deprived areas will be assisted by the expanded logistics network to promote increase in exports of Nicaraguan products for healthy development and expansion of socioeconomic activities across the nation to contribute to correction of poverty disparity.

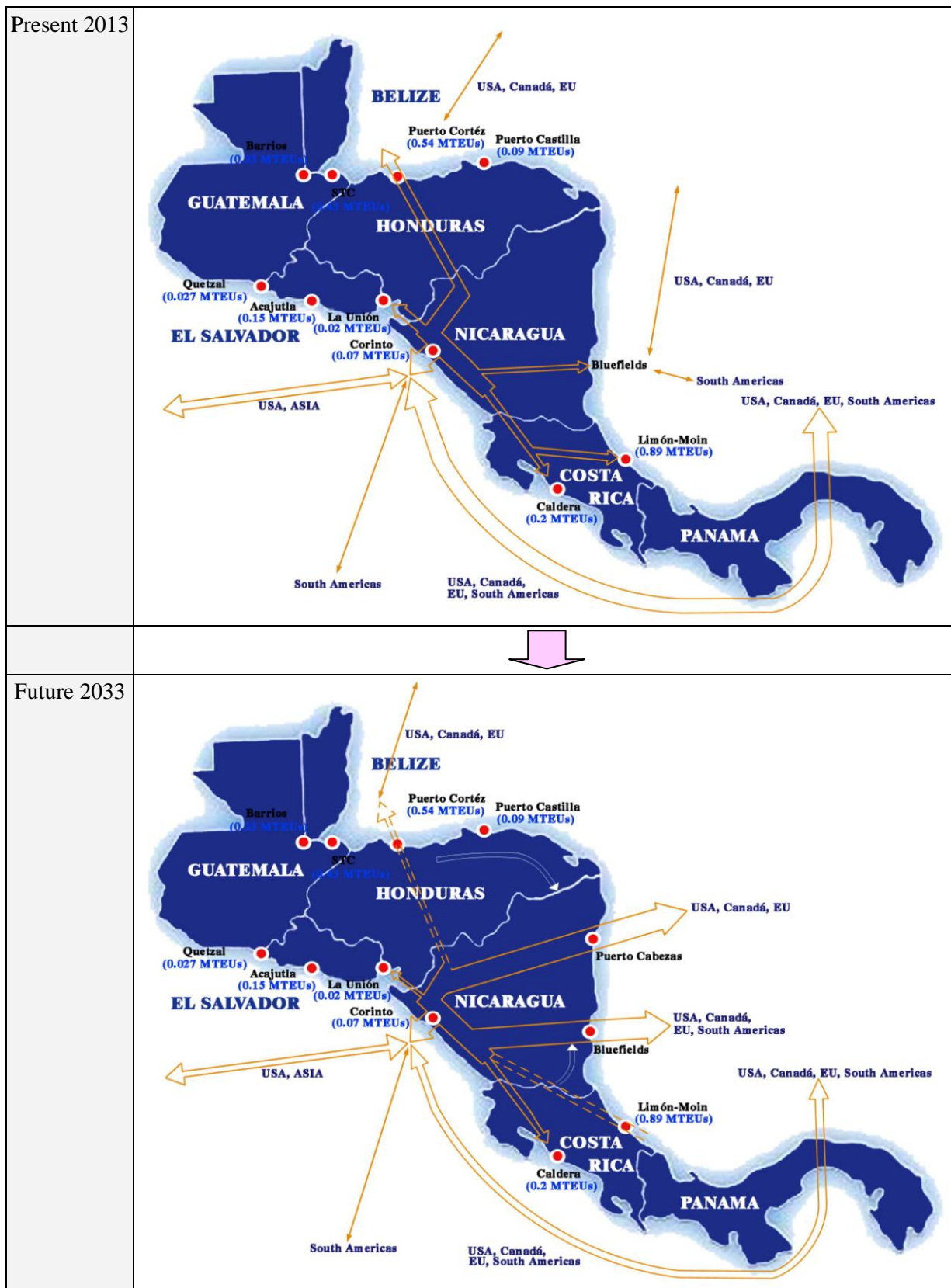
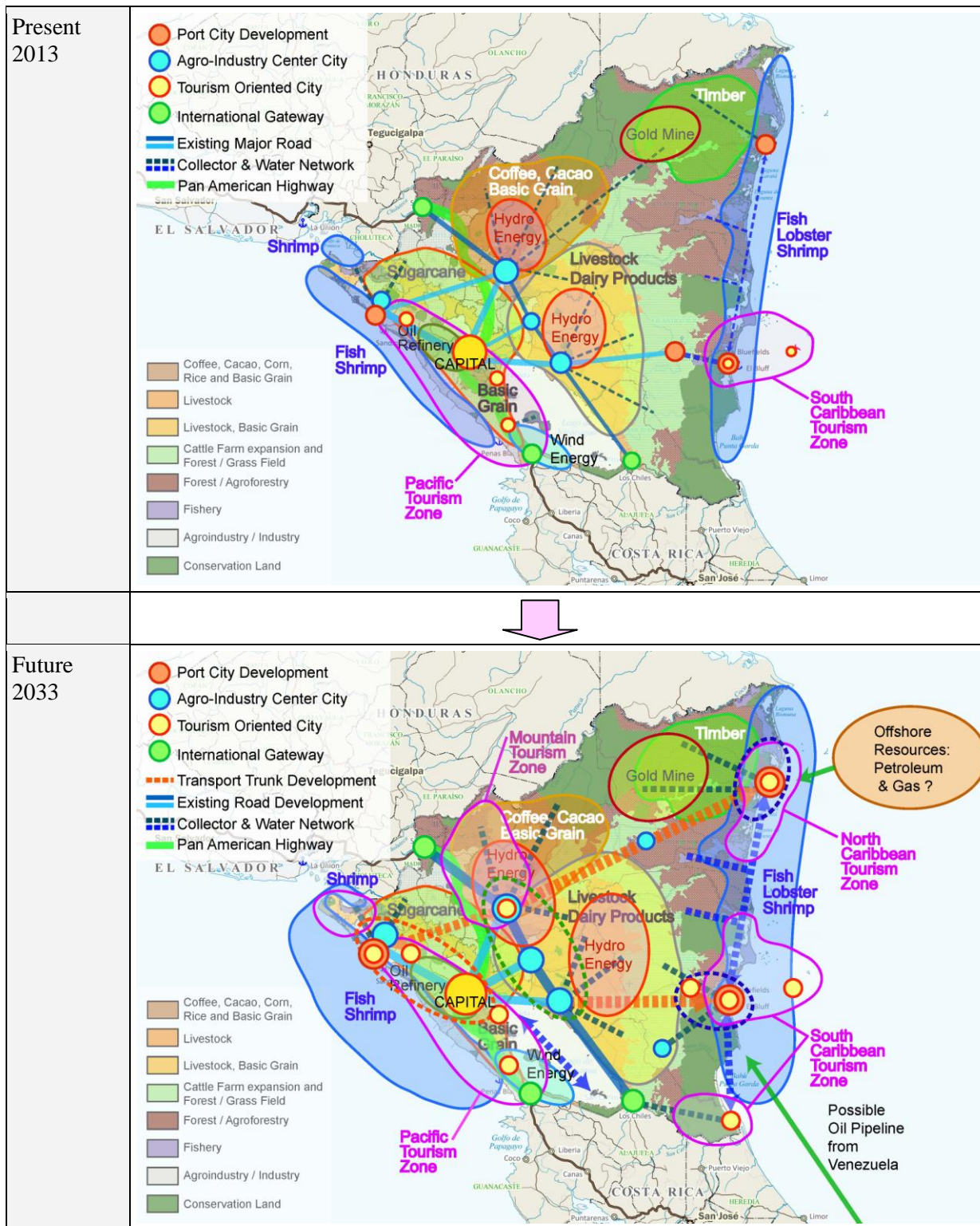


Figure 6.1.1 Spatial Diagram within Central America  
 Source: JICA Study Team



**Figure 6.1.2 Spatial Diagram in Nicaragua**  
 Source: JICA Study Team



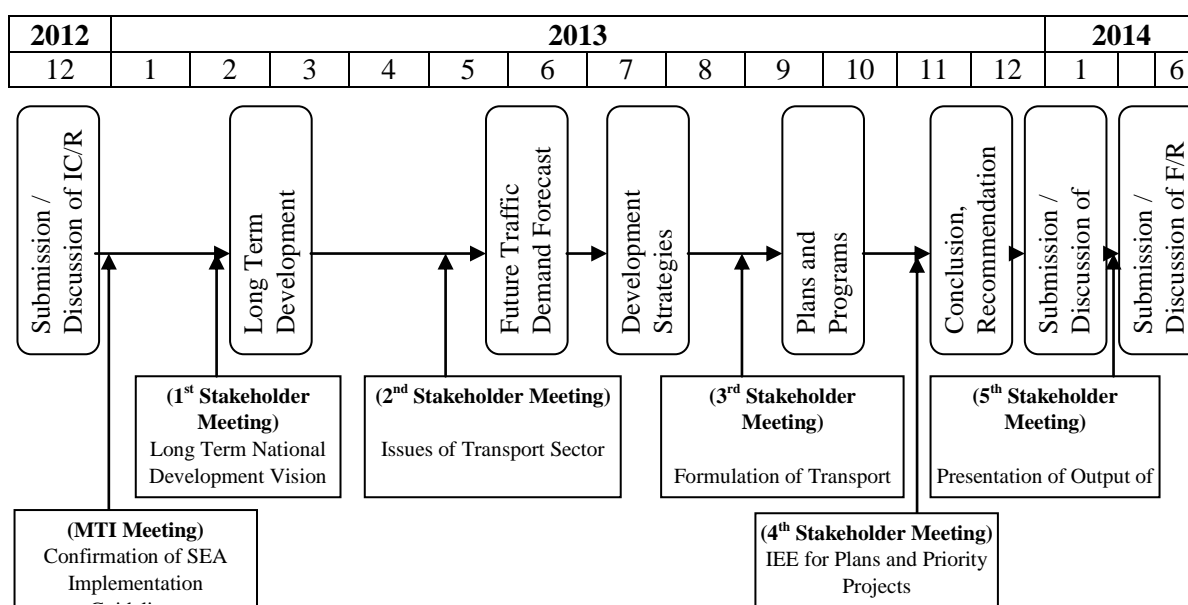
## Chapter 7 Environmental and Social Considerations

### 7.1 Introduction

#### (1) Application of SEA Approach to the Study

This study (Study of National Transport Plan in the Republic of Nicaragua) had carried out the SEA technique. The idea was to take into account environmental consideration at early stage of the plan and engage the stakeholders to make them aware and to provide them venue to participate in decision making process. In applying SEA, the environmental laws and regulations in Nicaragua and the new JICA Guidelines for environmental and social considerations were taken in account in the process of planning.

Figure 7.1.1 illustrates the SEA process which was implemented through various tasks adopted for planning by the JICA Study Team in close collaboration with the Counterpart Team. Presented also in the same figure was the agenda discussed with each stakeholder meeting. Throughout the SEA study process, various stakeholders were involved in order to understand and determine their interests and incorporate their needs and opinions into the whole process.



**Figure 7.1.1 SEA Approach to the Study  
(Planning and consensus building with the participation of stakeholders)**

Source: JICA Study Team

#### (2) Progress of SEA

At the initial planning stage as shown in Figure 7.1.1, confirmation of SEA implementation guidelines was sought from the Counterpart Team particularly MTI. The issues discussed include:

- Scope, procedure, contents of SEA
- Selection of stakeholders
- Environmental and social impact assessment items
- Other issues related to environmental and social considerations

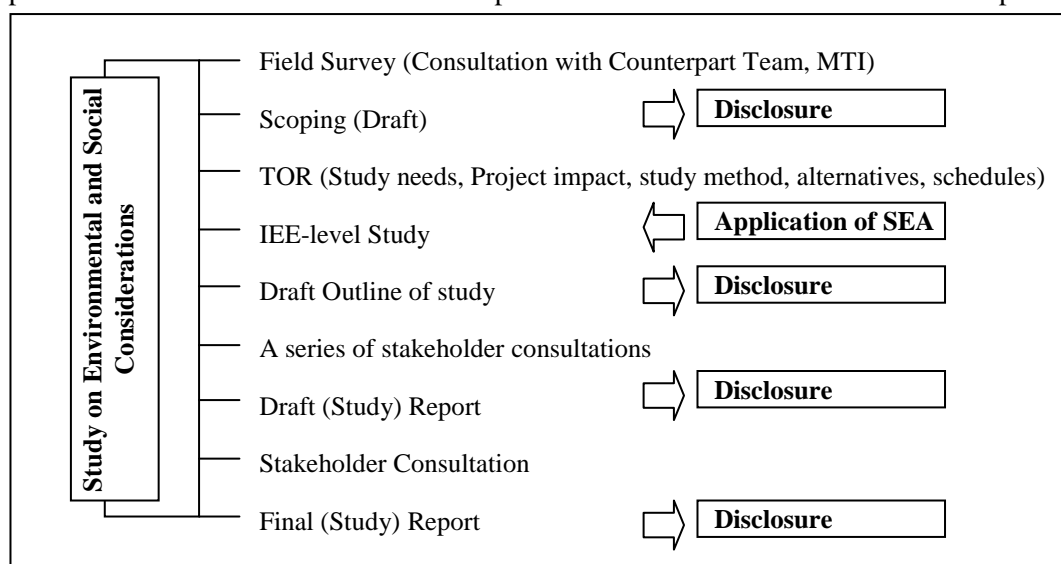
Upon this confirmation, the first stakeholder meeting was carried out last February 19, 2013 with a theme of Long Term National Development Vision. It was jointly organized by the MTI and the JICA Study Team where 66 participants graced the event. The participants came from various sectors such as government and private institutions, donor communities and academe. Opinions expressed during this meeting were captured and analyzed and integrated in the study. A total of five (5) meetings with stakeholders were held during the study. The program of meetings with

other stakeholders is the following:

- First Stakeholder Meeting – February 2013
- Second Stakeholder Meeting – June 2013
- Third Stakeholder Meeting - August 2013
- Fourth Stakeholder Meeting – November 2013
- Fifth Stakeholder Meeting - January 2014

### (3) Procedure of Environmental and Social Consideration for this Study

Based on the (i) JICA Guidelines for Environmental and Social Considerations and (ii) Environmental legislation of the country, the procedure followed to carry out environmental and social considerations for this study is presented in Figure 7.1.2. In consultation with the Counterpart Team, field survey was carried out to confirm environmental and social issues. Based on this survey, Draft Scoping which identified scoping items was prepared. Draft Scoping was discussed with the Counterpart Team for further refinement and other activities were carried out. Opinions expressed by various groups of stakeholder was analyzed and reflected in the report. Upon integration of these opinions and ideas into the report, a consultation meeting particularly with the Counterpart Team was held again to confirm accuracy of the report. Final report was prepared after concurrence from the Counterpart Team and this will be disclosed to the public.



**Figure 7.1.2 Procedure for Environmental and Social Considerations including Stakeholder Consultations for Master Plan Study**

Source: JICA Study Team

### (4) Environmental Legislation and Regulation in Nicaragua

Protecting the environment and natural resources of Nicaragua is enshrined in the Constitution of the country through Article 102 which states that “Natural resources are national assets. Environmental preservation and conservation, development and rational exploitation of natural resources belong to the State, it may enter into contracts for the exploitation of these resources, when the national interest requires”. This is reinforced by Article 60 which states “Nicaraguans have the right to live in a healthy environment. The State is obliged to preserve, conserve and rescue of the environment and natural resources.”

Likewise, Strategic Environmental Assessment (SEA) in Nicaragua has its legal basis in Article 13 of Act 76-2006 which aims to establish provisions governing the SEA in Nicaragua. The said Act define SEA as “instrument of environmental management that incorporates procedures for considering environmental impacts of plans and programs at the highest levels of the decision-making process in order to achieve sustainable development”.

## Chapter 8 Transport Sector: Current Status and Issues

### 8.1 Logistics and Transport Sector: Current Logistics and Issues

#### 8.1.1 Base Cargo Demand Forecast

##### (1) Production, Export, Import and Consumption Volumes of Main Commodities

The study team selected 25 items listed on Table 8.1.1 as main commodities of Nicaragua based on available data, categorized them into five groups and obtained their production, export, import and consumption volumes. As the most recent available data of all the items, particularly the production volume of agricultural products, by department was that of 2010, the cargo demand is forecast based on the 2010 data.

**Table 8.1.1 Items of Base Cargo**

<b>1. Agricultural products (17 items)</b>	<b>2. Industrial products (6 items)</b>
1.1 Coffee	2.1 Manufactured goods
1.2 Sesame	2.2 Agricultural input
1.3 Sugar cane	2.3 Capital goods for agriculture
1.4 Sugar	2.4 Raw materials for industrial production
1.5 Molasses	2.5 Capital goods for industry
1.6 Processed meat	2.6 Capital goods for transport
1.7 Cheese	<b>3. Building materials (4 items)</b>
1.8 Milk	3.1 Construction materials
1.9 Rice	3.2 Cement
1.10 Corn	3.3 Concrete block
1.11 Chestnut	3.4 Cobble (adoquín)
1.12 Peanuts	<b>4. Energy-related (1 item)</b>
1.13 Banana and pineapple	4.1 Petroleum products
1.14 Plantain	<b>5. Consumer goods (3 items)</b>
1.15 Cassava	5.1 Edible oil
1.16 Potato	5.2 Food
1.17 Marine products	5.3 Consumer goods

Source: JICA Study Team

##### (2) Production, Export, Import and Consumption Volumes

The study team analyzed the trend of production, export, import and consumption volumes of the selected items from 2000 to 2010 to obtain their annual average growth rate, based on which we forecast the future demand by target year and by economic activity. Table 8.1.2 summarizes the results. The consumption volume was obtained based on the formula below:

Consumption volume = production volume – export volume + import volume

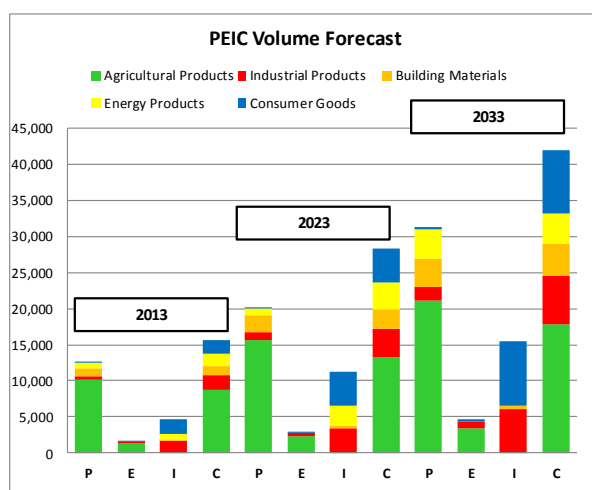
Figure 8.1.1 shows future forecast of production, export, import and consumption volumes (PEIC volume) by target year by commodity group.

**Table 8.1.2 Production, Export, Import and Consumption Volume Forecast**

Year	2010				2013				2023				2033				
	P	E	I	C	P	E	I	C	P	E	I	C	P	E	I	C	
<b>Agricultural Products</b>																	
1.1	Coffee	159	106	0	54	181	125	0	56	276	211	0	64	366	292	0	74
1.2	Sesame	5	3	0	3	7	5	0	3	19	18	0	1	36	35	0	1
1.3	Sugar Cane	4,894	0	0	4,894	5,521	0	0	5,521	8,251	0	0	8,251	10,805	0	0	10,805
1.4	Refined Sugar	1,175	259	0	916	1,325	292	0	1,033	1,980	436	0	1,544	2,593	571	0	2,022
1.5	Molasses	254	120	0	135	287	135	0	152	429	202	0	227	562	264	0	298
1.6	Beef Meat	500	240	0	260	579	278	0	301	943	452	0	490	1,309	628	0	681
1.7	Cheese	48	26	0	23	61	33	0	28	132	70	0	61	222	118	0	103
1.8	Cow Milk	50	36	0	14	54	51	0	4	73	157	0	-84	98	339	0	-241
1.9	Rice	454	0	0	454	539	0	0	539	957	0	0	957	1,407	0	0	1,407
1.10	Maize	457	26	0	431	491	30	0	461	622	30	0	574	729	67	0	662
1.11	Sorghum	30	0	0	30	38	0	0	38	85	0	0	85	145	0	0	145
1.12	Ground Nuts	361	80	0	280	458	102	0	356	1,016	227	0	790	1,742	389	0	1,353
1.13	Banana, Pineapple	114	75	0	38	121	80	0	40	147	98	0	49	168	111	0	56
1.14	Plantain	45	0	0	45	48	0	0	48	58	0	0	58	66	0	0	66
1.15	Cassava	74	38	0	36	74	46	0	36	159	46	0	77	237	123	0	114
1.16	Potabe	25	0	0	25	28	0	0	28	46	0	0	46	64	0	0	64
1.17	Marine Products	240	140	0	100	278	174	0	104	453	333	0	120	628	491	0	138
<b>Industrial Products</b>																	
2.1	Manufactured Goods	400	180	0	220	504	231	0	273	1,088	534	0	554	1,829	954	0	875
2.2	Agricultural Input	0	0	562	562	0	0	605	636	0	0	774	719	0	0	913	781
2.3	Capital Goods for Agriculture	0	0	101	101	0	0	127	127	0	0	274	274	0	0	461	461
2.4	Raw Material for Industry	0	0	275	275	0	0	366	366	0	0	949	949	0	0	1,809	1,809
2.5	Capital Goods for Industry	0	0	247	247	0	0	346	346	0	0	1,076	1,076	0	0	2,323	2,323
2.6	Capital Goods for Transport	0	0	123	123	0	0	334	334	0	0	334	334	0	0	561	561
<b>Building Materials</b>																	
3.1	Construction Material	0	0	85	85	0	0	113	85	0	0	292	292	0	0	557	557
3.2	Cement	850	0	0	850	1,062	0	0	1,062	2,229	0	0	2,229	3,678	0	0	3,678
3.3	Concrete Block	9	0	0	9	12	0	0	12	32	0	0	32	60	0	0	60
3.4	Cement Adquin	21	0	0	21	28	0	0	28	72	0	0	72	137	0	0	137
<b>Energy Products</b>																	
4.1	Petroleum	869	0	820	1,689	869	0	820	1,689	869	0	2,831	3,700	4,087	0	0	4,087
<b>Consumer Goods</b>																	
5.1	Edible Oil	0	0	120	175	0	0	131	131	0	0	176	176	0	0	215	215
5.2	Food Processed	73	73	86	86	92	92	108	108	199	199	233	233	334	334	391	391
5.3	Consumer Goods	0	0	1,246	1,246	0	0	1,659	1,659	0	0	4,303	4,303	0	0	8,204	8,204
<b>Total</b>		11,107	1,402	3,663	13,423	12,657	1,671	4,608	15,603	20,134	3,013	11,241	28,252	31,302	4,717	15,435	41,887

Calendar Year	Activity	2010				2013				2023				2033			
		P	E	I	C	P	E	I	C	P	E	I	C	P	E	I	C
1	Agricultural Products	8,885	1,149	0	7,736	10,090	1,349	0	8,749	15,645	2,280	0	13,310	21,176	3,429	0	17,747
2	Industrial Products	400	180	1,306	1,526	504	231	1,778	2,081	1,088	534	3,407	3,905	1,829	954	6,067	6,810
3	Building Materials	880	0	85	965	1,102	0	113	1,186	2,333	0	292	2,625	3,876	0	557	4,433
4	Energy Products	869	0	820	1,689	869	0	820	1,689	869	0	2,831	3,700	4,087	0	0	4,087
5	Consumer Goods	73	73	1,452	1,507	92	92	1,898	1,898	199	199	4,712	4,712	334	334	8,810	8,810
<b>Total</b>		11,107	1,402	3,663	13,423	12,657	1,671	4,608	15,603	20,134	3,013	11,241	28,252	31,302	4,717	15,435	41,887
<b>Growth Rate (Times of 2013)</b>						1.1	1.2	1.3	1.2	1.6	1.8	2.4	1.8	2.5	2.8	3.3	2.7
<b>CAGR of Each Period of Time</b>						4.4%	6.0%	8.0%	5.1%	4.8%	6.1%	9.3%	6.1%	4.6%	5.3%	6.2%	5.1%

Source: Compiled by JICA Study Team based on data collected from MAGFOR, MIFIC, MEM, etc.



Legend: P- Production, E- Exports, I - Imports, C - Consumption

**Figure 8.1.1 Production, Export, Import and Consumption Volume Forecast by Main Commodity Group**

Source: JICA Study Team

Table 8.1.3 shows the annual average growth rate of these commodities estimated based on the forecast by target year and by economic activity.



**Table 8.1.3 Annual Average Growth Rate of Production, Export, Import and Consumption Volumes**

(Unit: 1 million tons)

Year	Production	Export	Import	Consumption	GDP
2000	7.40	0.68	2.17	8.89	27.08
2010	10.88	1.27	5.17	14.79	36.11
<b>AAGR</b>	<b>3.9%</b>	<b>6.4%</b>	<b>9.1%</b>	<b>5.2%</b>	<b>4.2%</b>
2013	12.37	1.50	6.22	17.02	GDP Target
2023	19.63	2.72	11.59	28.45	6.8%
2033	28.47	4.22	17.30	41.41	7.0%
<b>Duration</b>	<b>Annual Average Cargo Growth Rate</b>				
2000-2010	3.9%	6.4%	9.1%	5.2%	4.2%
2013-2023	4.7%	6.1%	6.4%	5.3%	6.8%
2024-2033	3.8%	4.5%	4.1%	3.8%	7.0%

Source: JICA Study Team

Note: GDP unit is 1 billion NIO, 1994 price

**(3) Trade Value and Cargo Volume**

The annual export value was USD 1.8 billion in 2010, with high annual average growth rate at 11.4% from 2007 to 2010. Meanwhile, the import value was USD 4.2 billion and the annual growth rate was 7.5% during the same time period. The trade balance posted a deficit of USD 2.4 billion. The country has posted an annual trade deficit of USD 2 billion to 2.5 billion since 2000. In volume, it is equivalent to 1.6 million tons of exports and 2 million tons of imports. Table 8.1.4 summarizes export destinations by region. As shown in the table, the biggest export partner for Nicaragua is the U.S., followed by Venezuela. Exports to neighboring countries account for 26%. The exports to destinations on the Atlantic and Pacific sides account for 32% and 17% of the total export volume, respectively. Exports to South America, Latin American countries situated north of Nicaragua, and Costa Rica neighboring on the south account for 25%, 19%, and 7%, respectively.

Table 8.1.5 summarizes imported commodities by region of export destinations. The import volume is approx. 1.25 times as much as that of exports. The import volume from countries on the Atlantic and Pacific sides account for 34% and 19% of the total import volume, respectively. Imports from South America, Latin American countries situated north of Nicaragua, and Costa Rica neighboring on the south account for 14%, 24%, and 9%, respectively. Imports from neighboring countries account for 28 %.

Figure 8.1.2 shows the ratio of export and import volumes from Nicaragua by group of trade partners.

**Table 8.1.4 Trade Partner (Region) by Export Volume**

(Unit: '000 MT/year)

Area	Atlantic			Pacific	Atlantic/Pacific		North				South	Total
	USA	Canada	Europe	Asia	Rest of Latin America	Rest of the World	Hoduras	El Salvador	Guatemala	Mexico	Costa Rica	
Coffee	9.04	0.93	7.02	0.88	2.23	0.31	0.88	0.96	0.37	0.09	0.04	99.917
Cocoa	0.00	0.00	0.81	0.00	0.00	0.00	0.00	0.42	0.30	0.00	0.00	1.530
Precious Metal	2.14	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.528
Metal Waste	2.46	0.08	0.00	3.47	0.00	0.00	3.47	0.00	0.00	11.97	0.00	21.434
Marine products	18.76	0.00	9.46	1.24	0.18	0.13	1.24	0.40	0.25	0.00	0.12	31.766
Meat, offal, leather	53.62	0.00	5.58	9.44	116.39	0.12	9.44	31.70	8.82	0.00	4.50	239.613
Dairy products	1.30	0.00	0.00	0.00	3.16	0.00	0.00	8.62	3.75	0.00	0.09	16.912
Sugar and molasses	186.39	0.00	56.14	91.02	139.21	0.00	91.02	0.00	0.41	1.91	4.27	570.383
Grain	0.00	0.00	0.00	0.00	3.30	0.00	0.00	4.99	0.00	0.00	76.74	85.027
Root crops	18.51	0.00	0.00	0.00	18.81	0.00	0.00	0.96	0.00	0.00	0.00	38.279
Beans	28.76	3.25	35.16	0.40	44.70	5.35	0.40	41.58	3.06	0.69	3.75	167.086
Sesame	0.12	0.00	0.78	1.09	0.00	0.00	1.09	0.08	0.48	0.00	0.00	3.630
Vegetable and fruits	49.22	0.93	8.05	0.00	0.75	0.00	0.00	2.90	0.97	0.95	0.00	63.775
Cigar	0.00	0.00	0.07	0.00	0.19	0.00	0.00	0.00	0.00	0.02	0.00	0.275
Beverages	6.83	0.00	1.83	0.00	3.83	0.00	0.00	2.26	2.02	0.00	2.24	19.013
Food Processed	8.07	0.00	11.16	3.87	21.88	0.00	3.87	6.90	2.08	0.58	0.00	58.405
Sanitary ware	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.08	0.01	0.03	0.197
Manufactured Goods	0.00	0.00	0.00	1.04	0.87	0.08	1.04	2.63	2.43	0.00	3.12	11.207
Petroleum oil	0.00	0.00	0.00	0.00	1.18	0.00	0.00	20.54	0.90	0.17	0.00	22.784
Others	59.39	0.20	2.92	3.79	20.18	0.18	3.79	8.22	4.99	0.13	20.49	124.277
<b>Total</b>	<b>444.60</b>	<b>8.77</b>	<b>138.98</b>	<b>116.23</b>	<b>376.86</b>	<b>6.16</b>	<b>116.23</b>	<b>133.25</b>	<b>30.89</b>	<b>16.51</b>	<b>115.37</b>	<b>1,581.037</b>
Share by Country	30.1%	0.8%	10.3%	7.5%	24.3%	0.5%	7.5%	8.6%	2.0%	1.1%	7.3%	100.0%
Share by Atlantic	32%											
Share by Pacific				17%								
Share by North							19%					
Share by South										7%		
Share by Area of Outbound				49%		25%					27%	100%

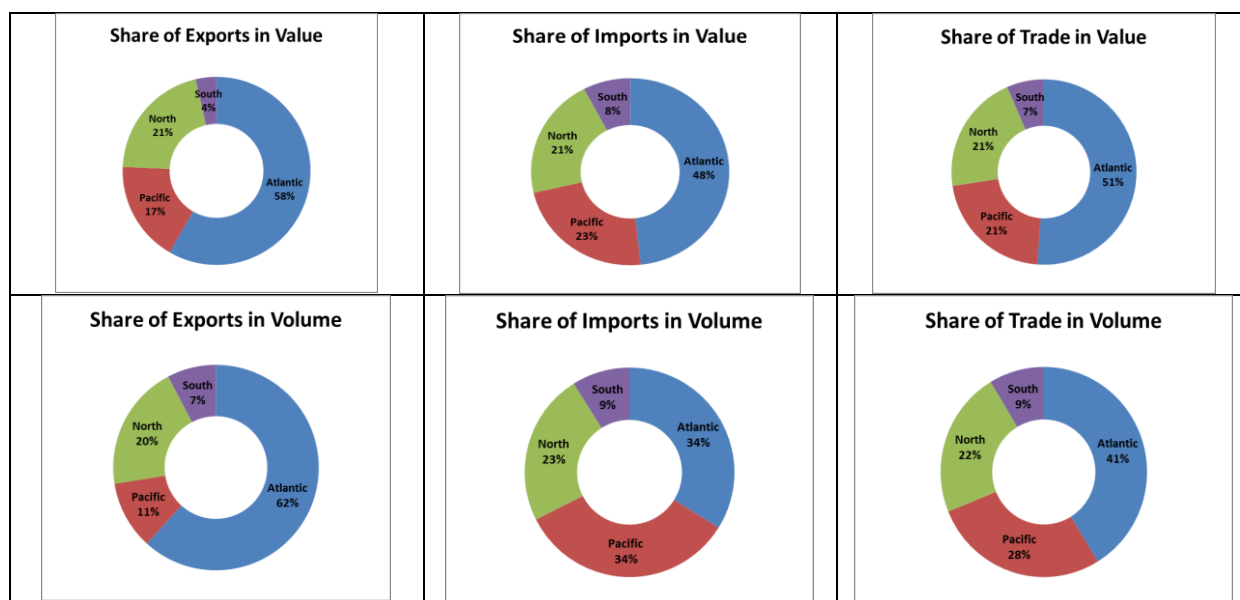
Source: Compiled by JICA Study Team based on MIFIC Data

**Table 8.1.5 Import Volume by Trade Partner**

(Unit: '000 MT)

Area	Atlantic			Pacific	Atlantic/Pacific		North				South	Total
	USA	Canada	Europe	Asia	Rest of Latin America	Rest of the World	Hoduras	El Salvador	Guatemala	Mexico	Costa Rica	
Consumer Goods (Durable)	27.5	0.5	9.4	125.4	8.4	0.1	2.7	9.0	6.4	33.6	15.0	237.9
Consumer Goods (Non Durable)	359.2	5.7	76.5	111.6	61.6	3.4	72.6	105.1	135.2	139.1	140.1	1,210.1
Petroleum fuels and lubricants	9.5	0.1	0.3	0.0	306.4	0.0	10.3	1.0	2.3	1.2	0.5	331.6
Raw Material for Agriculture	81.0	5.6	39.4	36.0	39.5	0.2	8.0	1.8	16.3	15.1	37.9	280.8
Raw Material for Industry	191.7	11.1	44.6	83.9	58.8	5.2	11.9	52.3	59.3	68.8	99.5	686.9
Construction Material	38.4	6.9	12.6	25.6	3.8	0.8	5.8	22.0	66.6	22.7	67.3	272.5
Capital Goods for Agriculture	46.5	1.2	13.3	8.6	25.9	0.1	4.9	10.9	0.3	8.1	1.1	120.9
Capital Goods for Industry	244.5	13.0	145.1	324.7	68.2	2.3	1.6	1.9	3.4	72.1	10.9	887.8
Capital Goods for Transport	23.2	1.4	12.1	86.3	3.5	0.2	0.0	0.2	1.0	6.8	0.2	135.0
Various	4.3	0.0	1.1	0.5	1.3	0.3	0.3	0.0	0.1	0.6	0.4	8.9
<b>Total</b>	<b>1,025.9</b>	<b>45.5</b>	<b>354.5</b>	<b>802.5</b>	<b>577.5</b>	<b>12.5</b>	<b>118.1</b>	<b>204.2</b>	<b>290.8</b>	<b>367.9</b>	<b>372.9</b>	<b>4,172.4</b>
Share by Country	24.6%	1.1%	8.5%	19.2%	13.8%	0.3%	2.8%	4.9%	7.0%	8.8%	8.9%	100.0%

Source: Compiled by JICA Study Team based on data from MAGFOR, MIFIC, MEM, etc.



**Figure 8.1.2 Ratio of Export, import and Trade Volumes by Region (2010)**

Source: JICA Study Team

As shown in the figure above, the trade volume with neighboring countries (Central America) accounts for approx. one-third of the total as well as one-third each with countries on the Pacific and Atlantic sides, although that with countries on the Atlantic side slightly exceeds that with

countries on the Atlantic side. The transit cargo volume that goes by Nicaragua is estimated to be approx. 11 % of the total based on the traffic survey.

#### (4) International Cargo Flow

Table 8.1.6 shows import and export cargo volumes by customs facility in 2013, base year of the project.

**Table 8.1.6 Import and Export Cargo Volume by Customs Facility**

Trade Volume 2013			Cargo Volume by Export and Import (1,000 tons)		
			Export	Import	Total
1	NUEVA SEGOVIA	Las Manos CBP	25	178	202
2	MADRIZ	El Espino CBP	51	126	177
3	CHINANDEGA	Guasaule CBP	732	1,828	2,560
4	RIVAS	Peñas Blancas CBP	407	1,062	1,469
5	RAAS	San Pancho CBP	0	0	0
6	CHINANDEGA	Puerto Corinto	849	2,571	3,420
7	RAAS	Alien Su Port	32	142	173
8	RAAN	Puerto Cabezas	7	11	17
		TOTAL	2,102	5,917	8,019
	Port Pacific Side		849	2,571	3,420
	Port Caribbean Side		38	152	191
	CBP Total		1,214	3,194	4,408

Source: Compiled by JICA Study Team based on data collected from MAGFOR, MIFIC, MEM, etc.

Note: Approx. 60 % of cargo that goes through customs in Las Manos, El Espino and Guasaule is the cargo from or to the Port Cortes in Honduras. Approx. 70 % of cargo that goes by Peñas Blancas customs is the cargo from or to the Port Limon in Costa Rica.

### 8.1.2 International and Regional Cargo Transport Corridors: Current Status

International and regional trade cargo in Nicaragua is transported via the four corridors below. Figure 8.1.3 is a conceptual map of their locations.

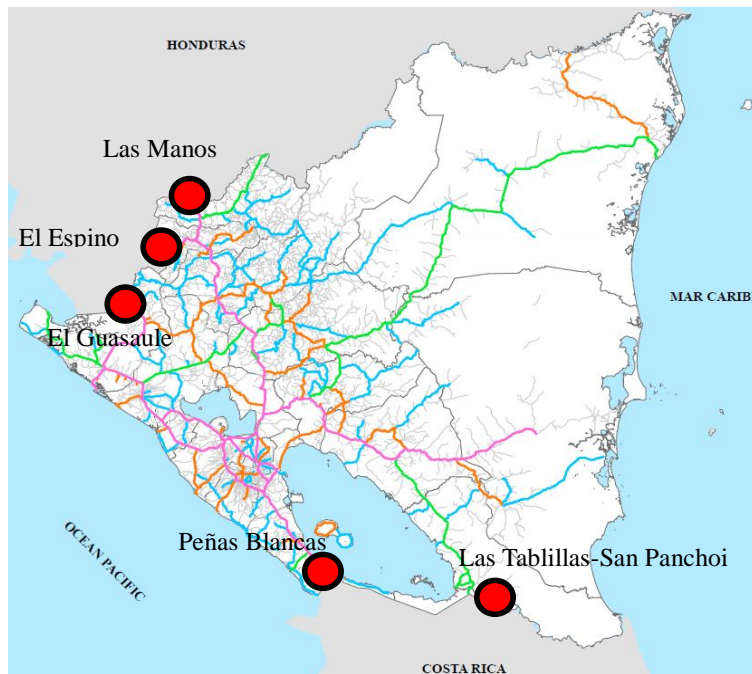
- Pacific Corridor connects one of the nation's major ports, Puerto Corinto Port, in the northern part on the Pacific side with the northern Central America on the Pacific side.
- Northern Corridor connects the Port Cortes in Honduras that is north of Nicaragua on the Pacific side with Nicaraguan northern mountainous region.
- Southern Corridor connects the Port Limon in Costa Rica, neighbor in the south, on the Atlantic Side with Nicaragua.
- Central Corridor connects El Lama and the El Bluff Port on the Atlantic Coast with the Pacific coast region in Nicaragua.



**Figure 8.1.3 Conceptual Map of Current International Cargo Logistics**  
Source: JICA Study Team

### 8.1.3 Cross Border Facility: Current Status and Issues

Five cross-border facilities are operated as customs office in Nicaragua: 1) Las Tablillas-San Pancho and 2) Peñas Blancas on the border with Costa Rica and 1) El Guasaule, 2) El Espino and 3) Las Manos on the border with Honduras (See Figure 8.1.4).



**Figure 8.1.4 Cross-Border Facilities of Nicaragua**  
Source: JICA Study Team

### 8.1.3.1 Las Tablillas-San Pancho Border

#### (1) Location

The San Pancho cross border is situated in San Carlos in Cardenas, Rio San Juan department in Nicaragua with Los Chiles in Alajuela Province in Costa Rica, 199 km away from San Jose, the capital of Costa Rica and 297 km from Managua, the capital of Nicaragua. San Pancho is 506 km from Guasaule on the border with Honduras in northern Nicaragua.

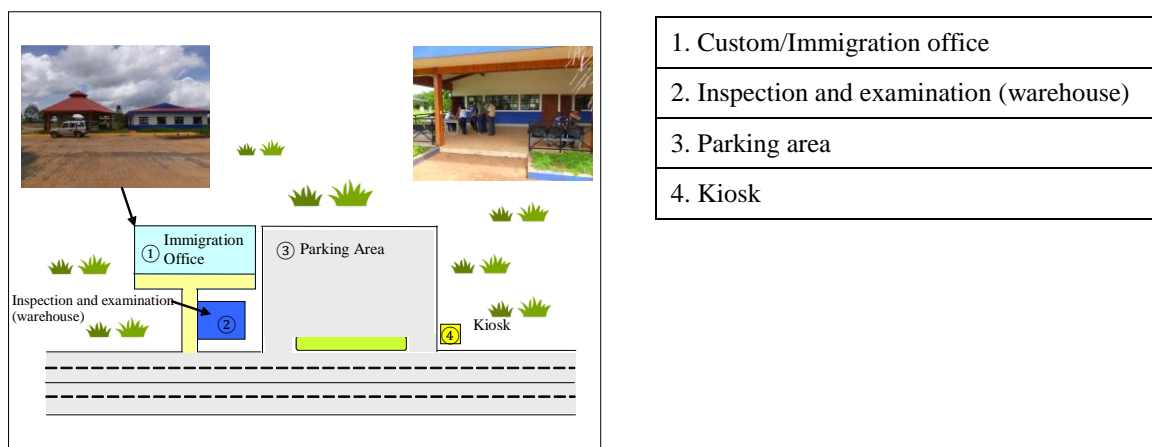
#### (2) Facilities around Cross Border

##### 1) Customs Clearance Area

The customs clearance facility consists of two new brick buildings, located 100 meters away from the border. The bigger building is the customs office with floor space of 800 m<sup>2</sup> and the other one is a warehouse with floor space of 300 m<sup>2</sup>. It is much smaller than other cross-border facilities (See Figure 8.1.5). The facility is surrounded by vacant lots and parking lot covering an area of 1,000 m<sup>2</sup> is under construction next to the buildings. There is one privately-operated kiosk on the corner of the parking. On the Costa Rica side, there is no customs office although there are military facility and parking lot.

##### 2) Traffic Flow of Customs Users

There is a new paved asphalt four-lane road only in front of the customs office. The traffic is closed on the Costa Rica side. Local buses (wagon) are in operation and passengers go through the customs clearance only if they are on foot with no customs clearance of freight vehicles. However, such vehicles go through the customs clearance in the harvest season of oranges and other agricultural products under a special agreement with their growers in the surrounding areas.



**Figure 8.1.5 Customs Clearance Facility and Passenger and Cargo Flow on Las Tablillas-San Pancho Border**

Source: JICA Study Team

#### 3) Customs Clearance Facility and Operation

The customs clearance facility is equipped with electricity and water supply. Although it is small, it is in good conditions. Passengers and freight vehicles go through the same customs clearance route and there is no axle load scale, quarantine or tax collection facility.

#### (3) Current Traffic Demand

Although there is no cargo demand currently, the potential demand that goes through Nicaragua and Costa Rica in the area is estimated to worth approx. 8 million dollars (60,000 tons) in total of both ways in terms of annual commodity trade volume in 2010. This is equivalent to approx. 4,500 freight vehicles a year. Meanwhile, the annual passenger demand who cross the two countries (border river) in the area on foot is approx. 43,000 in both ways in 2010 and the ratio of the two

ways is nearly 1:1. The annual average growth rate since 2001 is approx. 6.7%. (Source: “*Definición de la Operación y Optimización de los Pasos de Frontera del Corredor Pacífico de la RICAM Las Tablillas-San Pancho (CR – NI), Borrador de Informe Final*”, BID in 2011). There is no passenger vehicle or vehicle of this kind that crosses the border.

#### **(4) Current Problems and Issues**

##### **1) Facility and Traffic Flow**

Because there is no customs clearance for freight vehicles or passenger vehicles, the facility is yet to be developed and it is small. As a general customs facility, there is no axle load scale, quarantine or tax collection facility. If the bridge construction (Santa Fe Bridge) over the border river on the Nicaragua side and a customs agreement is concluded with Costa Rica, demand for customs clearance of freight vehicles from the Limon Port is estimated to increase and thus the customs facility needs to be expanded and developed.

##### **2) Customs Clearance Procedures**

The customs facility needs to be developed and a system needs to be introduced to separate general passengers and freight vehicles to meet the future demand increase of freight vehicles.

#### **8.1.3.2 Peñas Blancas Border**

##### **(1) Location**

The Peñas Blancas border is on the national highway that connects Cárdenas in Nicaragua and Cruz in Costa Rica 295km away from San Jose, the capital of Costa Rica and 147 km from Managua, the capital of Nicaragua. It is 336 km from the Peñas Blancas cross-border facility to Guasaule on the border with Honduras in northern Nicaragua.

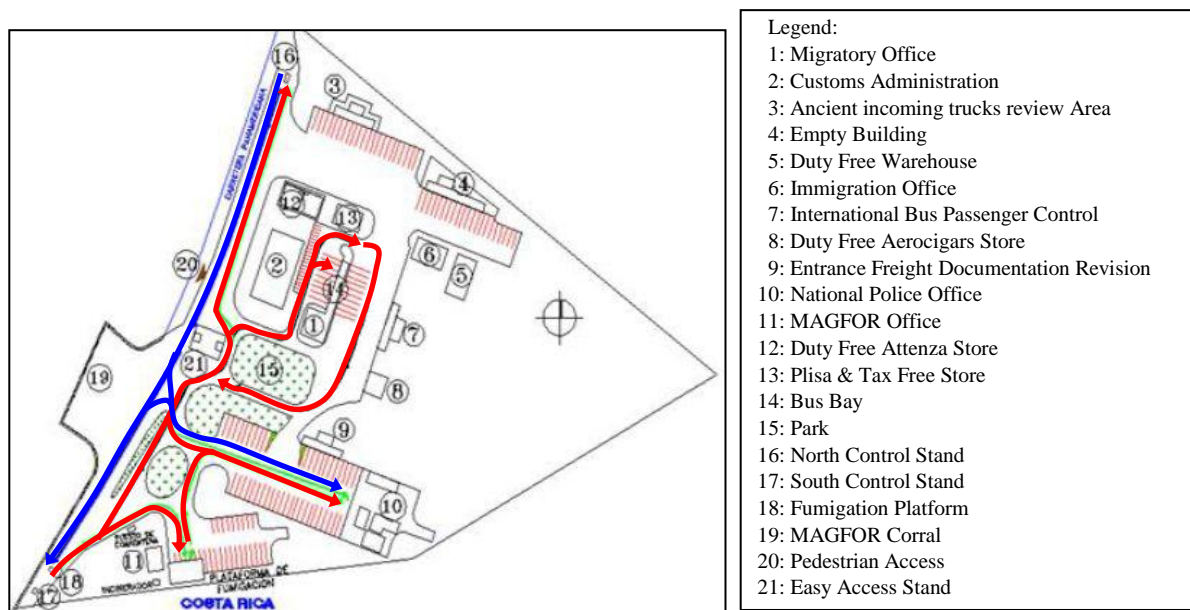
##### **(2) Facilities around Cross Border**

###### **1) Customs Clearance Area**

The Nicaraguan customs clearance facility consists of 21 facilities that include immigration office, customs facility, passenger management office, customs declaration counter, office of Ministry of Agriculture and Livestock, fumigation facility, national police and duty-free shops and they are located separately (See Figure 8.1.6). The immigration office, the key facility of the Peñas Blancas border facility and the customs clearance facility that covers an area of 850m<sup>2</sup> are situated in the center together with parking facility and traffic police, tourism office, and bank office are situated in the same building. An animal and plant inspection station and an inspection office of the national police are situated on the south side (Costa Rica side) together with parking facility and the fumigation facility is at the entrance gate. Most of the facilities are old and the pavement condition of the parking facility is very bad with holes and water pools. There is long traffic congestion of large freight vehicles waiting for the customs clearance on the national highway along the customs clearance facility. There is a preliminary checkpoint 15 km before the border on Nicaragua side and freight vehicles are capable of completing screening of preliminary documents there.

###### **2) Traffic Flow of Customs Users**

All freight vehicles, cross-border buses, passenger vehicles and pedestrians go through the customs clearance in the same route from the national highway (NIC-2) along the customs clearance facility. Traffic congestion for customs clearance occurs partly because the facilities are scattering. Because the pavement condition of parking lot of each facility is bad, freight vehicles are parked along the national highway rather than at the parking facility, which is a reason for the congestion at the entrance and exit to the facility. The traffic flow of the customs users is shown in Figure 8.1.6.



**Figure 8.1.6 Customs Clearance Facility and Passenger and Cargo Flow on Peñas Blancas Border**

Source: JICA Study Team

### 3) Customs Clearance Facility and Operation

The customs clearance facility is equipped with electricity and water supply from the national highway (NIC-2) and it is in good conditions. The customs office is in the central area and all customs users enter the parking lot from the front entrance of the national highway for customs clearance. Imports and exports with freight vehicles are declared separately from passengers. The customs clearance facility is large with the floor space of 850 m<sup>2</sup> and well developed. However, because axle load inspection (with no measuring instrument) for freight vehicles, quarantine facility, and tax payment procedures are separately located, it usually takes 2 to 2.5 hours for the customs clearance. If there is a problem at the customs office, it takes more than twice the time.

#### (3) Current traffic Demand

##### 1) Traffic Volume and Fluctuations by Time

The traffic volume for 16 hours on the Peñas Blancas border in 2013 is 832 vehicles on weekdays and 800 vehicles on holidays. The peak time is 17:00 to 18:00 on weekdays and 11:00 to 14:00 on holidays, with 69 vehicles in both of the time period. The peak ratio to the 16-hour traffic volume is 8.3 % on weekdays and 8.6 % on holidays. As for the traffic volume by vehicle type, the traffic of five-axis freight vehicles is the biggest on both weekdays and holidays, accounting for 67 % of all vehicle types, followed by passenger vehicles at 5 % to 6 % on weekdays and 7 % to 8 % on holidays. The ratio of other types of vehicle is between 0.3 % and 4 %.

##### 2) Freight Demand

The daily freight volume that crosses the Peñas Blancas border in 2013 is 2,165 tons from Nicaragua to Costa Rica, 4,192 tons in the opposite direction, 2,025 tons from Honduras to Costa Rica and 2,481 tons in the opposite direction, which totals 1,0863 tons

#### (4) Current Problems and Issues

##### 1) Facility and Traffic Flow

The customs clearance facility building is old in whole and axle scale and X-ray scanner and other equipment for smooth customs clearance are insufficient. Because the facilities are separately located for different procedures, customs clearance is time-consuming. Restaurants and toilet facilities are poorly built. Because of very bad pavement conditions in addition to capacity shortage of the parking facility, freight vehicles park along the national highway to cause traffic congestion

of 8km to 9km in length, which includes vehicles waiting for the customs clearance. The national highway on the Costa Rica side is currently in renovation into a separate 4-lane road. The highway (NIC-2) on the Nicaraguan side needs to be consistent with the standard of the Costa Rican highway.

## **2) Customs Clearance Procedure**

It is inefficient for bus passengers to cross the national highway to go to the customs clearance facility on the opposite side of the road and it is not desirable for safety. Passengers and freight vehicles also go through the same customs clearance process, which is least efficient. They should be separated for smooth customs clearance and time saving. It currently requires 2 to 2.5 hours and it takes twice as long as it is now when there is a problem at the customs office.

### **8.1.3.3 El Guasaule Border**

#### **(1) Location**

The El Guasaule border is situated on the national highway near the Guasaule River in Guasaule between Honduras and Nicaragua, 183km away from Tegucigalpa, the capital of Honduras and 206km from Managua, the capital of Nicaragua. It is approx. 336km from the Peñas Blancas cross-border facility to Peñas Blancas border with Honduras in northern Nicaragua.

#### **(2) Facilities around Cross Border**

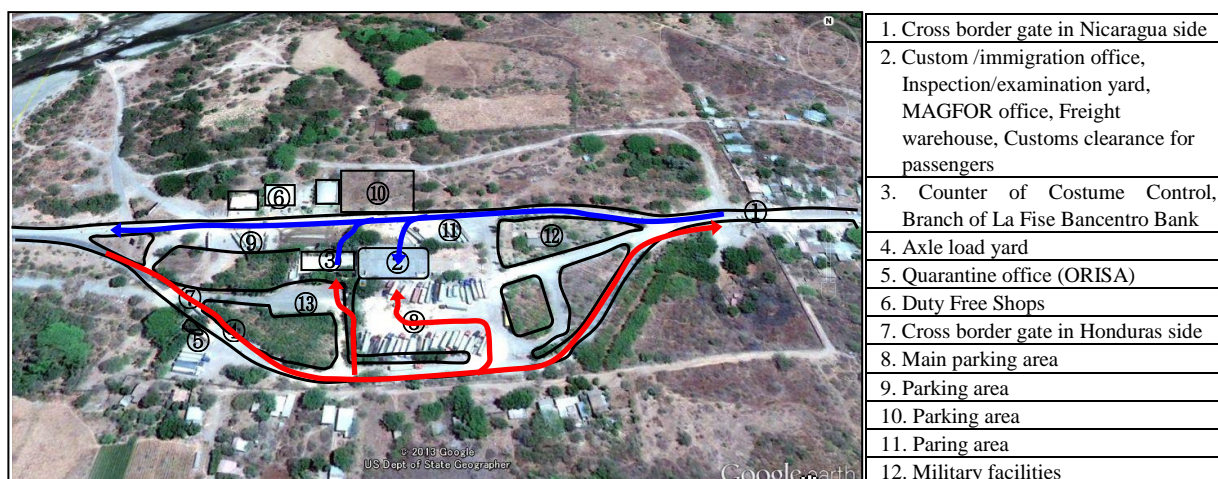
##### **1) Customs Clearance Area**

The Nicaraguan customs clearance facility consists of six facilities—main one-story building (customs office DGA, office of Ministry of Agriculture, Livestock and Forestry MAGFOR, immigration office, cargo inspection station, cargo warehouse, passenger customs clearance office, customs counter and bank office), axle load inspection office, quarantine OIRSA, duty-free shops, and military facility (See Figure 8.1.7). The infrastructure and the facility are old built in 1971. Functions for customs clearance from cargo inspection of freight vehicles to the customs counter concentrate in the main one-story building for integrated customs clearance. However, each facility is small and not separated from the warehouse. As a result, the hallway and customs clearance counter are crowded with people. Although the customs clearance procedures for bus passengers are separated by wall, it is still handled on the small floor. Because the procedures from the inspection to customs of the freight vehicles are handled by limited employees on the small space, it usually takes 2 to 2.5 hours. The quarantine station, OIRSA, and newly built axle load inspection office are near the entrance to the customs clearance facility from Honduras and there are two duty-free shops east of the entrance. The customs clearance area is small and the area in the facility is all small. Insufficient parking space causes traffic congestion.

##### **2) Traffic Flow of Customs Users**

Customs users, freight vehicles, cross-border buses and pedestrians go through the same route for the customs clearance procedures from the national highway (Pan CA3) along the customs clearance facility. The traffic flows one-way from both the Nicaraguan and Honduras sides to the customs clearance facility in the center. At the freight vehicle inspection station, vehicles can enter the booth both from east and west. The parking lot is on the east and west of the facility and users choose whichever in accordance with the entry route on the Nicaraguan and Honduras sides. Cross-border buses park west of the main customs building for passengers to go through the customs clearance. As this shows, freight vehicles, cross-border buses and pedestrians take the same route (See Figure 8.1.7).





**Figure 8.1.7 Customs Clearance Facility and Passenger and Cargo Flow on El Guasaule Border**

Source: JICA Study Team

### 3) Customs Clearance Facility and Operation

The customs clearance facility has been used since 1970 and is very old. However, electricity and water supply is developed from the national highway (Pan CA3) and the condition is good. The customs clearance facility is a one-story building and small to enable integrated customs clearance procedures from cargo inspection of freight vehicles to customs counter. Each facility is small. Because the procedures from the inspection to customs of the freight vehicles are handled by limited employees in the small space, it usually takes more than 2.5 hours. The insufficient parking capacity causes traffic jam on the road of the entrance to the national highway.

#### (3) Current Traffic Demand

##### 1) Traffic Volume and Fluctuations by Time

The traffic volume for 16 hours on the El Guasaule border in 2013 is 998 vehicles on weekdays and 968 vehicles on holidays. The peak time is 8:00 to 9:00 on weekdays with 85 vehicles and 18:00 to 19:00 on holidays with 84 vehicles. The peak ratio to the 16-hour traffic volume is 8.5% on weekdays and 8.7% on holidays. As for the traffic volume by vehicle type, the traffic of five-axis freight vehicles is the biggest, accounting for 53% and 61% of all vehicle types on weekdays and holidays, respectively, followed by passenger vehicles at 15% to 17% on weekdays and 12% on holidays. The ratio of other types of vehicle is between 0.1% and 12 %.

##### 2) Freight Demand

The daily freight volume that crosses the El Guasaule border in 2013 is 3,345 tons from Nicaragua to Honduras and 5,968 tons in the opposite direction and 2,404 tons from Honduras to Costa Rica and 1,182 tons in the opposite direction, which totals 12,900 tons.

#### (4) Current Problems and Issues

##### 1) Facility and Traffic Flow

The infrastructure facility of the cross-border facility was built in 1970 and is very old. The customs clearance facility is small and the hallway and counter are crowded. Although the customs clearance facility is compact to enable integrated customs clearance procedures, luggage inspection of both passengers and freight vehicles is carried out together and this causes congestion. It usually takes 2 to 2.5 hours to go through the customs clearance procedures. The procedures for the passengers and freight vehicles should be separated. Although the parking lot is developed on the eastern and western sides, the capacity is insufficient and thus many freight vehicles are parked on the road. The restaurants and toilets are also in poor conditions.

## 2) Customs Clearance Procedure

The El Guasaule border is important as the route of large freight vehicles from Panama, Costa Rica, and Nicaragua to Guatemala and El Salvador. There is an office at the International Commodities Transportation (TIM) and there is a plan to prepare for the introduction of single-window-single-stop system separating the customs clearance of people on foot, passengers, and small and large freight vehicles after 2014 to solve the current problem.

### 8.1.3.4 El Espino Border

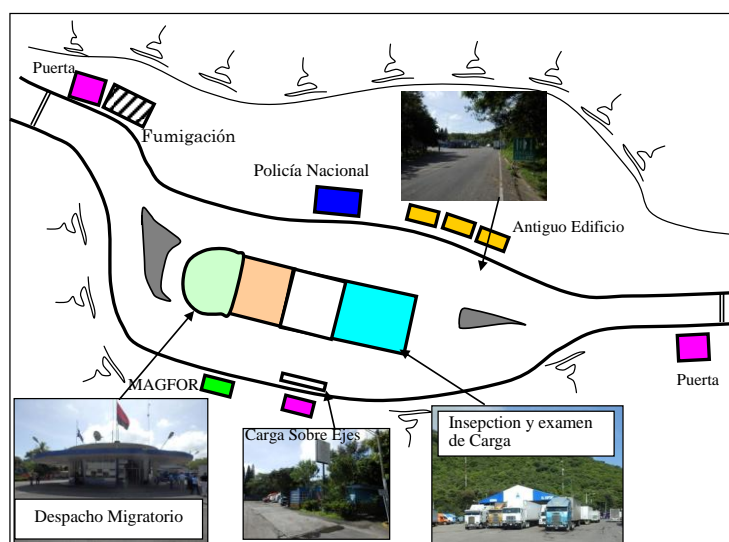
#### (1) Location

El Espino is situated on the border of San Marcos de Colón in Choluteca Department in Honduras and Somoto in Madriz Department in Nicaragua, 240km away from Tegucigalpa, the capital of Honduras, and 238km from Managua, the capital of Nicaragua. It is 352km away from the El Espino cross-border facility to Peñas Blancas in the southern Nicaragua on the border of Costa Rica.

#### (2) Facilities around Cross Border

##### 1) Customs Clearance Area

The Nicaraguan customs clearance facility consists of a main one-story building (customs office DGA, office of Ministry of Agriculture, Livestock and Forestry MAGFOR, immigration office, cargo warehouse and passenger customs clearance office), MTI axle load inspection office, quarantine OIRSA, fumigation facility, national police and duty-free shops (See Figure 8.1.8). The infrastructure and the facility are old built in 1970. The main one-story building is situated in the center and it is modularized connecting three sections to integrate the customs clearance procedures from luggage inspection to customs counter of freight vehicles, excluding fumigation, police and axle load inspection. Although the immigration office is relatively big, the hallway and the counter are crowded. The customs office is shared with the freight inspection and warehouse and the small national police building is located to the east. All the customs clearance procedures are carried out at the compact facility and it takes 1.0 to 1.5 hours a freight vehicle to go through the process. The axle load inspection station is along the road west of the immigration office and the quarantine (OIRSA) is located southwest of the gate of the Honduras side and two duty-free shops are next to the national police facility.



**Figure 8.1.8 Cross-Border Facility and Passenger and Freight Flow on El Espino Border**

Source: JICA Study Team

#### 2) Traffic Flow of Customs Users

The traffic flow of freight vehicles, cross-border buses, passenger vehicles and pedestrians moves

one-way each from Nicaraguan and Honduras sides to the customs clearance facility built in the center of the road (See Figure 8.1.8). Because freight vehicles, cross-border buses and passenger vehicles take the same route, it is crowded. The parking lot is paved and in good conditions. However, it is always crowded because of capacity shortage. The large volume of freight vehicles causes confusion.

### **3) Customs Clearance Facility and Operation**

Although the customs facility is old built in 1970, it is in good conditions with electricity and water supply from the national route (NIC-1). The customs clearance procedures are integrated from the luggage inspection to the customs counter with the immigration office, customs office, cargo inspection and warehouse, etc., located in the center. Because fumigation, police, and axle load inspection facilities are next to the central facility to east and west, it is efficient. Because the facility layout is compact, it usually takes a freight vehicle 1.0 to 1.5 hours to go through the procedures. However, it takes more than twice as long when there is a problem of customs.

### **(3) Current Traffic Demand**

#### **1) Traffic Volume and Fluctuations by Time**

The traffic volume for 16 hours on the El Espino border in 2013 is 195 vehicles on weekdays and 217 vehicles on holidays. The peak time is 16:00 to 18:00 on weekdays with 18 vehicles and 7:00 to 8:00, 9:00 to 10:00, and 13:00 to 14:00 on holidays with 21 vehicles each. The peak ratio to the 16-hour traffic volume is 9.2 % on weekdays and 9.7 % on holidays. As for the traffic volume by vehicle type, the traffic of five-axis freight vehicles is the biggest, accounting for 24 % to 29 % and 31 % of all vehicle types on weekdays and holidays, respectively, followed by passenger vehicles at 19 % to 21 % on weekdays and 21 % on holidays. The ratio of other types of vehicle is between 1 % and 15 %.

#### **2) Freight Demand**

The daily freight volume that crosses the El Espino border in 2013 is 359 tons from Nicaragua to Honduras and 429 tons in the opposite direction and 99 tons from Honduras to Costa Rica and 73 tons in the opposite direction, which totals 960 tons.

### **(4) Current Problems and Issues**

#### **1) Facility and Traffic Flow**

Although the infrastructure facility of the cross-border facility is old built in 1970 and small, it can be expanded and renovated as there is empty space. Although the parking lot is in good conditions including the pavement, it is always crowded due to capacity shortage and parking for the quarantine station is in short. The axle load scale is old and the function is insufficient. The toilets are in poor conditions.

#### **2) Customs Clearance Procedure**

Same as other customs clearance facilities, passengers and freight vehicles take the same route without being separated and it is inefficient. They should be separated for smooth operation and time saving.

### **8.1.3.5 Las Manos Border**

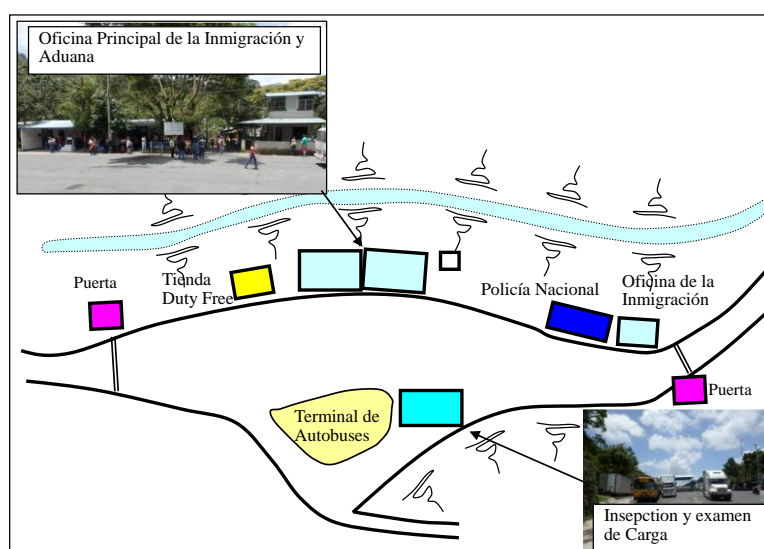
#### **(1) Location**

Las Manos is situated on the border in El Paraíso in El Paraíso Department in Honduras and Dipilto in Nueva Segovia Department in Nicaragua, 130 km away from Tegucigalpa, the capital of Honduras and 250 km from Managua, the capital of Nicaragua. It is 360 km from the border to Peñas Blancas on the border with Costa Rica in southern Nicaragua.

## (2) Facilities around Cross Border

### 1) Customs Clearance Area

The Nicaraguan cross-border facility is very small consisting of six facilities: a one-story main building (customs office DGA and immigration office), cargo inspection and warehouse, quarantine OIRSA, fumigation facility, national police and duty-free shops (See Figure 8.1.9). It is old build in 1967. The one-story main building is located east of the road and it is a modulated small building connected with the customs office (DGA) and immigration office. The immigration office is small and the customs office is like a residence made of bricks and wood. The quarantine station (OIRSA) is next to the Honduras gate and it is also a small brick and wooden building. There is no axle load inspection station and there are two duty-free shops northeast of the immigration office. There are valleys in mountains on both sides of the cross-border facility and it is geographically difficult to expand it.



**Figure 8.1.9 Cross-Border Facility and Passenger and Freight Flow on Las Manos Border**

Source: JICA Study Team

### 2) Traffic Flow of Customs Users

Freight vehicles, cross-border buses, passenger vehicles and pedestrians go to the customs clearance facility built on the road (national highway NIC-15) from Nicaragua and Honduras sides (See Figure 8.1.9). Their flow is simple as is the case of the El Espino border and the freight vehicles, bus passengers and passenger vehicles go through the same route and have the fumigation at the quarantine. Freight vehicles go to the cargo inspection station on the other side of the road in the immigration office. However, the traffic is mixed because the cross-border area is small and this causes traffic congestion. The customs clearance procedures need to be separated by vehicle type. Because of capacity shortage of the parking lot, there always is long traffic congestion on both sides.

### 3) Customs Clearance Facility and Operation

Although such infrastructure as electricity and water supply of the customs clearance facility is in good conditions, the road infrastructure and customs clearance building were old built in 1967. The customs clearance facility is situated on NIC-15 and all customs users enter the parking lot of the immigration office and customs office and customs clearance procedures of imports and exports by freight vehicles are separated from passengers. However, there is no axle load scale facility. All passengers have immigration and customs clearance procedures in the building. The tax payment section is independent outside the facility. The customs clearance procedures require 1 hour, although it takes more than twice as long when there is a problem. The Luggage warehouse is currently used as luggage inspection station.

### **(3) Current Traffic Demand**

#### **1) Traffic Volume and Fluctuations by Time**

The traffic volume for 16 hours on the Las Manos border in 2013 is 311 vehicles on weekdays and 354 vehicles on holidays. The peak time is 17:00 to 18:00 on weekdays with 33 vehicles and 14:00 to 15:00 on holidays with 42 vehicles. The peak ratio to the 16-hour traffic volume is 10.6 % on weekdays and 11.9 % on holidays. As for the traffic volume by vehicle type, the traffic of five-axis freight vehicles is the biggest, accounting for 31 % to 43 % on weekdays and 42 % on holidays, followed by passenger vehicles at 17 % to 28 % on weekdays and 21 % on holidays. The ratio of other types of vehicle is between 0.3 % and 1.3 %.

#### **2) Freight Demand**

The daily freight volume that crosses the Las Manos border in 2013 is 608 tons from Nicaragua to Honduras and 991 tons in the opposite direction and 413 tons from Honduras to Costa Rica and 178 ton in the opposite direction, which totals 2,190 tons.

### **(4) Current Problems and Issues**

#### **1) Facility and Traffic Flow**

The infrastructure and customs clearance facility on the Las Manos border is old built in 1967. Although minor repair work is currently underway, it is difficult to expand the customs clearance area (approx. 25,000m<sup>2</sup>) geographically because the facility is between a cliff and high hill. The customs clearance area for the traffic of freight vehicles and buses is small. Because of capacity shortage of the parking lot, there is always long traffic congestion on both sides. The capacity of the luggage inspection station of freight vehicles is also small and there is no axle load scale. There is no roof over the fumigation facility. The small customs clearance area hinders the traffic flow.

#### **2) Customs Clearance Procedure**

The problem of the customs clearance procedures is its inefficiency as passengers and freight vehicles have to go through the same route as is the case of other cross-border facilities. They should be separate to make them smooth and thus shorten time. The procedures require 1 hour, although it takes more than twice as long when there is a problem.

## **8.1.4 Logistics and Transport Sector/Issues of Logistics**

### **(1) Issues from Perspective of International Logistics**

The international freight volume is estimated to increase at an annual average rate of 5.3 % for the next 20 years to an amount 2.8 times as much as it is now in 2033. Without improvement of the cross-border customs facilities and systems where smooth operation even with neighboring countries is not realized even now, they are unlikely to handle the increasing freight and will cause serious logistics problems. The essential problems of Nicaraguan logistics service are summarized below.

- Freight handling capacity shortage at ports and harbors not only lowers the export competitiveness but raises import prices.
- Reliance on ports and harbors in neighboring countries makes the transportation distance and thus raises the land transportation cost.
- Safety problems in neighboring countries hinder international freight logistics.
- The waiting time for passing through cross-border customs clearance facilities exceeds the acceptable range.
- Reliance ratio of international freight logistics on port and harbors in neighboring countries is high.
- The transportation cost per unit is not rationalized because of no consolidated container and this weakens the export competitiveness of small and medium-sized trading companies.

**(2) Issues from Regional Perspective**

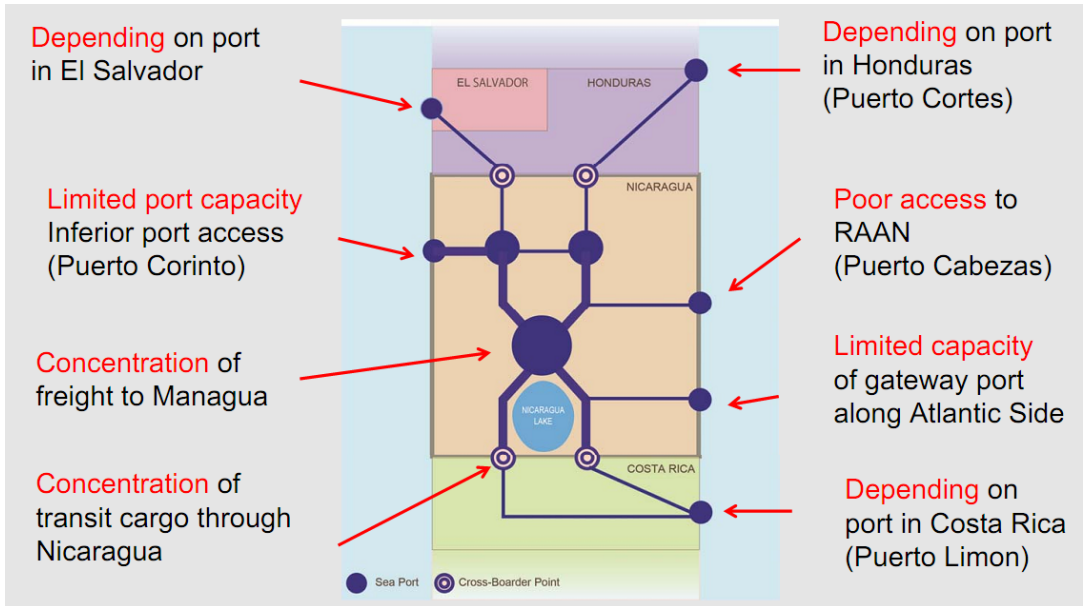
The interregional trade volume of the cross-border customs clearance facilities is 3.2 million tons in 2013, which is equivalent to 37 % of all the trade. Compared with other Central American countries, Nicaraguan exports of agricultural products, particularly processed livestock products and meats, are competitive. The customs clearance system and logistics system need to be improved to maintain the competitiveness. The survey of transportation time of freight trucks that pass through the cross-border customs clearance facilities show that the average average time for passage through the border is for 12 hours on the El Guasaule border and 24 hours on the Peñas Blancas border. There is also a problem of no allowance f truck transportation after 6p.m. in Honduras for public safety problems.

**(3) Issues from Perspective of Domestic Logistics**

The annual domestic freight transportation volume is estimated to be 13 million tons and this is forecast to increase 2.8 times as much as it is now in 20 years. Because domestic consumption concentrates in Managua, smooth freight flow in the city needs to be promoted.

**(4) Direction of Fundamental Solutions**

Traffic survey results show that the daily international cargo volume that uses ports and harbors on the Atlantic side of Nicaragua’s neighboring countries is 85 trucks and 1,656 tons of freight at the Port Cortes in Honduras and 64 trucks and freight of 961 tons at the Port Limon in Costa Rica. The trucks go through the cross-border facilities. It currently requires more than a day to cross the border. Use of ports and harbors on the Atlantic side of its own shorten the truck transportation significantly because of no need to go through the customs on the border. Development of international ports and harbors on the Atlantic side in Nicaragua to use them as bases in the region instead of using such facilities in neighboring countries shortens transportation distance and cost of international logistics drastically. In addition, decrease in the volume of freight that passes through the cross-border customs clearance facility also significantly shorten the distance and time for international and regional logistics in Nicaragua, which not only enables increase export competitiveness but drastically reduces land cost of import freight and this contributes to improvement of trade balance. Thus, there is much need to examine the development of international ports of a certain scale on the Atlantic side of Nicaragua. Because port and harbor development is also the development of a new transport corridor, it not only enables promotion of regional development along the corridor but contributes to correction of economic disparity between eastern and western regions.



**Figure 8.1.10 Diagram of Issues of Logistics in Nicaragua**  
Source: compiled by JICA Study Team

### **8.1.5 Problems and Issues of Cross-Border Facilities**

Problems and issues of five cross-border facilities of Nicaragua are listed below from the perspectives of 1) facility and traffic flow and 2) customs clearance procedures.

#### **(1) Facility and Traffic Flow**

- a. Because infrastructure and customs clearance facility are old and small, congestion of vehicles and passengers that go through the customs occurs. It is a cause of long time required for the customs clearance.
- b. Because facilities for customs clearance of freight vehicles are not integrated, it requires time for the customs clearance. It is a cause of long traffic jam along the national highway at the entrance and exit.
- c. As the passengers and freight vehicles take the same route of customs clearance procedures, it is inefficient and is a cause of traffic congestion in the area.
- d. Such equipment as axle load scale, quarantine inspection device and X-ray scanner is needed for efficient customs clearance procedures.
- e. Parking capacity is in short at all cross-border facilities. Furthermore, the pavement condition of parking lot is bad. It is a cause of long traffic jam as vehicles park their car along the national highway at the entrance and exit of the customs clearance facility. Parking capacity needs to be improved to meet the demand.

#### **(2) Customs Clearance Procedures**

- a. Passengers and freight vehicles take the same customs clearance route at existing customs clearance facilities and this makes the time to go through the process longer. The route should be separated for passengers and freight vehicles to make the process smooth and shorten the required time.
- b. The number of inspectors at the inspection station of freight vehicles is not sufficient in general. This makes customs clearance procedures longer and causes traffic congestion. The human resources need to be increased. Introduction of the Single-Window and Single-Stop system of submitting required document at one spot or customs clearance office is proposed to offset the manpower shortage and shorten the time required for customs clearance.

## **8.2 Land Transport (Road Transport and Infrastructure) Sector: Current Status and Issues**

### **8.2.1 Road Classification**

Roads in Nicaragua are classified based on 1) administrative responsibilities, 2) functions, and 3) design/construction types. The classification is described below.

The classification based on administrative responsibilities is i) national roads (first-class and second-class), ii) departmental roads (primary and secondary), and iii) local roads in accordance with administrative boundaries. The classification based on functions are i) main trunk road (Troncal Principal (TP)), ii) secondary trunk road (Troncal Secundaria (TS)), iii) main collector (Colectora Principal (CP)), iv) secondary collector (Colectora Secundaria (CS)), and v) local road (Camino Vicinal (CV)) in accordance with the service level and role of the roads. The classification based on the design and construction types are i) paved road (rigid road: concrete pavement, semi-rigid road: Cobble (adoquín) pavement road, flexible road: single- or double-layer asphalt surface treatment or hot or cold asphalt concrete pavement) in accordance with the road surface type. Although the three types of road are for main trunk roads, the Cobble (adoquín) pavement is usually used as the main trunk road, the Cobble (adoquín) pavement is commonly found to be used on collector roads, while the concrete pavement is used in wetlands. Other types of pavement are ii) earth/gravel paved road (constructed based on design standards and mainly used for collector

roads both in urban and rural areas), iii) all-time road (constructed not in accordance with design standards, allowing traffic throughout the year, paved with stable soil with a minimum thickness of 15cm), and iv) dry-season road (not constructed based on design standards, affected greatly by the local topography, clay surface, impassable in the rainy season).

## 8.2.2 Road Design Standards

Nicaragua currently has no original design standards of its own and the Ministry of Transport and Infrastructure sets regulations on road infrastructure. Technical specifications and design standards are produced based on the Secretaría de Integración Económica Centroamericana (SIECA, Secretariat for Central American Economic Integration) that are widely used in Central America as well as the American Association of State Highway and Transportation Officials (AASHTO). The study team plans and designs roads in the survey based on AASHTO technical specifications and design standards.

## 8.2.3 Current Road Network

### (1) Road Network based on Road Functional Classification

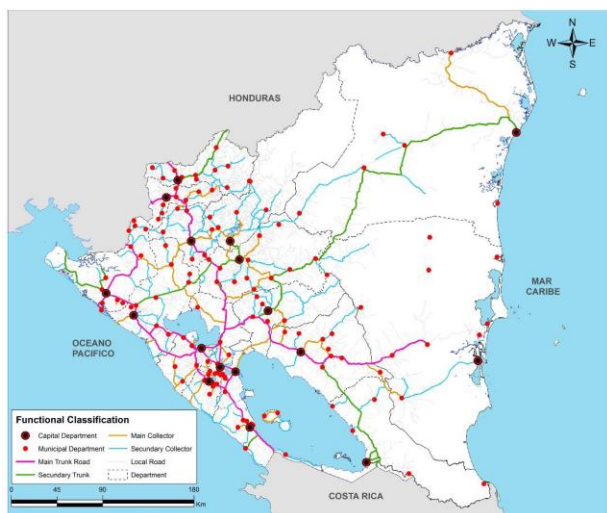
The total road length of Nicaragua is 23,647 km (as of 2011). The total of trunk roads and collectors is 6,018km (25.4%). The total length of trunk roads (main and secondary) is 2,081km (4%), and the total of main collectors is 1,226 km (5.2%) and secondary is 2,710 km (11.5%), respectively, and the remaining 17,630 km (74.6%) is local roads. As for the road density by department by road classification, the ratio of trunk roads and collector roads is significantly low in the eastern region.

Figure 8.2.1 shows the road network based on functional classification. The trunk road network consists of NIC-1 and NIC-2, north-south corridors that connect Costa Rica and Honduras, and NIC-3, NIC-26, NIC-7 and NIC-21B that run east-west across the country. NIC-7 connects El Rama and Blue Fields and NIC-21B is an important east-west road that connects Puerto Cabezas. Road network development in the eastern region significantly lags behind that of the western region where population and industry concentrate and this demonstrates regional disparity.

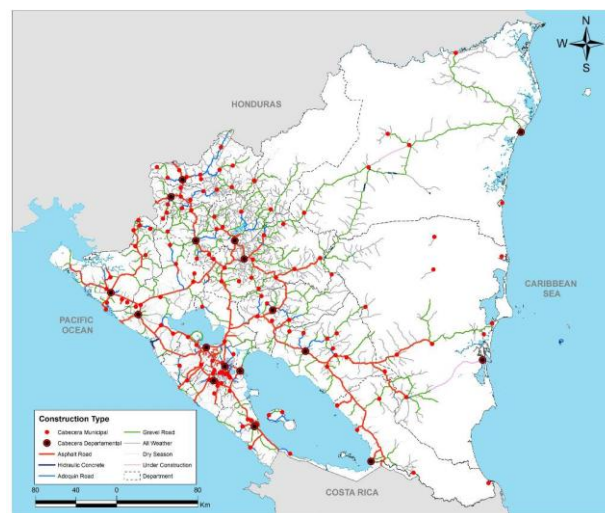
### (2) Road Network based on Design Type Classification (road surface type)

Figure 8.2.2 shows the road network based on design type classification. The road inventory survey results in 2011 show that a total of 3,151 km of roads is paved, accounting for 13.3 % of all roads. Of the paved roads, the majority is asphalt pavement with the total length of 2,299 km (73%), followed by Cobble (adoquín) pavement that totals 798 km (25.3%), and concrete pavement that totals 54km (0.2%). Most trunk roads and main collector roads are asphalt pavement and Cobble (adoquín) and concrete pavement are for secondary collectors and lower-class roads. Concrete pavement is used particularly in areas where asphalt and Cobble (adoquín) pavement is limited as it is more likely to be damaged by rainfalls and where the subgrade is weak and that has low bearing capacity. Most concrete roads are found in RAAN. Unpaved roads total 20,496 km (86.7%), which is six times as long as the total of paved roads.





**Figure 8.2.1 Road Network based on Functional Classification**



**Figure 8.2.2 Road Network based on Design and Construction Type Classification**

Source: Red Vial Nicaragua, 2011, MTI

### (3) Meso America Corridor under Plan Puebla-Panamá (PPP)

The Plan Puebla-Panama formulated in 2001 under the Central American System of Integration (SICA) is a plan to promote regional integration and development of 10 Central American countries. It consists of eight major initiatives called Meso America Initiatives: 1) integration of electric power market, 2) integration of road network, 3) development and promotion of telecommunications services, 4) trade promotion and enhancement of its competitiveness, 5) human development, 6) sustainable development, 7) mitigation of natural disasters and disaster prevention, and 8) tourism promotion. An expansive road infrastructure development plan was promoted in 2008 based on the PPP. The Meso America road infrastructure development plan proposes two high-standard roads traversing Central America, a corridor that runs along the Pacific and the other corridor that runs along the Atlantic side. The Pacific corridor development includes the modernization of cross-border facilities and customs clearance improvement of freight and passengers who cross the border. In line with the high-standard road plan, Nicaragua is formulating an implementation plan of improvement of a 336km-long Pacific corridor (from Peñas Blancas on the border of Costa Rica to Guasaule on the border of Honduras via Pan-American Highway) and a 500km-long Atlantic corridor (from San Pancho on the border of Costa Rica to Las Manos on the border of Honduras via NIC-1 NIC-7 and NIC25 along Lake Nicaragua). Nicaragua has the strategies below in relation with the Meso America road infrastructure development plan.

- Development and maintenance of infrastructure that connects Central American countries and regions in Nicaragua to secure promotion of international transportation
- Innovation of road technology to improve to the level of efficiency and quality to connect two autonomous regions on the Caribbean side with other parts of the country via roads throughout the year.
- Development and maintenance of road infrastructure to reach ports and harbors and airports for international commerce and trade

### (4) Scope of Road Network Service

#### 1) Access to Departmental Capital

Departmental capitals are accessible via trunk roads (main and secondary trunk roads) excluding the Bluefields connection zone in RAAS and the pavement condition is good. Eleven departmental capitals are directly connected with the nation's capital of Managua by main trunk roads and six departmental capitals are connected by secondary trunk roads branching off from the main trunk road. Functionally, NIC-71 that connects to Bluefields is same as NIC-21B that serves as main east-west axis and thus it needs to be upgraded as a higher-class trunk road from the current

collector road. The collector road segment of the east-west axis of Leon-Chinandega-Estelí-Jinotega-Puerto Cabezas and the Matagalpa-Boaco north-south axis that connect to the departmental capitals needs to be upgraded to a higher-class trunk road (secondary trunk road) (See Figure 8.2.3).

## **2) Access to Municipal capital**

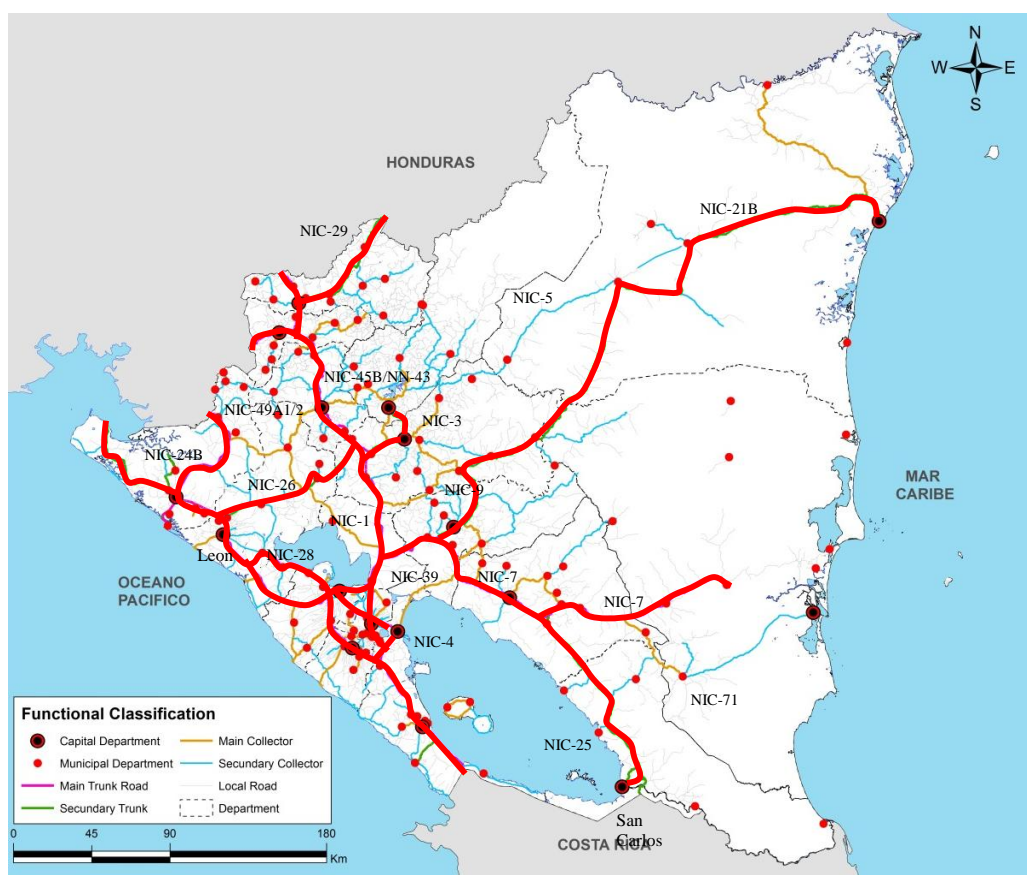
Access to municipal capitals is provided by collector roads (main and secondary collector roads) that account for 17 % of all road networks. 69% of the collector roads are earth/gravel pavement, all-time roads and dry-season roads and they are in poor conditions. Particularly, the pavement condition of access road of NN-118, NN-7, NN-129 and NN-73 that connect to municipal capitals in the eastern region is very bad and asphalt or Cobble (adoquín) pavement work is needed. There is no access road network (missing link) to connect to municipalities in the eastern region and the current transportation service depends on water transport. New roads need to be constructed to guarantee road transport service to reduce poverty and correct regional disparity of the region. The roads that connect the missing link and surrounding trunk roads are low-class collector roads. They need to be upgraded to main collector roads because of their function in the collector road network (See Figure 8.2.3).

## **3) Access to Towns and Villages**

Access to towns and villages is provided by local roads that account for 75 % of the entire road network of Nicaragua and 98 % of this type of road is in poor conditions. The road condition and capacity need to be improved. Their improvement can help improve poor local transportation service in towns and villages and thus contributes to poverty reduction.

## **4) International Corridor Network**

Main international corridors of Nicaragua consists of two north-south international corridors--1) Peñas Blancas (border with Costa Rica)-NIC02-NIC01-El Espino/Las Manos (border with Honduras) and 2) Peñas Blancas (border with Costa Rica)-NIC02--NIC12A-NIC24B –Guasuale (border with Honduras). Development of east-west international corridors, NIC-21B and NIC-07/NIC-71 that connect the port city of Puerto Cabezas and Bluefields in the eastern region will progress as international freight transport is promoted. Functionally, they need to be upgraded to higher-class trunk roads as they function as international corridors (See Figure 8.2.3).



**Figure 8.2.3 Road Network Coverage**

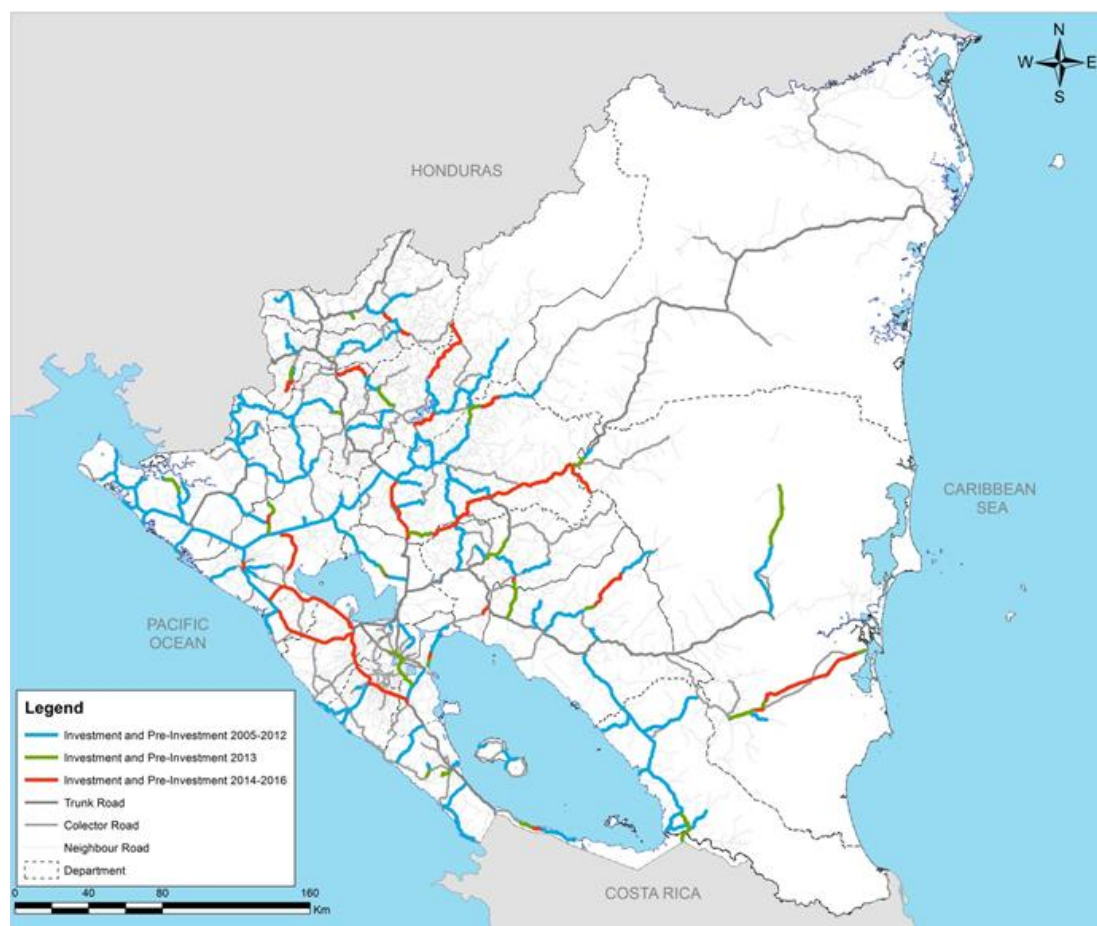
Source: JICA Study Team

### (5) Traffic Congestion in Gateways to Major Cities

The Annual Average Daily Traffic (AADT) on the current road network varies significantly from 70 to 48,600 vehicles in 2013. The traffic volume of NIC-4, the gateway to Managua, is 48,600 vehicles, which shows that the volume exceeds the capacity. There is need to improve the situation by widening the road to increase the lanes, for example. The volume at other gateways is 18,000 vehicles on NIC-1 and 12,200 vehicles on NIC-28. Direct inflow of large freight vehicles in the city center is a cause of traffic congestion as well as air and other pollution. There is need to regulate the entry of such vehicles and construct a beltway. Other than major cities, the traffic volume is 8,500 vehicles on NIC-2 near Jinotepe and 4,800 on NIC-1 south of Estelí.

### (6) Trend of Road Construction and Road Development Plan

A total length of 3,314 km of roads was built from 2007 to 2011 by MTI, with an annual increase rate of 14 % or 800km in length. Meanwhile, pavement repair work was carried out on a total length of 711km and the annual average increase rate is 23 % or 180km in length. Road construction and pavement work is in progress. Road development projects by MTI including donor countries are also planned. Figure 8.2.4 shows ongoing road construction projects and plans from 2014 to 2017.



**Figure 8.2.4 On-going and Planned Road Construction Projects**

Source: Red Vial Nicaragua 2011, MTI

## 8.2.4 Road Infrastructure

### (1) Road Pavement situations

Figure 8.2.5 shows current pavement situations by surface type based on the road inventory survey results. Figure 8.2.6 also shows their conditions in “poor” and “fair” (acceptable) by road function.

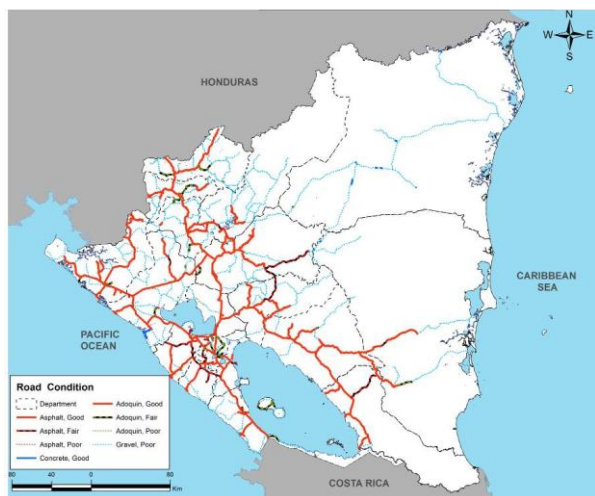
The surface of main trunk roads with asphalt pavement is properly maintained and in good conditions excluding some segments on NIC-12A and NIC-2 in the western region. The earth/gravel pavement is in poor conditions in some sections of NIC-12A and some segments of NIC-2 are in fair conditions for asphalt pavement. The surface of the segments with insufficient maintenance needs to be repaired preferentially as trunk roads.

Secondary trunk roads generally with asphalt and Cobble (adoquín) pavement are properly maintained in good conditions excluding some segments of NIC-21B, NIC-09 and NIC-12A in the eastern region. There are some segments with earth/gravel and asphalt pavement on NIC-21B and they are in poor and fair conditions, respectively. Some segments of NIC-9 with asphalt pavement are in fair conditions and some segments of NIC-12A with earth/gravel pavement are in poor conditions. The surface of the segments with insufficient maintenance needs to be repaired preferentially as trunk roads.

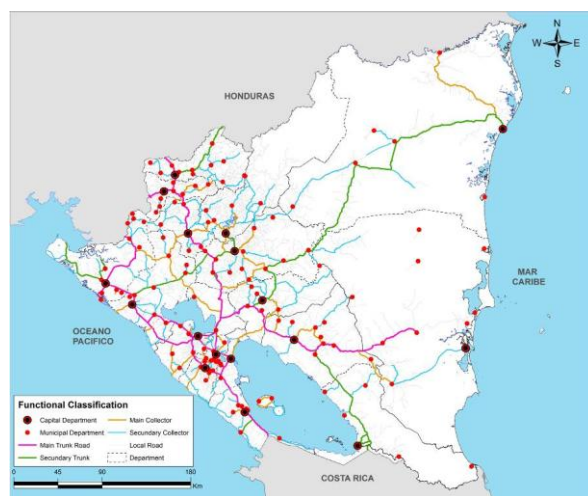
As for surface conditions of main collector roads, approx. 50 % of such roads are in poor or fair conditions due to insufficient maintenance. Poor and fair surface conditions are observed on some segments of 16 roads with earth/gravel, asphalt and Cobble (adoquín) pavement: NIC-38, NIC-43 to NIC-3, NIC-49A1 to 49A2, NN270, NIC-38, NIC-70A, NIC-21A, NIC-19B1, NIC-23A, NIC-39, NIC-27, NIC-20B1, NIC-20C, NIC-62, NIC-67 and NN-73 mainly in the western region. Of the insufficiently maintained segments, the surface of the access road to areas with important

economic activities and industrial potential need to be repaired preferentially.

The surface pavement of secondary collector roads is mostly in poor and fair conditions excluding some segments in good conditions. Of the insufficiently maintained segments, the surface of the access road to areas for poverty reduction and industrial potential need to be repaired preferentially.



**Figure 8.2.5 Pavement Condition by Surface Type**

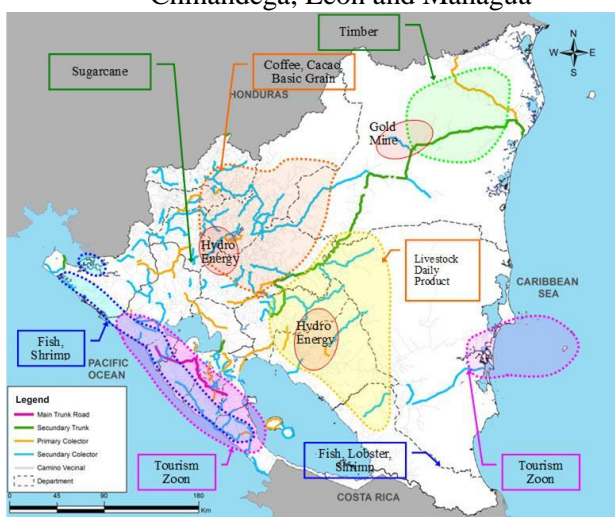


**Figure 8.2.6 Segments in Poor and Fair Conditions**

Source: JICA Study Team

In comparison of areas with industrial potential and road surface pavement conditions based on road inventory survey results, areas with access roads in poor and fair surface conditions are shown in Figure 8.2.7 and Figure 8.2.8 as described below.

- Secondary collector roads around cacao and main grain production sites in Nueva Segovia, Madriz, Jinotega, Estelí and Matagalpa
- Secondary collector roads around livestock and dairy products and hydraulic energy production sites in Boaco and Chontales
- Main collector roads around sugar cane and hydraulic energy production sites in Chinandega, Leon and Managua



**Figure 8.2.7 Areas with Industrial Potential and Segments of Poor / Fair Road Surface**



**Figure 8.2.8 Segments where Surface Needs to be Improved Preferentially**

Source: JICA Study Team

**(2) Intersections**

Intersections are categorized into three types in Nicaragua—signal-controlled, roundabout, and yield control. The signal-controlled intersections concentrate on trunk roads in urban areas and

rural areas have insufficient traffic control equipment with few signal-controlled intersections. On the other hand, there are relatively many roundabouts on trunk roads, causing traffic congestion in heavy traffic hours. Signal-controlled intersections need to be developed for easing traffic congestion and ensuring safety.

### (3) Bridge Structure

#### 1) Road structure on Road Network

There are 2,633 road structures on the current road network and 1,225 of them are bridges—555 are composite bridges and the remaining 670 are Irish bridges and suspension bridges. Of the 555 composite bridges, 474 are concrete bridges, 43 are steel, 25 are masonry and 13 are Bailey bridges (See Figure 8.2.9).

#### 2) Bridge Conditions on Road Network

Road inventory survey results show that current bridges are vulnerable in various aspects: ① road missing links due to bridge collapse, ② damaged bridges, ③ old bridges, and ④ temporary bridges. Missing links refer to no road passage due to bridge collapse cause by hurricanes and other disasters and there are 12 of such bridges. Figure 8.2.10 shows vulnerable bridges including missing links. Such bridges need to be newly built or renovated to secure smooth flow of passengers and freight vehicles and serve for local industry and living.

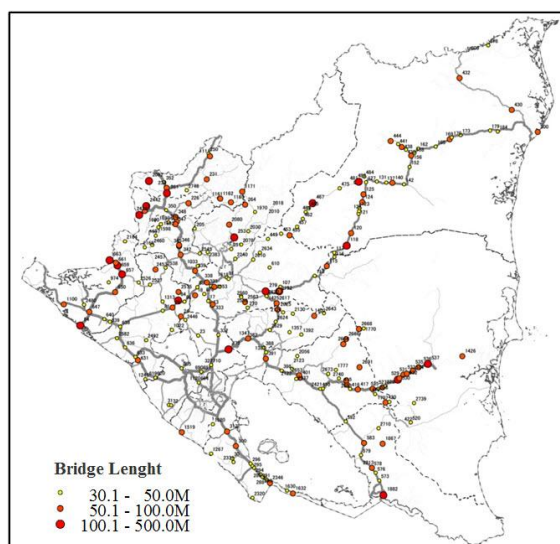


Figure 8.2.9 Bridges on Road Network

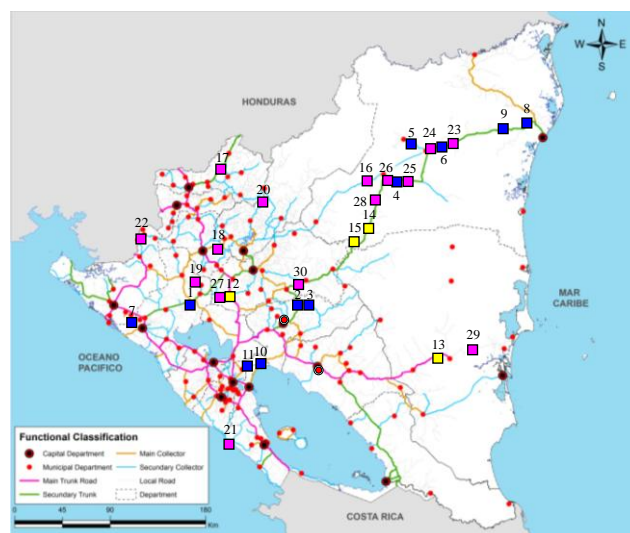


Figure 8.2.10 Vulnerable Bridges on Road Network

Source: MTI

### (4) Drainage Facilities

Main roads in urban areas are equipped with rainwater drainage on the surface of paved roads. However, roads in rural areas and local roads are not equipped with such facilities and water drains naturally. Masonry channels are built on trunk roads in mountainous areas where vertical grades often exceed 3 % or near bridges or other major structures in order to prevent roadbed erosion. However, roads below the collector road class mainly in rural areas are frequently closed due to such disasters as torrential rain and hurricanes.

### (5) Automotive Load Weigh Stations

Automotive load weigh stations to check and regulate overloading vehicles are situated at 10 locations including on such north-south corridors as NIC-1, NIC-2 and NIC-7 including three border gates. However, 10 locations are not enough. Furthermore, regulation and control needs to be tightened properly for prevention of road damage and other road maintenance.

## **(6) Other Ancillary Facilities**

### **1) Pedestrian Crossing**

Although pedestrian bridges, signal-controlled intersections, and pedestrian crossings with marking are installed on major roads in and around Managua, the quantity is insufficient. Trunk roads in rural areas, NIC-1, NIC-2, NIC-4 and NIC-28, particularly, are equipped with pedestrian bridges and there are few pedestrian crossings with marking at intersections. Traffic safety installations are insufficient.

### **2) Traffic Signals, Pedestrian Signals and Street Lights**

Traffic signals hanging out from an arm out are commonly found major intersections in urban areas and rural areas. The control system is not sensing or systematic control types but the point control system. Sensing and systematic control types need to be introduced in line with increasing traffic congestion. As for street lights, double-lamp and single-lamp types are installed in the medium on trunk roads. However, there are not enough street lights on roads below trunk-road class.

### **3) Road and Traffic Signs**

Although road and traffic signs including guiding signs, warnings, regulatory signs, warning signs and direction signs are mainly installed in major cities, they are insufficient in quantity. In rural areas, they are not sufficient on roads below the collector road class, although they are installed relatively well on trunk roads. More signs need to be installed for traffic safety.

### **4) Pavement Marking**

Roads are provided with pavement markings that include stop line in intersections, pedestrian crossings and lane lines mainly in major cities. However, pedestrian crossing marks are insufficient at intersections. Although markings are relatively well maintained on trunk roads, their maintenance in urban areas with heavy traffic is insufficient.

### **5) Guard Rail and Fence**

Although there are few guard rails or fences in urban areas including in Managua, trunk roads have guard rails in main dangerous sections in rural areas. As traffic accidents involving automobiles and pedestrians are on the rise every year, more of such safety facilities need to be installed in major intersections and around public facilities where pedestrians concentrate in urban areas.

### **6) Guideposts and Delineators**

Simple rectangular concrete guideposts are installed every two kilometers on the road. Main trunk roads are sufficiently equipped with them. Delineators on the centerline and guard rails on the road edge are installed only on recently renovated roads and newly constructed trunk roads. Their installation should be promoted for traffic safety at nighttime and warning in dangerous zones.

## **8.2.5 Road Safety**

### **(1) Traffic Accidents**

#### **1) Road Traffic Accidents: Current Status**

Road traffic accidents increased gradually year after year between 2004 and 2011 and the number increased by 65 % in 12 years until 2011. There were 24,508 traffic accidents in 2011, causing 603 deaths and 5,125 injured persons. The annual fatality rate per 100,000 persons from 2006 to 2011 is in the range of 7.5 to 10.5 with an increase trend since 2004. The fatality rate in 2011 is 10.2, which is not serious compared with the world average of 20.8.

**Table 8.2.1 Current Status of Road Traffic Accidents in Nicaragua**

Year	Number of Population	Number of Registered Vehicles	Number of Accident	Number of Victims		Fatality Rate	
				Fatalities	Injuries	Per 10,000 Vehicles	Per 100,000 Peoples
2000	5,098,000	-	14,865	535	4,181	-	10.49
2001	5,173,900	-	13,829	532	4,172	-	10.28
2002	5,244,700	-	12,638	473	4,037	-	9.02
2003	5,312,700	-	12,563	452	3,619	-	8.51
2004	5,380,500	-	14,875	404	3,657	-	7.51
2005	5,450,400	312,181	15,406	474	3,305	15.18	8.70
2006	5,522,600	339,610	17,779	472	3,943	13.90	8.55
2007	5,595,500	374,296	19,106	493	4,200	13.17	8.81
2008	5,668,900	406,330	20,531	515	4,473	12.67	9.08
2009	5,742,300	419,477	21,850	542	4,702	12.92	9.44
2010	5,815,500	441,644	23,709	562	5,075	12.73	9.66
2011	5,888,900	455,558	24,508	603	5,125	13.24	10.24

Source: MTI, World Banki

Note: Registered Vehicles = Automobiles + Motor cycles

By department, of total of 24,573 accidents in 2011, 16,642 occurred in Managua, accounting for an extremely high portion of 68 %.

When accidents are categorized into different types, “collision of vehicle to vehicle,” “collision with pedestrian,” “collision into a fixed object” account for 88.2 %, 4.4 % and 3.0 %, respectively, in 2011. Details cannot be analyzed because of lack of statistical police data by collision type. As for the cause, “insufficient distance between vehicles” is the most frequent cause, accounting for 24.7 %, followed by “forced entry into another lane” at 17.3 %, “unreasonable turns” at 13.9 %, “careless backward driving” at 12.4 %, and “ignoring traffic rules” at 11.3 %. The causes are bad driving manners not complying with traffic rules and traffic safety education not only for drivers but pedestrians needs to be provided. It is also necessary to build an integrated traffic accident monitoring system of database, analysis, countermeasures, education and effect analysis and take action to reduce such accidents.

## 2) Organizations for Road Traffic Safety

Road traffic safety is managed by ① the National Police Traffic Department (NPTD), ② MTI’s Road Safety Department, ③ Road Maintenance Fund (FOMAV), ④ Ministry of Health (MINSAL), ⑤ Ministry of Education (MINED), and ⑥ Road Safety National Committee (CONASEV). Their responsibilities are as follows: the National Police is responsible for collection and analysis of accident data, countermeasures, driving education, and driving license; MTI is responsible for accident analysis and countermeasures for national roads; FOMAV is responsible for road facility improvement; MINSAL and MINED are responsible for traffic safety education; and CONASEV is responsible for comprehensive management of all concerned organizations. However, the CONASEV is not conducting any specific activity and thus the road traffic safety activities involving the entire nation are not working efficiently. The organization and activities of the committee need to be enhanced and improved.

### (2) Road Disasters

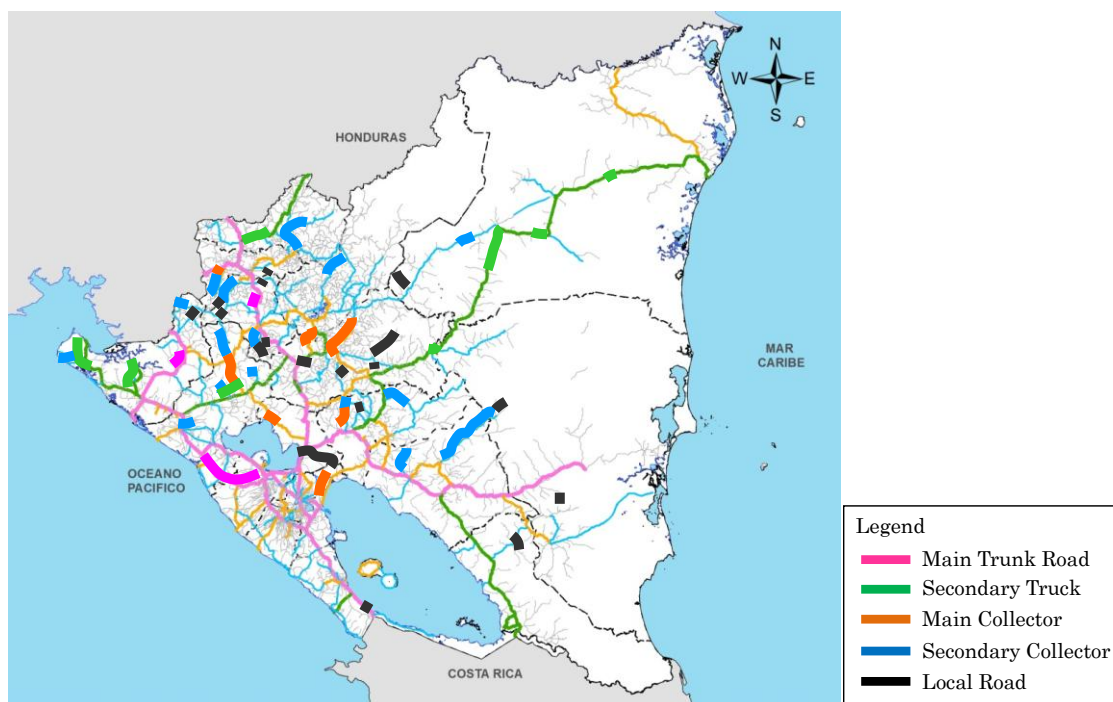
Nicaragua is prone to such natural disasters as hurricanes, earthquakes, volcanic eruptions and tsunamis and they cause road and housing damage as well as fatalities and injured victims, which results in enormous economic loss. Natural disasters that occurred in the last 35 years include Managua earthquake in 1972, hurricanes in 1988, 1997, 1998 and 2007, and volcanic eruptions and tsunamis in 1992. Such natural disasters have caused closure of road network and road and bridge damage.

Figure 8.2.11 shows the road segments where urgent rehabilitation works were carried out to fix problems caused by road disasters by functional classification for the last three years (2009 to



2011). The damaged segments distribute uniformly on secondary trunk roads and collector roads excluding some segments of main trunk roads with asphalt pavement. The majority of the damage is road flooding caused by torrential rains. Damaged segments of secondary trunk roads concentrate on NIC-21B in the eastern region and NIC-29, NIC-12B, NIC-50 and NIC-26 in the northwestern region and those of main collector roads are in and around the central region including mountainous areas. This shows the vulnerability of secondary trunk roads and main collector roads to torrential rains.

The annual urgent rehabilitation cost ranges from 1.4 million to 5.9 million dollars between 2007 and 2011, with the average length of 360km. The rehabilitation cost in 2011 is 4.0 million dollars (total length of 250.7km), which accounts for 3 % of annual road maintenance budget of 2013.



**Figure 8.2.11 Road Segments of Urgent Rehabilitation Works by Functional Classification 2009-2011**

Source: MTI, JICA Study Team

## 8.2.6 Road Maintenance System

### (1) Organizations Responsible for Road Maintenance and their Roles

MTI and Road Maintenance Fund (Fondo De Mantenimiento Vial: FOMAV) are responsible for maintenance of trunk and collector roads financed with gasoline tax revenues. The maintenance responsibilities of the two organizations depend on the degree of road deterioration: MTI is responsible for significantly damaged roads or roads and bridges that require urgent rehabilitation work and FOMAV is responsible for maintenance of paved roads in “fair” (acceptable limit) conditions. MTI outsources road maintenance work in urban areas and their boundary zones to private companies and bridge and road maintenance in rural areas to Corporation of Regional Construction Firms (COERCO). There is an established system in which road maintenance is outsourced to public or private companies by scale and region. It is carried out in accordance with FOMAV road maintenance criteria described below.

- Asphalt pavement: visual inspection (deterioration criteria  $\leq 25$  %: Good;  $25 < \text{criteria} \leq 50$  %: Fair;  $50 < \text{criteria} \leq 75$  %: Bad;  $\text{criteria} > 75$  %: Worse), roughness ( $\text{IRI} \leq 2.5$ : Good;  $2.5 < \text{IRI} \leq 4.5$ : Fair;  $4.5 < \text{IRI} \leq 6.0$ : Bad;  $\text{IRI} > 6.0$ : Worse)
- Cobble (adoquín) pavement: visual inspection is same as asphalt, roughness ( $\text{IRI} \leq 4.5$ : Good;  $4.5 < \text{IRI} \leq 6.0$ : Fair;  $\text{IRI} > 6.0$ : Worse)

- Gravel pavement: roughness ( $IRI \leq 8.0$ : Good;  $8.0 < IRI \leq 12.0$ : Fair;  $12.0 < IRI \leq 16.0$ : Bad;  $IRI > 16.0$ : Worse)

## **(2) Corporation of Regional Construction Firms (COERCO) and FOMAV**

COERCO is an independently operated organization formed by four (4) enterprises namely ENIC, EICMEP, EMCOSE and ECONS-3. ENIC has offices in Sébaco and Matagalpa; EICMEP has an office in southeastern Managua; EMCOSE operates on the Pacific coast; and ECONS-3 has an office in Managua and operates in the Pacific region. Due to budget deficits and maintenance equipment and human resources shortage, it has difficulties carrying out functional and large-scale road maintenance. FOMAV is an independent fund financed with gasoline tax revenues fund and it concludes an annual contract with MTI. It outsources maintenance work to private companies via community organizations. Its annual budget is between 17.72 million and 30.07 dollars between 2008 and 2012 (annual average increase rate of 14.1%).

## **(3) Road Maintenance Responsibilities of FOMAV**

FOMAV performs routine and periodical maintenance work. Routine work includes initial repair of pavement, cleaning of such road drainage facilities as side ditches and culverts and road premises including slopes. Periodical maintenance work includes repair of paved surfaces including overlay of asphalt pavement, maintenance of road signs and street lights, and installation of bus bays and other bus facilities. It performed maintenance work on a total length of 3,394.10km in 2013.

## **(4) Maintenance of Municipality Roads**

Each municipality performs maintenance work of their roads with subsidies from FOMAV and funds allotted by MTI. FOMAV subsidies equivalent to 20 % of gasoline tax revenues are allocated through Regional Transport Council (Consejo Regional de Transporte (CRT)).

The Regional Transport Council (CRT) was established in 1999 with support from the Danish International Development Agency (DANIDA) to assist national-level activities of planning, renovation and maintenance of road network. Members include departmental governors, FOMAV representative, DANIDA, Minister of Transport and Infrastructure, and Rural Development Institute (RDI). CRT is currently conducting activities in the South Atlantic Autonomous Region (RAAS), the North Atlantic Autonomous Region (RAAN) and La Segovia.

### **8.2.7 Road Maintenance Budget**

The annual road maintenance operation budget comprises three financial sources: gasoline tax revenues, funds from donors and loans. The annual budget (MTI forecast) in 2013 is 126.87 million dollars, 7.9% increase from the previous year: 92.09 million dollars (72.5%) is for road development and 34.78 million dollars (27.5%) is for road maintenance. The financial sources are gasoline tax revenues that account for 34.6 % and funds from donors and loans that account for 65.4 %. This shows that the larger portion of the budget sources is funds from donors and loans or that country heavily depends on external financial sources as the road development budget sources. The road maintenance cost is on the rise every year. While the ratio of funds for annual operation from donors and loans is declining significantly, the ratio of gasoline tax revenues is on the rise. The gasoline tax revenues are allocated to FOMAV road maintenance. There is need to examine the introduction of funding mechanism to cover MTI revenues with financial assistance from road users

### **8.2.8 Problems and Issues of Land Transport (Road Traffic and Facilities) Sector**

The problems and issues the road sector faces are listed below based on the analysis of current road status described above.

## **(1) Problems and Issues of Road Network**

### **1) Missing Road Segments**

The pavement condition of roads, mainly collector roads, is bad and thus they are often closed due to torrential rains in the rainy season. There is no access road that connects some municipalities in the eastern region causing some missing links. There is need to eliminate closed segments in the rainy season and develop access roads to secure transport services to connect municipalities.

### **2) Missing Road Segments at River Crossing Points (missing links due to bridge collapse, etc.)**

There are 12 bridges including El Tamarindo Bridge where road traffic is closed due to their collapse caused by hurricanes and other natural disasters according to road inventory survey results. These vulnerable bridges need to be replaced to secure smooth traffic flow of passengers and freight vehicles and serve for local industry and living.

### **3) Insufficient Service Level of East-West Corridors**

North-south and east-west corridors face issues of guaranteeing promotion of international transport based on the Meso America road infrastructure development plan and connecting two autonomous regions on the Caribbean side with other parts of the country via roads throughout the year. The main east-west axis in the eastern region does not provide sufficient transport services due to road vulnerability unique to the region and traffic demand shortage. There is need to develop east-west corridors for road technology innovation to improve the transport efficiency and quality level for future development of the eastern coastal region and creation of trunk road network that connect western and eastern regions.

### **4) Traffic Congestion and Environmental Problems in Major Cities and Rural Areas**

Currently, north-south corridors (NIC-1 • NIC-2 • NIC-4, etc.) are connected to central Managua, the nation's capital, and its surrounding major cities and heavy international freight vehicles directly pass the cities, which is causing traffic congestion and frequent accidents and pollution problems combined with inner-city traffic in main gateway zones. Construction of beltways and introduction of traffic regulations of truck entry time are needed to ease such road transport problems.

## **(2) Problems and Issues of Road Conditions**

### **1) Poor Pavement Conditions**

The total length of unpaved road is 20,496 km (MTI, as of 2011) with low pavement ratio at about 13.3 %. The survey results show that collector road pavement condition is "Poor" to "Fair" in most parts due to insufficient maintenance although the pavement condition of trunk roads are mostly "Good" excluding some segments. Particularly, there is need to enhance maintenance of access roads that connect key cities that serve as the heart of economic activities and with industrial potential.

### **2) Vulnerability to Floods**

Landslides and floods triggered by torrential rains frequently cause closure of specific segments on major roads. The closure is caused due to insufficient drainage system, fragile road bed, and collapse-prone slopes and bridges, combined with torrential rains and hurricanes in the rainy season. The road disasters occur uniformly on the current road network. Countermeasures need to be taken on the flood-prone segments of major roads.

### **3) Road Maintenance-related Problems**

Road maintenance is a key to longer road life. However, in reality, insufficient maintenance deteriorates road conditions to cause closure in the rainy season. Although the road maintenance system is properly established, road repair work is hindered by shortage and ageing of maintenance equipment due to road budget shortage. We propose that cost-efficient Cobble (adoquín) pavement with such advantages as easiness to build and repair and low cost (half of asphalt pavement) be

applied to enable efficient road maintenance as the country faces the road budget shortage problem.

### **(3) Problems and Issues of Bridge**

#### **1) Temporary Bridges**

There are 14 temporary bridges on the road network and most of them are built over secondary trunk and main and secondary collector roads. They need to be improved to a level with effective width same as the road width. As for the improvement work to permanent bridges, priority will be given to secondary trunk and main collector roads.

#### **2) Damaged and Old Bridges**

There are four damaged or old bridges on the current road network. The damage was caused due to structural problems and by natural disasters. Repair work or replacement shall be carried out in consideration of the priority order of road classification.

### **(4) Problems and Issues of Road Maintenance**

#### **1) Maintenance Equipment in Poor Condition**

Most of maintenance equipment has some defects and needs to be repaired. However, budget shortage hinders sufficient repair and thus hinders road repair work.

#### **2) Road Maintenance Budget Shortage**

Annual road maintenance cost is covered with three financial sources: gasoline tax revenues, funds from donors and loans. Nicaraguan road development cost heavily depends on external financial sources. The cost is on the rise year after year and most of gasoline tax revenues are allocated to road maintenance. There is need to examine funding mechanism with financial assistance from road users to cover new MTI revenues.

### **(5) Problems and Issues of Road Traffic Safety**

#### **1) Shortage of Road Traffic Safety Facilities**

Roads excluding trunk roads are not sufficiently equipped with road safety facilities. Such facilities need to be installed sufficiently particularly in areas where traffic accidents occur frequently.

#### **2) Weak Function of Road Safety National Committee (CONASEV)**

Such major governmental organizations as the National Police, MTI, local governments, FOMAV, MINSA, MINDED and Road Safety National Committee (CONASEV) are involved in the creation of Nicaraguan road traffic safety system. However, CONASEV is not functioning fully and partnership with other organizations is not sufficiently built. The human resources and functions of CONASEV need to be enhanced.

#### **3) Insufficient Database for Accident Analysis**

Database and statistic materials are not sufficient enough for accident analysis. Particularly, the format of original records is insufficient to make it difficult to analyze accident type and how accidents occurred in accident-prone areas. A traffic accident monitoring system with routine work for analysis needs to be introduced. (See section 16.2.4).

#### **4) Insufficient Traffic Safety Education**

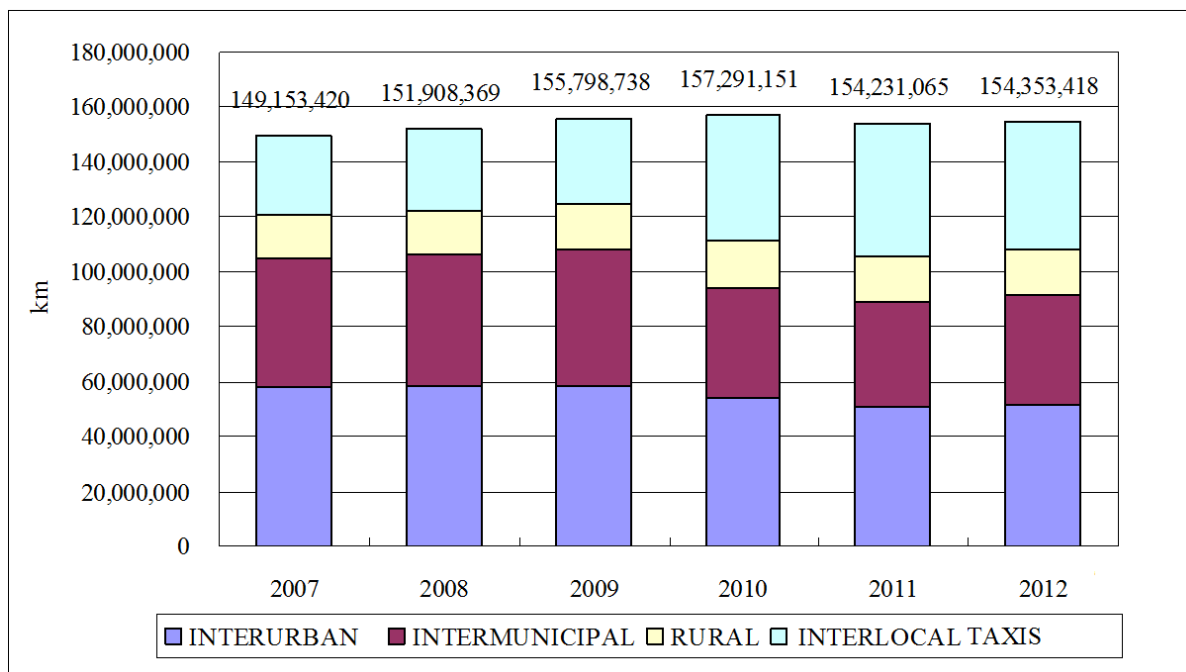
Traffic accidents are caused mainly as a result of violation of traffic rules and this reflects bad driving manners. It is essential for drivers and pedestrians to obey the rules and understand the advantages of traffic safety. There is need to provide effective traffic safety education and introduce traffic control.

### 8.3 Land Transport (Passenger Transport) Sector: Current Status and Issues

#### 8.3.1 Current Land Passenger Transport

##### (1) No Increase in Bus Service Distance

The public bus operation distance across the country fluctuated very little from 2007 to 2012 although its population and economy are growing. This is because of the institutional problem of requiring bus service operators to bid for concessions to get the permit for the operation on land. However, the national transport plan has not been revised for the last 10 years and there is no bidding for new bus routes.

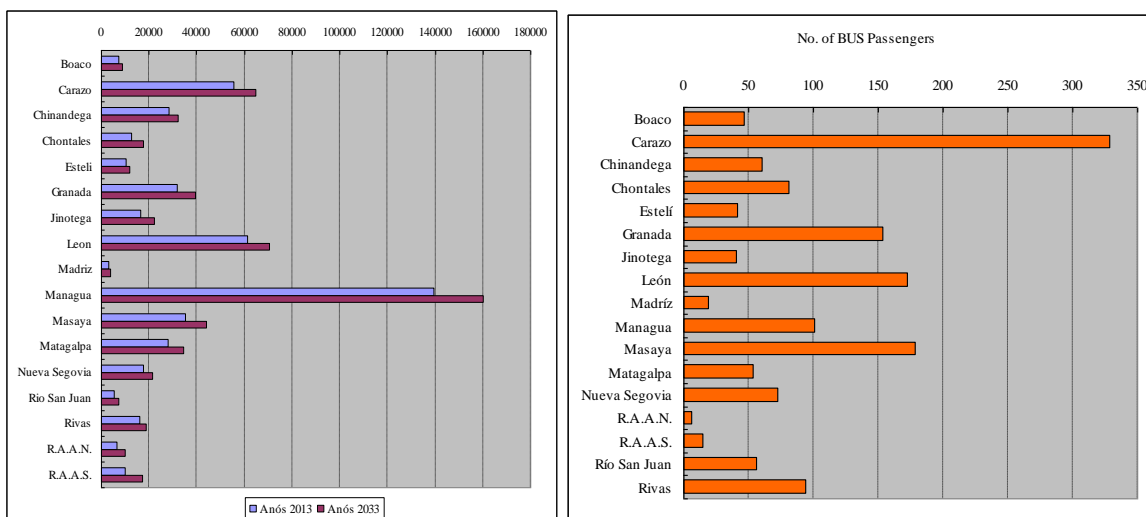


**Figure 8.3.1 Public Bus Operation Distance in Nicaragua**

Source: compiled by JICA Study Team based on GDTT data

##### (2) Concentration of Bus Passengers by Department in Urban Areas and High Usage Density in Rural Areas

There are 485,000 public bus passengers daily in Nicaragua and 29% of them concentrate in Managua, the capital of the country. It is forecast to increase by 1.36 times to 660,000 in 2033 and adequate supply-demand balance will not be maintained in and around urban areas. The bus passenger density obtained by dividing the number of passenger by the population of each department is higher in rural areas than such urban areas as Managua and Masaya as they depend on public bus service that is an important means of transportation.



(Number of Passenger 2013 to 2033) (Passenger Density 2013)

**Figure 8.3.2 Number of Public Bus Passengers by Department**

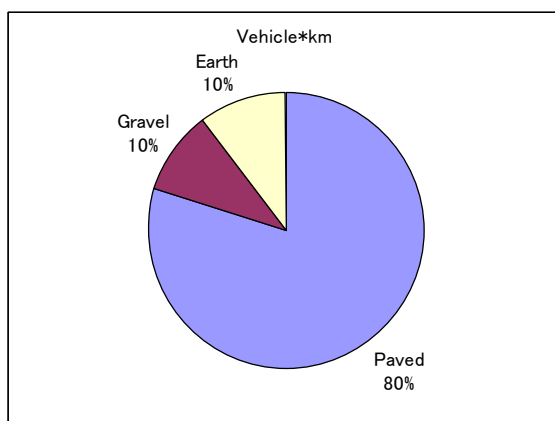
Source: compiled by JICA Study Team based on GDTT data

**(3) Poor Road Condition for Public Bus Operation**

The public bus network connects departmental capitals and municipalities via trunk and collector roads to cover the entire nation. However, buses are operated on roads with poor surface conditions, with 10% of the roads where buses are operated are earth roads and another 10% are gravel roads. This hinders bus operation as scheduled and causes detour on local roads in poorer conditions due to road closures in the rainy season. The poor road condition also increases operation cost and ruin comfortability.

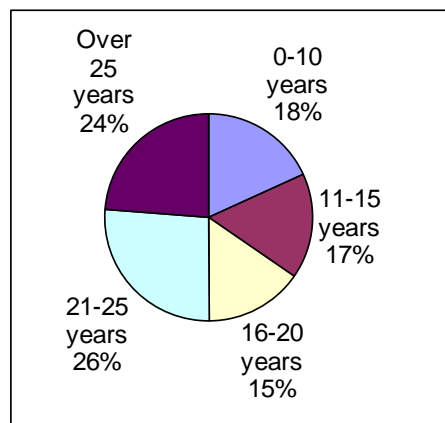
**(4) Old Buses**

More than 50% of public buses are more than 20 years (service years) and bus maintenance is not properly carried out due to the insufficient public vehicle inspection system and facility. A large amount of subsidies is injected for bus service operation. Although the depreciation cost is set to replace buses every five years, the monitoring system is inadequate and buses are not replaced with new ones.



**Figure 8.3.3 Ratio of Road Surface where Public Bus Service is Operated**

Source: compiled by JICA Study Team based on GDTT data



**Figure 8.3.4 Public Bus Service Years**

Source: DGTT

**(5) Current Status of Bus Terminal**

Although departmental capitals and other main cities are equipped with facilities that serve as bus terminals, there are few places with bus terminal facilities off the road, excluding such major cities

as Managua and Granada. As a result, passengers get on and off and wait for the bus on the road. Even when bus terminal facility is developed, it is not separated from taxis or passenger vehicles or freights for the market established in conjunction and thus there is much congestion and confusion. The figure below shows the evaluation results of bus terminal field survey conducted by JICA Study Team. The conditions are evaluated based on “Good”, “Fair” and “Bad” criteria.

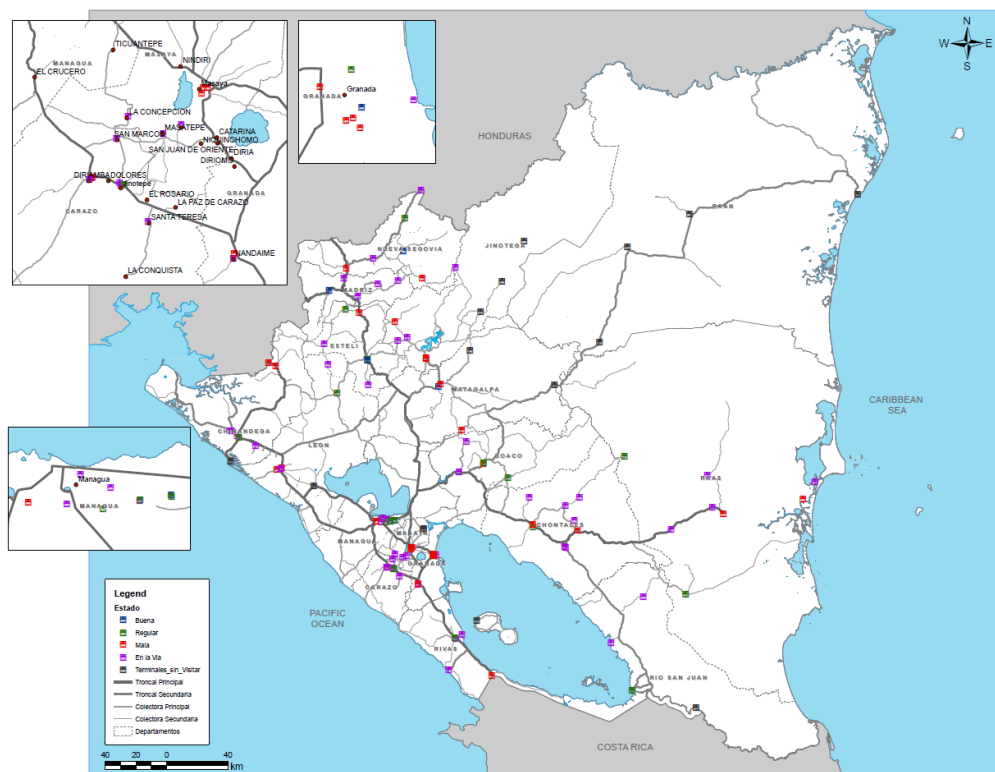


Figure 8.3.5 Locations and Conditions of Bus Terminal

Source: JICA Study Team

**(6) Current Status of Roadside Service and Rest Area**

The public bus service covers the entire country and the longest operation distance by route is 400km. MTI stipulates a passenger transport regulation that a rest needs to be taken within 150km for providing safe and comfortable service. The distribution of public bus operation distance shows that there are 60 routes with the distance of 150km or longer, which accounts for 12% of all routes. It is important to develop roadside stations not only for public buses but tour buses and trucks to provide safe and comfortable services.

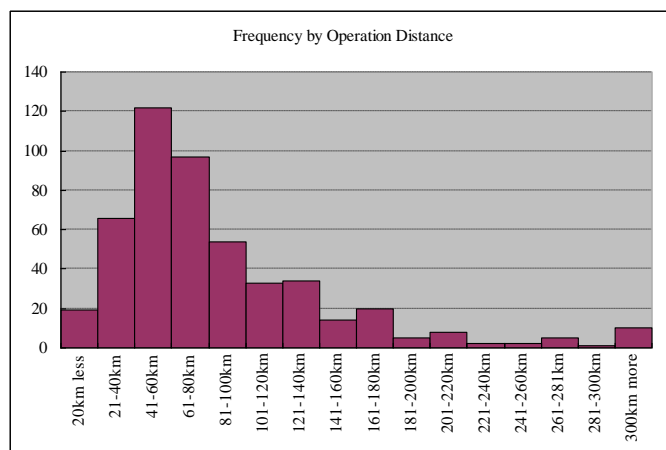


Figure 8.3.6 Distribution of Public Bus Operation Distance

Source: Compiled by JICA Study Team based on GDTT data

### 8.3.2 Issues of Land Transport (Passenger Transport) Sector: Summary

Issues of land passenger transport sector are summarized below based on public bus transport analysis results.

- Local bus network with insufficient coordination among national and municipal governments and bus services
- Public bus service expansion hindered by legal system inappropriate to the realities
- Underdevelopment of road where public bus service is operated and high operation cost due to the underdevelopment
- Old buses and insufficient inspection system and facility
- Future shortage of bus service capacity because minibuses account for the majority of buses in service
- Underdeveloped or poorly developed terminal facilities and passengers getting on and off and waiting for buses on the road
- Underdevelopment of roadside service facilities for providing safe and comfortable public bus service

## 8.4 Current status and Issues of Water Transport

### 8.4.1 Current status of Port Facilities

Figure 8.4.1 shows the location of ports in Nicaragua as of 2012, of which the Puerto Corinto Port handled the largest volume of cargo, totaling 2.44 million tons in the year. Table 8.4.1 outlines the ports in Nicaragua.



**Figure 8.4.1 Location of Ports under the EPN Jurisdiction**

Source: National Port Authority (EPN), 2012



Table 8.4.1 Ports in Nicaragua

Region	Port name	Location	Specifications of port facilities	Major cargo handling	Handling cargo volume (2011)
Pacific Ocean coastal area	Corint	160km Chinandega province, from Managua	Bath: Container (10.0m depth/L240m), General cargo (12.2m depth / L370m), Liquid bulk (12.1m depth) Access Channel: 14.6m depth / L3.4km ×W150m, 13.6m depth/L2.6km ×W115m	General cargo, container (dry, reefer), liquid bulk, gas, diesel, alcohol, Ro-Ro, Passenger	Import:1,806,938MT Export: 631,028MT
	Puerto Sandino	70km Leon province, from Managua	Floating pontoon: 4.3m depth/L182m ×W22m Access Channel: 3.0m depth/L1.2km ×W40m	Liquid bulk, bulk cargo	Import: 920,849MT Export: Zero
	San Juan del Sur	140km Rivas province, from Managua	Bath: 2.49m depth (low tide) ~ 4.25m (high tide) /L500m Access Channel: 4.0m depth (Front of the Bath) ~ 8m (Channel Entrance) /L180m ×W80m	Passenger	-
Caribbean Sea coastal area	Puerto Cabezas	Northern Atlantic Autonomous Region 556km, from Managua	Pier: 4.8m depth / L461m ×W7m Passenger and Cargo Private Deck: 3.9m depth/ L42.8m × W5.8m Small boats Deck: 3.3m depth/ L25.6m × W3.05m	Liquid bulk	Import: 14,891MT Export: Zero
	El Bluff	382km south Atlantic Autonomous Region, from Managua	Bath: 5.0m depth/ L 150m ×W 17m	General cargo, container (dry, reefer), liquid bulk (diesel, gasoline), wood	Import: 18,430MT Export: 5,776MT
	Alren Siu (River port)	294km south Atlantic Autonomous Region, from Managua	Multipurpose berth: 5.0m depth/L105m × W35m, Floating pontoon: 5.5m depth/L93m ×W24m	General cargo, container cargo (dry, reefer), Live Cattle, Ro-Ro, Passenger	Import: 21,577MT Export: 18,262MT
Lake Nicaragua	Granada	45km Granada province, from Managua	Pier: 4.2m depth / L461m ×W5m	General cargo, Passenger	Loading-unloading :1,433MT
	San Joege	115km Rivas province, from Managua	Bath: 2.4m depth/ L24.5m	General cargo, Passenger	Loading-unloading :3,8,710MT
	Moyogalpa	Rivas province	Bath: 2.4m depth/ L20.0m	General cargo, Passenger	Loading-unloading :3,8,710MT
	Altagracia	Rivas province	Bath: 3.0m depth/ L28.0m	General cargo, Passenger	Loading-unloading :3,260MT
	San Carlos	297km Rio San Juan province, from Managua	Bath: 3.6m depth/ L80.0m	General cargo, Passenger	Loading-unloading :5,582MT
	Morrito	230km Rio San Juan province, from Managua	Bath: 3.0m depth/ L200.0m	General cargo, Passenger	Loading-unloading :405MT
	San Miguelito	248km Rio San Juan province, from Managua	Bath:2.4m depth/ L250.0m	General cargo, Passenger	Loading-unloading :196MT
Lake Managua	Puerto Salvador Allende	Managua province, City of Managua	Pier: L150m	Passenger (closed)	-
	Puerto Carlos Fonseca	Managua province	Pier: L80m ×W40m	Passenger (closed)	-

Source: created by the JICA Study Team based on data from the ENP

## 8.4.2 Current status of Water Transport Services

### (1) Current status of water transport services

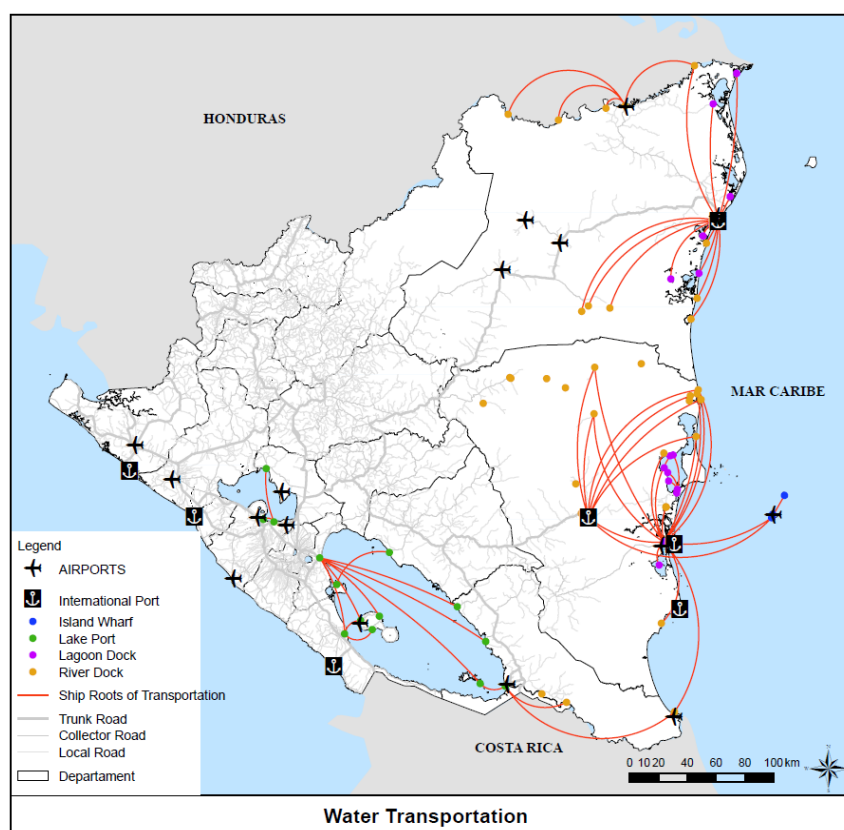
Water transport services using rivers, canals and waterways are an important means of mobility for persons and goods. Particularly, the Caribbean Sea coastal areas of the RAAN and the RAAS, where land transport is underdeveloped, depend on water transport for mobility involved in social and economic activities. The public water transport services are provided from Bluefields city in the RAAS to various cities and villages. The RAAN, on the other hand, has its water transport network services with its basis in Bilwi, which are not public scheduled services but charter services provided by private fishing vessels.

These services use panga boats, non-motorized sailboat and canoes but are not developed enough to be provided by any organization and thus have serious problems with safety and quality of the services.

### (2) Current status of water transport network and docks on the Caribbean Sea coast

There are 13 municipal docks and 47 village docks in the Caribbean Sea coastal areas of the RAAS and the RAAN. The DANIDA granted support for the building and improvement of these docks and river waterways. Not all the docks have been upgraded, and quite a few remain decrepit or unrepaired though they were damaged by hurricanes or other natural disasters.

The improvement of waterways and dredging and other maintenance works are insufficient because of fund shortages and lack of appropriate management organization or system. In the rainy season, panga boats and non-motorized boats have difficulty in stable traveling, causing negative impact on social and economic activities in the regions.



**Figure 8.4.2 Water Transportation Network**

Source: JICA Study Team

### 8.4.3 Issues of the Water Transport Sector

#### 8.4.3.1 Issues of Ports on the Pacific Ocean Coastal Areas

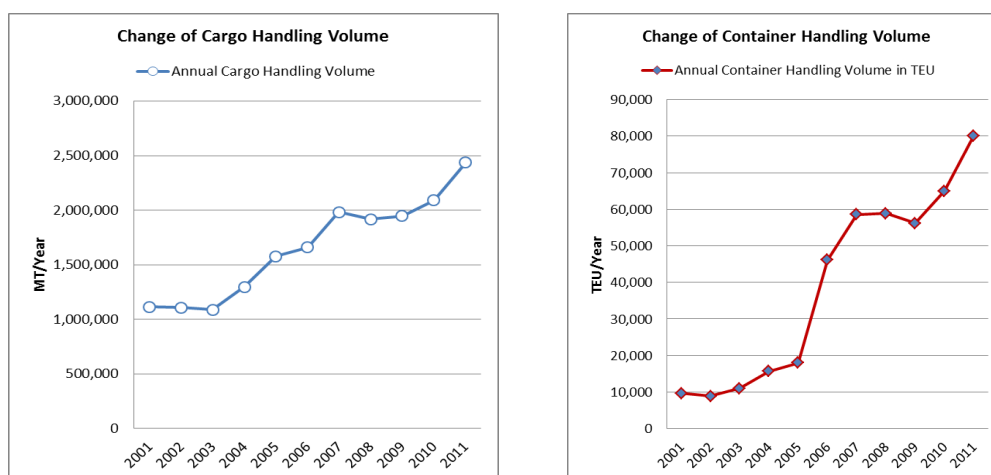
##### (1) The Puerto Corinto Port

###### 1) Town of Corinto developed right behind the port

The Puerto Corinto Port is located in Corinto, a town founded in 1863, where some 20,000 people currently reside. Container vessels started to make a call at the port around 1995. Because of the presence of an old townscape right behind, it is likely to be difficult to expand the port facilities.

###### 2) Insufficient port capacity

Figure 8.4.3 illustrates the change of cargo and container handling volumes during 2000 and 2011. The cargo handling volume increased some 8.5% each year, and the upward trend is expected to continue in future. The container handling volume, on the other hand, increased substantially, 29.2%, over the period. Behind the rapid growth in the container handling volume lie the facts that the growing manufacturing in Managua and Leon increases imports of industrial materials from Asia and that the economic growth increases imports of consumption goods. The Puerto Corinto Port currently has only one gantry crane, which is fairly old, as shown in Figure 8.4.4. If the container handling volume continues to crease at the present pace, it is highly likely to exceed the capacity of the port and thus the port may have to rely on ports in neighboring El Salvador.



**Figure 8.4.3 Changes of Cargo/Container Handling Volumes**

Source: created by the JICA Study Team based on data from the EPN

###### 3) Issues of the logistic terminals adjacent to the port

For smooth customs clearance and a higher handling volume in the small container yard, the port has a truck terminal equipped with a customs office that can accommodate 125 large trucks, which is located some 1.5km inland of the gate to the port as shown in Figure 8.4.5. The terminal is also likely to fail to meet an increase in the handling volume in future.



**Figure 8.4.4 Container Yard and Gantry Crane at the Puerto Corinto Port**

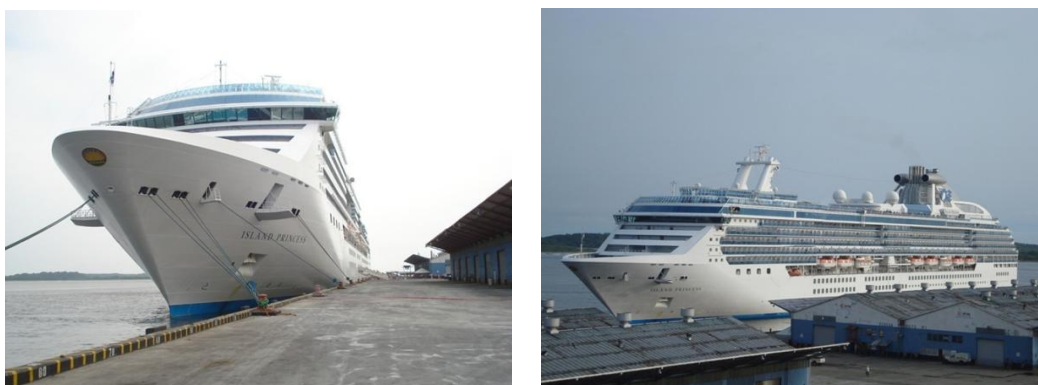


**Figure 8.4.5 Truck Terminal and Customs Office**

Source: JICA Study Team

#### 4) Calls of international cruise ships

An increasing number of international cruise ships have been calling at the Puerto Corinto Port. Because large cruise vessels as shown in Figure 8.4.6 occupy quay walls for general cargos and containers for a certain period, cargo vessels cannot make a call, undermining the freight handling capacity of the port. However, the growth in demand for international cruise ships is estimated to be less than the growth of international tourists visiting Nicaragua in the future, so the facilities for cargo vessels can be used if the Corinto Port is expanded.



**Figure 8.4.6 International Cruise Ships Calling at the Puerto Corinto Port**

Source: JICA Study Team

#### (2) Puerto Sandino Port

The port chiefly handles liquid cargo. It has a fairly low-water depth and cannot accommodate large ships.

#### (3) Puerto San Juan del Sur Port

The port is used for transport of tourists discharged afloat from cruise ships calling on their way to important tourist places in the southern part of the Pacific Ocean coast in Nicaragua. Currently, there is a plan to build a quay for cruise ships, but the plan may not pay off for its style of discharging tourists afloat and the current number of tourists, some 30,000-40,000 per year. The basic approach for the development of Puerto San Juan del Sur Port and its surrounding area should be focused on the port facilities only, but on the tourism in general.

### 8.4.3.2 Issues of Ports on the Atlantic Ocean Coast

#### (1) Puerto Cabezas Port (Bilwi)

The major facility of Puerto Cabezas Port is a jetty made of wood some 450m in length at the moment, but there is a plan to replace it with a concrete jetty some 400m longer with a construction fund of about USD 80 million. Even so, in order for the new jetty to demonstrate its performance, the road leading to the Pacific Ocean coast must be improved. If the road (some 280km in length)

is improved, it will make it possible to export agricultural products from the northern part of Nicaragua and transport import products to Managua, a large consumption place of the country. But since the port is a jetty-type, it will remain vulnerable against hurricanes and other climate conditions.

## **(2) Arlen Siu Port (El Rama)**

Currently, the international cargo transport to the Atlantic ocean coast is carried out using the Port of Arlen Sui, a river port built in El Rama which is some 100km inward of the coast. As the Port of Arlen Sui is a river port, its water depth seasonally varies. It is somewhat inconvenient because of its location, some 100km away from the seacoast. The freight handling volume totaled some 130,000 tons in 2012, a mere 5% of the total international cargo volume of the country. The port has a fairly low-water depth of -5m and can accommodate vessels not larger than 3,000 DWT (5,000 DWT at a maximum), so the freight handling volume is not large. Currently, one water transport company provides linear services once a week or so between Nicaragua, via Colombia, to the Dominican Republic.

### **8.4.3.3 Issues of Inland Water Transport**

Water transport is an indispensable means of transport for Nicaragua, in particular for the RAAN, RAAS and other Caribbean Seacoast areas, but has various issues as described below.

#### **(1) Organizations**

The scopes of water transport management among the MTI, and the RAAN, RAAS and other municipalities are not clearly defined, and the central government fails to provide enough budget and supervision.

#### **(2) Systems**

The legal system related to water transport and management of ports was revised and put into force in March 2013, but reforms on the organizations and systems executing the legal system, as well as adjustments among the central and regional governments, do not make substantial progress. Budget formulation for the water transport services and facilities is not appropriately executed at the national level, and no particular subsidies are granted to service providers, either. In such circumstances, the development, maintenance and management of infrastructure still depend on international aid money.

#### **(3) Water transport services and infrastructure**

Water transport services are chiefly supplied with panga boats, but because any public support system is unavailable, service providers are still unable to provide safe and regular services. Currently, FOMAV collects fuel tax for maintenance and improvement of roads, and even the tax collected from water transportation fuels is consumed in the road sector. Therefore, it is necessary to establish a sustainable system or mechanism which allows, for example, the use of the fuel tax collected from water transportation to improve the infrastructure in the water transport sector.

## **8.5 Current status and Issues of Air Transport**

### **8.5.1 Current status of Air Transport**

There are 16 airports in Nicaragua, which are classifiable into international airports, regional airports of the EAAI, domestic airports, regional airports, private airports and other types of airports. Among them, Augusto C. Sandino International Airport is the main international airport, providing international and domestic regular flights. Eight airports handle regular domestic flights, which are Puerto Cabezas (Bilwi) Airport, Bluefields Airport, Corn Island Airport, Bonanza Airport, San Carlos Airport, Siuna Airport, Waspam Airport and San Juan de Nicaragua Airport.

The following figure gives the location of these airports, and the table gives their descriptions.



**Figure 8.5.1 Location of Airports in Nicaragua**

Source: Created by the JICA Study Team based on data from the EAAI

**Table 8.5.1 Airports in Nicaragua**

Airport	Category	ICAO Code	IATA Code	ICAO Category	Runway Length (m)	Runway Width (m)	Runway Surface	Max. Aircraft Weight (kg)
Augusto C. Sandino International Airport	EAAI (International)	MNMG	MGA	4D	2,442	45	Asphalt	152,727
Bilwi Airport	EAAI (Domestic)	MNPC	PUZ	4C	2,471	45	Concrete	78,494
Bluefields Airport	EAAI (Domestic)	MNBL	BEF	3C	1,817	30	Double Asphalt Seal	22,407
Corn Island Airport	EAAI (Domestic)	MNCI	RNI	3C	1,450	30	Double Asphalt Seal	22,407
San Juan de Nicaragua Airport	EAAI (Domestic)			3C	1,500	25	Concrete	24,000
Ometepe Airport (Under rehabilitation)	EAAI (Domestic)			3C	1,500	30	Asphalt	24,000
León Airport (Famor Urroz)	National	MNLN		1B	929	25	Double Asphalt Seal	4,200
Los Brasiles Airport	National	MNBR		2C	915	24	Double Asphalt Seal	11,454
Chinandega Airport	National	MNCH		1B	757	18	Double Asphalt Seal	4,200
Bonanza Airport	Municipality	MNBZ	BZA	3C	1,430	30	Macadam	3,969
San Carlos Airport	Municipality	MNSC	NCR	3C	850	18	Macadam	3,969
Siuna Airport	Municipality	MNSI	SIU	2B	1,100	30	Macadam	3,969
Rosita Airport	Municipality	MNRT	RFS	3C	1,900	30	Macadam	22,470
Waspam Airport	Municipality	MNWP	WSP	2B	1,250	20	Macadam	7,466
Montelimar Airport	Private	MNMR		3D	1,450	43	Double Asphalt Seal	16,700
Punta Huete (Panchito) Airport	Others	MNFC		4D	3,000	45	Concrete	152,727

Source: Created by the JICA Study Team based on data from the INAC and EAAI

## 8.5.2 Current status of Aviation Services

### (1) International Air Route

There are 11 international air routes with 132 flights per week at Augusto C. Sandino International Airport. Table 8.5.2 lists international air routes at the airport as of February 2013.

**Table 8.5.2 International Air Routes at Augusto C. Sandino International Airport  
(as of February 2013)**

Destination	Distance	Airline	Aircraft	Departure / Week
Miami (USA)	1,633 km	American Airlines	B737-800	21
		TACA	A319, A320 & A321	7
		UPS	B757-F	1
				Total 29
San Jose (Costa Rica) (SJO)	320 km	Copa Airlines	Embraer 90	14
		TACA	ATR42	6
		LACSA	Embraer 90	4
		AVIATECA	ATR42	1
		Total 25		
San Salvador (El Salvador)	345 km	TACA	ATR42	6
			Embraer 90	3
		AVIATECA	A319, A320 & A321	11
			ATR42	1
	Total 21			
Panama City (Panama)	507 km	Copa Airlines	B737	5
			Embraer 90	8
		Copa Airlines Columbia Amerijet International	Embraer 90	6
			B727F	1
	Total 20			
Houston (USA)	2,191 km	United Airlines	B737-700, -800, & -900	14
Atlanta (USA)	2,387 km	Delta	A319	7
Guatemala City (Guatemala)	544 km	Copa Airlines	Embraer 90	7
Fort Lauderdale (USA)	1,666 km	Spirit Airlines	A320	4
San Jose (Costa Rica) (SYQ)	328 km	Nature Air	DHC-6	2
Montreal (Canada)	3,878 km	Air Transtat	A310	2
San Pedro Sula (Honduras)	413 km	Aerocaribbean	ATR72	1
Total				132

Source: Created by the JICA Study Team based on data from the INAC and EAAI



Figure 8.5.2 International Air Route to/from Managua  
 Source: JICA Study Team

(2) Domestic Air Route

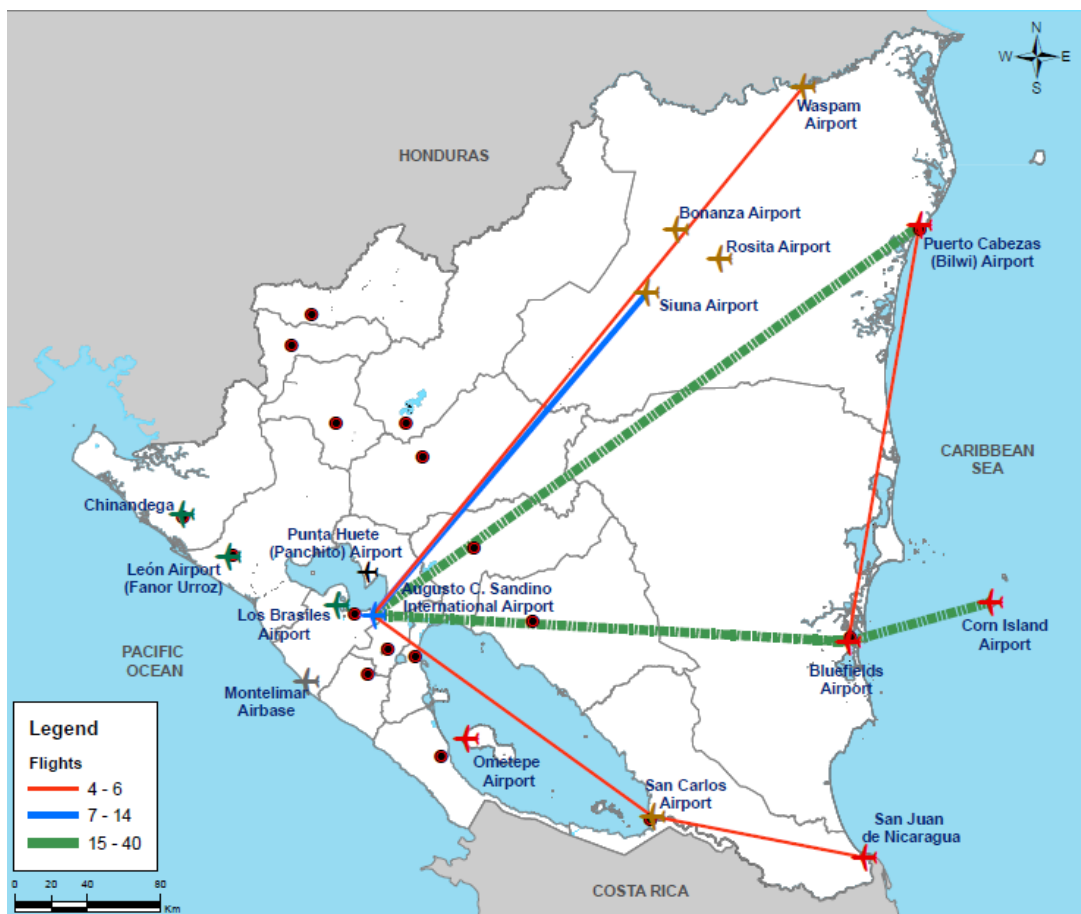
Most of the domestic routes start from Augusto C. Sandino International Airport, where La Costeña Airline operates 142 domestic flight services per week.

Table 8.5.3 Domestic Air Routes in Nicaragua (as of February 2013)

Origin	Destination	Distance	Airline	Flights / Week
Managua	Bluefields	365 km	La Costeña	40
Managua	Bilwi	376 km	La Costeña	40
Bluefields	Corn Island	80 km	La Costeña	28
Managua	Mine Area (Siuna, Rosita and Bonanza)	311 km 382 km 308 km	La Costeña	14
Managua	Waspan	380 km	La Costeña	6
Bluefields	Puerto Cabezas (Bilwi)	365 km	La Costeña	6
Managua	San Carlos	293 km	La Costeña	4
San Carlos	San Juan de Nicaragua	100 km	La Costeña	4
Total				142

Source: JICA Study Team





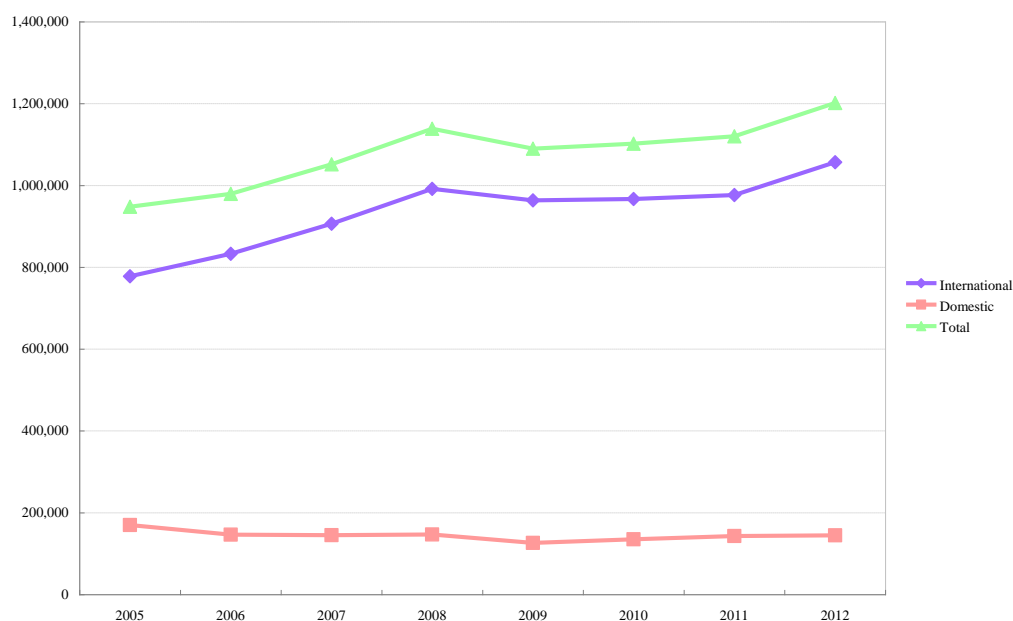
**Figure 8.5.3 Domestic Air Routes in Nicaragua**  
 Source: the JICA Study Team

### 8.5.3 The Present Demand for Aviation Services

#### (1) The number of passengers at Augusto C. Sandino International Airport

The number of international and domestic flight passengers using Augusto C. Sandino International Airport peaked at 992,000 in 2008 and decreased in the subsequent years. It increased again at the growth rate of 8.2% in 2011-12, totaling 1.06 million in 2012.

The number of domestic flight passengers marked 170,000 in 2015 and decreased in the subsequent years. As in the case of the number of international flight passengers, after reaching bottom in 2009, it started to increase again. Domestic flight passengers totaled 145,000 in 2012.



**Figure 8.5.4 Annual Air Passengers at Augusto C. Sandino International Airport (2005-2012)**

Source: created by the JICA Study Team based on data from the INAC

## (2) The number of passengers at other airports

Table 8.5.4 shows the air traffic volume at major airports in 2010 and 2011. The number of domestic flight passengers at Bilwi, Bluefields and Corn Island Airports totaled more than 30,000 per year as of 2011. These airports host not just scheduled flights but also international chartered flights. The annual number of passengers at other regional airports is around 5,000-8,000 per year.

**Table 8.5.4 Air Traffic Volume at Major Domestic Airports (2010 and 2011)**

	2010			2011		
	Passengers	Aircraft Movements	Passengers per Aircraft	Passengers	Aircraft Movements	Passengers per Aircraft
<b>Domestic</b>						
Bilwi	38,753	2,997	12.9	39,483	3,700	10.7
Bluefields	28,666	2,531	11.3	32,530	2,864	11.4
Corn Island	28,902	904	32.0	30,546	1,306	23.4
Bonanza	6,164	955	6.5	7,987	786	10.2
Siuna	5,448	631	8.6	5,398	654	8.3
Rosita	4,195	523	8.0	4,804	463	10.4
Waspan	3,987	557	7.2	4,954	433	11.4
San Carlos	6,775	713	9.5	5,863	890	6.6
Chinandega	128	N/A		306	N/A	
<b>International</b>						
Bluefields (Intl)	6,531	N/A		6,196	N/A	
Corn Island (Intl)	4,133	N/A		4,058	N/A	
Puerto Cabezas (Intl)	1,223	N/A		1,276	N/A	

Source: created by JICA Study Team based on data from the INAC

## 8.5.4 Issues of Air Transport

### (1) Facility development to handle increased air passengers

It is forecasted that annual international air passengers will reach approximately 1.3 million and 4.1 million in 2015 and 2033, respectively. Comparing with the current number of international air passengers of 1.1 million at August C. Sandino Airport in 2011, the number of international air passengers will be approximately 3.7 times more than the present number by 2033. The number of

domestic air passengers is also expected to increase as in the case of international air passengers. To handle the increasing number of passengers, it is necessary to increase the capacity of international and domestic airports especially that of August C. Sandino International Airport and Bluefields Airport because the former is an international gateway airport and the latter a hub airport for domestic air routes.

It is also important to develop airport facilities in accordance with International Standards and Recommended Practice to secure safe aircraft operation. August C. Sandino Airport has an issue related to the obstacle limitation surface. Because the distance between the international terminal building and the runway is close, large aircraft parking in the apron infringes the transitional surface.

An airport master plan for August C. Sandino Airport was formulated in 1975 and in 2010, but traffic conditions and aircraft types have changed over the years: it is necessary to update the master plan for higher efficiency of the airport.

**(2) Low capacity of domestic passenger terminal at August C. Sandino International Airport**

The floor area of the domestic passenger building is 560 m<sup>2</sup> only and the capacity of the domestic passenger terminal at August C. Sandino International Airport is quite low and does not meet even the present demand. Because of the low capacity, congestion is frequent in the building and the quality of services to passengers remains low.

**(3) Airport as part of multi-modal transport system**

Bilwi airport and Bluefields Airports are located near seaports. It is important to improve them as a part of the multi-modal transport system so that high value sea products can be exported efficiently to international markets such as the USA.



## Chapter 9 Transportation Surveys

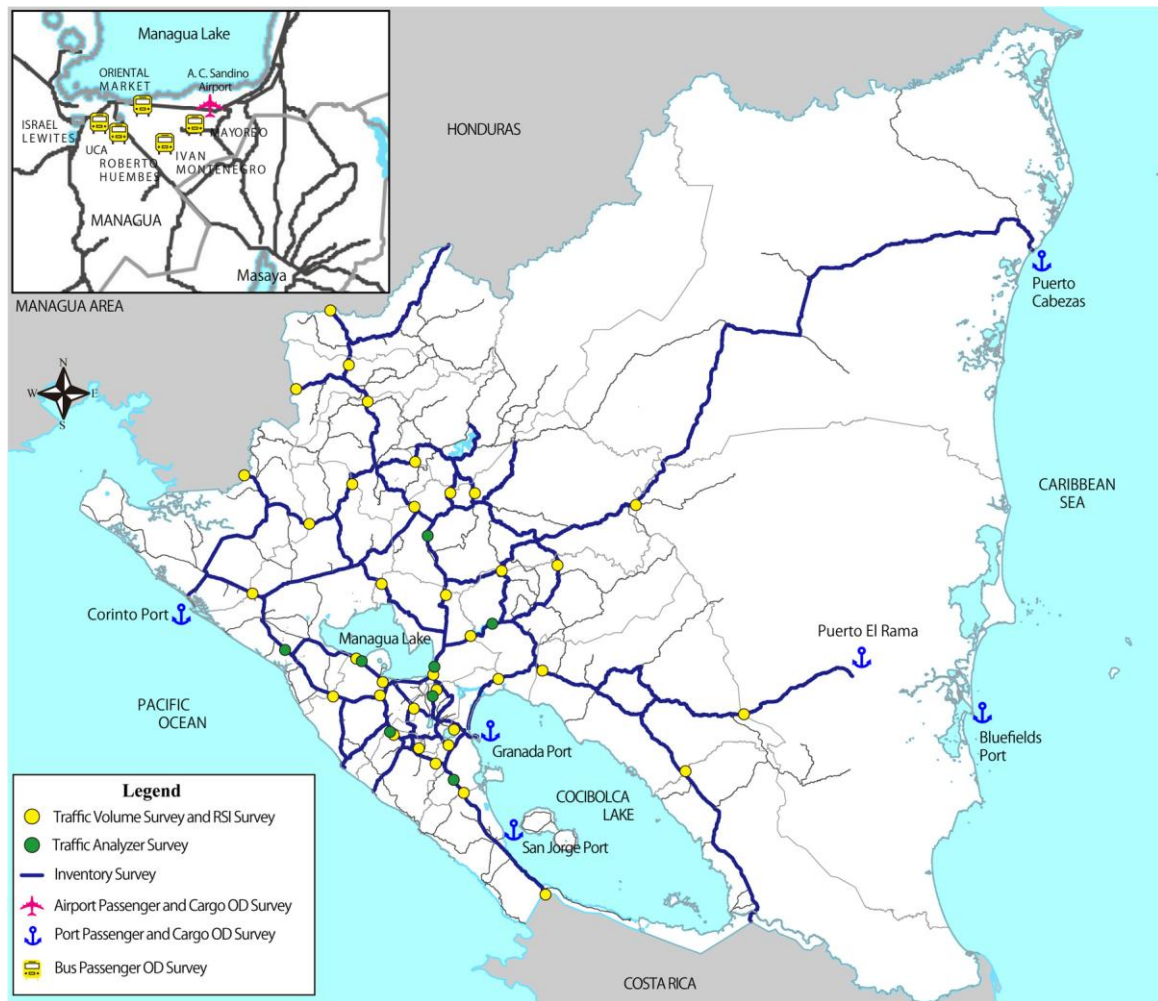
### 9.1 Transportation Surveys

As summarized in Table 9.1.1, a series of transportation surveys were conducted as part of the National Transport Plan across the country from February to July in 2013.

**Table 9.1.1 Summary of Transportation Surveys**

Name	Objective	Output	Content
1. Survey on Transport Demand, by transport mode			
1.1 Roadside OD Interview Survey with Traffic Count	Assessing trip patterns and volume of vehicle traffic on inter-city roads nationwide.	<ul style="list-style-type: none"> <li>• Passenger OD table (person-based, per 1 day)</li> <li>• Distribution OD table (tonnage –based, per main freight item)</li> <li>• OD table by vehicle type (passenger vehicle, bus, freight)</li> <li>• OD table by mode (vehicle category)</li> </ul>	<ul style="list-style-type: none"> <li>• Points: 36 locations total</li> <li>4 national border OD</li> <li>6 national capital screen OD</li> <li>10 department border OD (high traffic volume)</li> <li>16 department border OD (low traffic volume)</li> <li>• Survey times: 16-hrs survey</li> <li>2 weekdays, weekend (high traffic volume)</li> <li>1 weekday, weekend (low traffic volume)</li> </ul>
1.2 Passenger Transport Terminal OD Survey	Assessing trip patterns and volume of traffic at passenger terminals nationwide (bus terminals, airport and ferries)	<ul style="list-style-type: none"> <li>• OD table for passengers using transportation terminals (terminal zones) as the points of origin and destination</li> </ul>	<ul style="list-style-type: none"> <li>• Points: 10 locations total</li> <li>1 airport, 2 ports, 2 lakeside ports, and 5 bus terminals</li> <li>• Survey times: 16-hr survey</li> <li>2 weekdays and 1 weekend day</li> </ul>
1.3 Freight Transport Terminal OD Survey	Assessing trip patterns and volume of traffic at freight terminals nationwide (airport, ports, etc.)	<ul style="list-style-type: none"> <li>• OD table for distribution having distribution terminals as the points of origin and destination</li> <li>• OD table for terminating trucks</li> </ul>	<ul style="list-style-type: none"> <li>• Points: 5 locations total</li> <li>1 air transport, 4 ports</li> <li>• Survey times: 16-hr survey</li> <li>2 weekdays, 1 weekend day</li> </ul>
1.4 Weekly/Seasonal Vehicle Variation Survey with Automatic Traffic Analyzer	Obtaining traffic data such as weekly and seasonal (rainy and dry seasons) fluctuations of traffic, for which the Ministry of Transport and Infrastructure does not conduct surveys	<ul style="list-style-type: none"> <li>• Weekly fluctuation in major road traffic volume</li> </ul>	<ul style="list-style-type: none"> <li>• Points: 4 locations total</li> <li>4 major trunk roads</li> <li>• Survey times: 24-hr survey for 14 days</li> <li>Successive 7 days in rainy and dry seasons (using traffic analyzer)</li> </ul>
2. Road Inventory Survey			
2-1 Road Inventory Survey	Assessing current road and road facility conditions, problems, and issues. Creation of basic network data for transport demand forecasting.	<ul style="list-style-type: none"> <li>• Road standards</li> <li>• No. of lanes</li> <li>• Type of paving</li> <li>• Building a database with bridge information</li> </ul>	<ul style="list-style-type: none"> <li>• Sections: 200 sections total</li> <li>• Verifying and updating inventory data on currently existing roads and bridges as a base for implementing road surveys at approximately 200 sections</li> </ul>
3. Surveys to find the facts and issues of transport-related businesses			
3-1 Trucking/Logistics Companies and Major Factory Interview Survey	Interviewing distribution companies regarding transport problems and issues. Obtaining quantitative OD information on raw materials and products and asking about current problems and issues.	<ul style="list-style-type: none"> <li>• Activities OD for major products</li> <li>• Issues pertaining to distribution in production activities for major products</li> </ul>	<ul style="list-style-type: none"> <li>• Companies: 30 companies total</li> <li>5 trucking/logistic companies</li> <li>• Conduct an interview survey with major companies (coffee, meat, shrimp, sugar, etc.)</li> <li>• (5 items x 5 companies=25 businesses)</li> </ul>

Source: JICA Study Team



**Figure 9.1.1 Transportation Survey Location Map**  
 Source: JICA Study Team

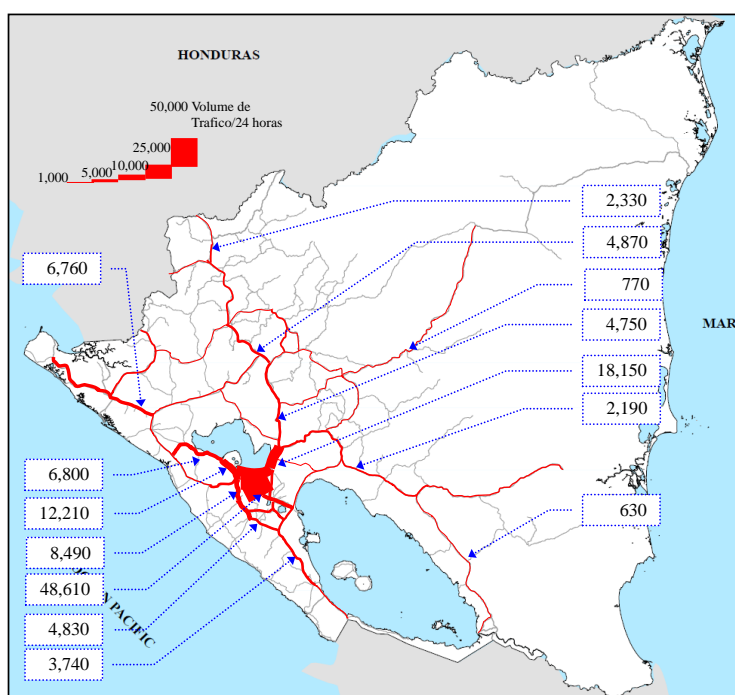
## Chapter 10 Analysis of Data from the Transportation Surveys

Analysis of data was conducted based on the results of the transportation surveys. Obtained data is to be used as a basic data for the development strategies of the National Transport Plan. In this chapter, only the main results of the study analysis are described, while the detailed results are shown in the Chapter 10 of the Support Document, Volume 2.

### 10.1 The results of the Traffic Count Survey

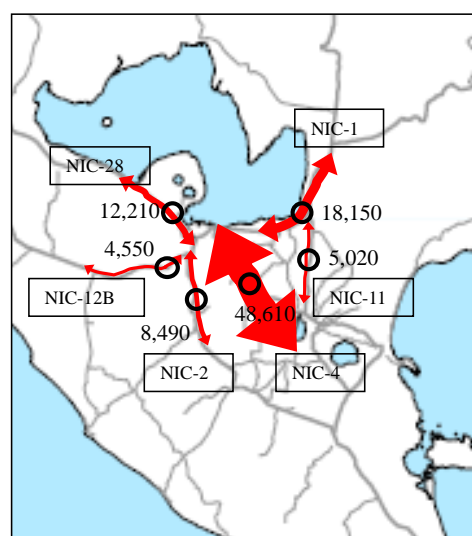
The survey on traffic volume in the entire country shows that national roads running north-south, particularly in Managua, are busy. It has also found that roads in the eastern part of the country has not much traffic but are crucial because they connect Managua to other major cities.

The traffic volume around the city of Managua is much larger than that around other major cities. The survey has found that the traffic on NIC-4 (National Route 4) that connects Managua to Masaya and Granada totals 48,610 vehicles per day, and that the traffic on NIC-1 (National Route 1) totals 18,150 vehicles per day and that on NIC-28 (National Route 28) totals 12,210 vehicles per day. These roads are expected to be congested chronically in near future due to an increase in the traffic volume, so they need to be expanded in width.



**Figure 10.1.1 Traffic Volumes in Nicaragua**

Source: JICA Study Team



**Figure 10.1.2 Traffic Volumes in Managua**

Source: JICA Study Team

### 10.2 The Results of the Roadside Interview Survey

According to the results of the roadside interview survey, comparisons have been made among survey points around the city of Managua and major roads outside the city. The comparisons have clarified the following features.

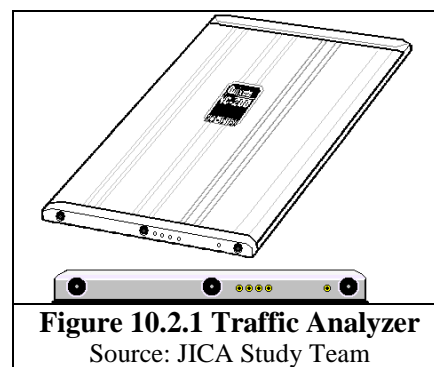
- “Commuting” accounted for the largest share of the purposes of traveling regardless of within and outside the city of Managua, some 70% of all the purposes. This was followed by “social visit” and “other purpose”, both of which accounted for some 10%.
- The average number of persons per vehicle for passenger cars and pickups was 2.2 – 2.4 around the city of Managua and slightly larger outside the city, 2.5 – 2.7 persons on average. The average number of persons per large bus, on the other hand, was 37.2 around the city of

- Managua and slightly fewer outside the city, 30.3 persons per large bus.
- Around half of vehicles for cargo transportation that were observed around the city were empty. This was followed by cargo transportation vehicles carrying food, which accounted for 10%. Outside the city, on the other hand, empty cargo transportation vehicles accounted for 10 – 50%: there were some survey points where empty cargo vehicles were fewer, compared to vehicles around the city.

### 10.3 Weekly Vehicle Variation Survey

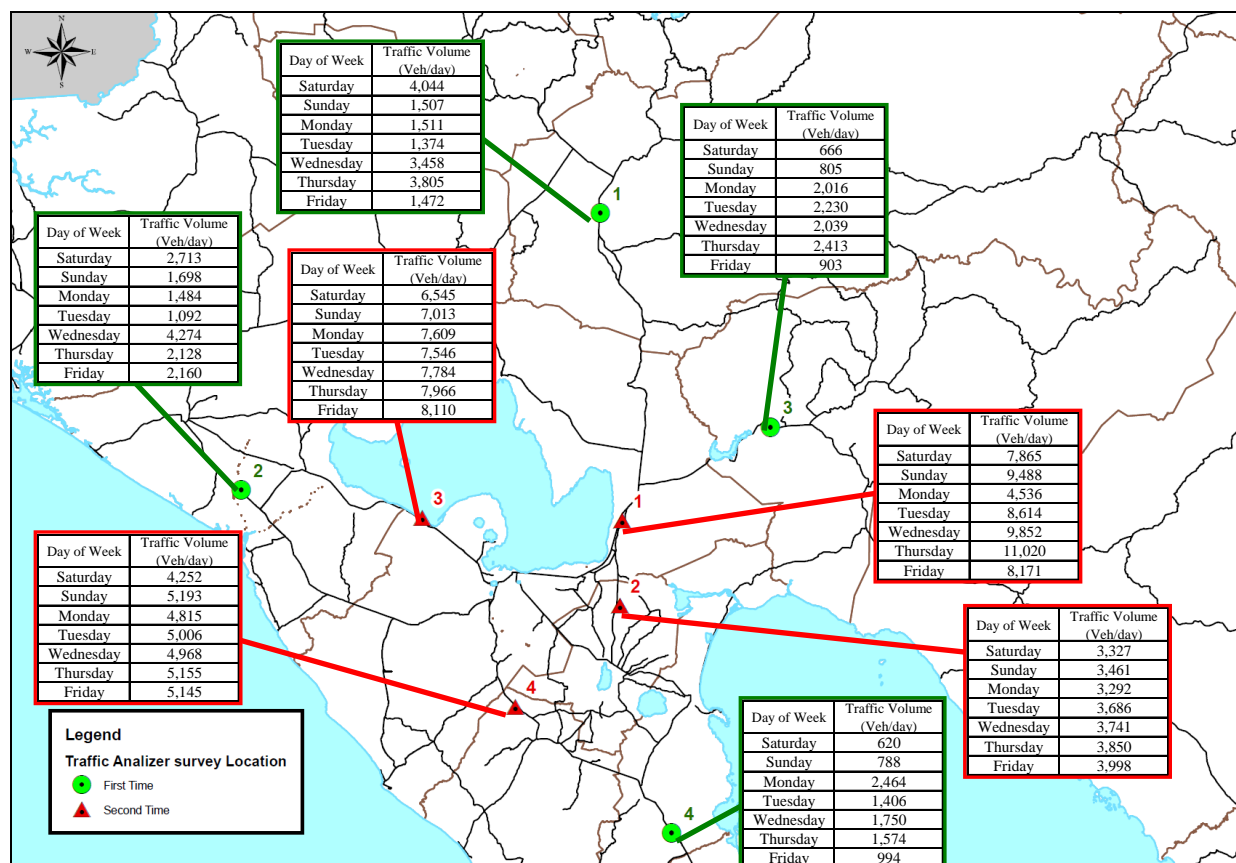
The weekly vehicle variation survey used automatic traffic analyzers (Figure 10.2.1). The survey aimed at technology transfer and thus was conducted with the MTI, the counterpart of the Project.

Four survey points were divided into two, each monitoring the traffic volumes for seven successive days around regional cities and around the city of Managua. The survey results were used to compute the day coefficient and the week coefficient.



**Figure 10.2.1 Traffic Analyzer**  
Source: JICA Study Team

The day coefficients of the survey points ranged between 1.32 and 1.42 for the entire vehicle types, and the week coefficients ranged between 0.83 and 1.01.



**Figure 10.3.1 The Results of the Weekly Vehicle Variation Survey**  
Source: JICA Study Team

### 10.4 The Results of the Traveling Speed Survey

The JICA Study Team, jointly with the counterpart, surveyed the speeds of vehicles traveling on national and general roads across the country. The average traveling speed was 60km/h or higher on most of the roads surveyed, but 20km/h or lower on some routes in the eastern part of Nicaragua because of the poor road conditions. The Figure 10.4.1 shows the results of traveling speed survey.



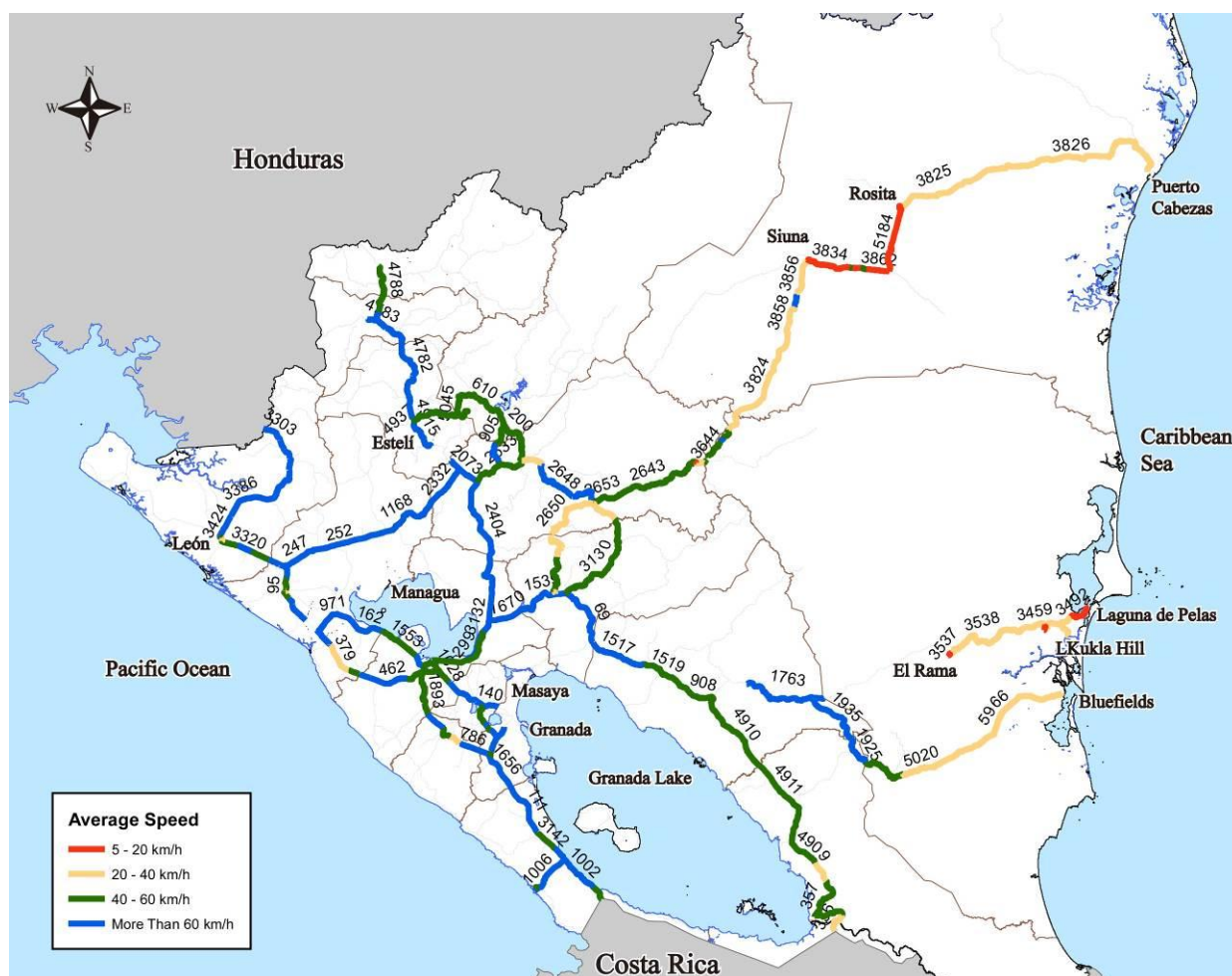


Figure 10.4.1 The Results of Travel Speed Survey

Source: JICA Study Team

## 10.5 The Results of the Passenger Transport Terminal OD Survey

The passenger transport terminal OD survey conducted at an airport, bus terminals and ports have clarified the following features.

- “Sightseeing” accounted for some 40% of the purposes of traveling among the persons surveyed at the airport. “Commuting” accounted for some 40% at both the bus terminals and the ports.
- The proportion of persons using the transport means “on rare occasions” was the largest.
- A large proportion of the travelers surveyed at the airport used passenger cars or pickups to come to the airport. A large proportion of the persons surveyed at the bus terminals used taxis or walked to the terminals. And a large proportion of the persons surveyed at the ports used taxis or buses.

## 10.6 The Results of the Freight Transport Terminal OD Survey

The freight transport terminal OD survey conducted at an airport and ports have clarified the following features.

- For air freight transport, some 60% of the cargos were brought in by light trucks and 40-add % by passenger cars or pickups. For freight transport at the ports, some 50% were brought in by large trucks or trailers and some 30% by light trucks.
- The proportion of persons using air freight transport “on rare occasions” was the largest, some 30%, followed by “10 times or more” of some 20%. Among the persons surveyed at

the ports, those using freight transport “once to three times per week” accounted for some 50% at the Puerto Corinto Port, some 30% at the Bluefields Port and some 80% at the Puerto El Rama Port. Among those surveyed at the Puerto Cabezas Port, some 60% used freight transport 10 times or more per week.

- As for the types of cargos handled, some 50% were agricultural products at both the airport terminal and the ports.

## Chapter 11 Socio-Economic Framework for Future

### 11.1 National Socio-Economic Framework for Future

The analysis results of the socio-economic framework forecast are shown in the Table 11.1.1. In order to make the forecast appropriate based on the international comparison, the project GDP is computed on the basis of US dollar constant price of year 2000.

#### (1) Population

The study team has set the conditions for socio-economic development in the next twenty years considering the role and position of Nicaragua in Central America. The study team has adopted population estimated up to 2050 by INDE.

#### (2) GDP and Industrial Sector GDP

For GDP forecast, four calculation methods described below were applied for comparison and analysis using the index of GDP per capita for calculating target value.

- (i) The GDP growth rate of in the last 10 years will be applied for the next 20 years.
- (ii) GDP per capita is equal to the average GDP per capita of six countries (Guatemala, Honduras, El Salvador, Nicaragua Costa Rica and Panama) in Central America for the year 2033 (USD 5,452, constant price, year 2000).
- (iii) The GDP growth rate of year 2030 forecast by BNC (Nicaragua Central Bank) is applied for the following three years till 2033.
- (iv) GDP per capita will reach and remain the same as the average of Central America in 2050, and this growth rate to achieve this target is applied and calculated.

From the historical viewpoint, economic and GDP growth periods of other countries are classified into three periods: (i) Growing Period, (ii) Stable Growth or Maturation Period, and (iii) Decline or Slow Growth Period. According to this perspective, Nicaragua is now at the Growing Period, and it is so reasonable to consider the approximate growth rate of next twenty years around 7%. Thus, GDP per capita in the year 2033 is forecasted and set as USD 3,800 (price of year 2000).

It is expected that the primary industry and related services will continuously be the core economic activities of Nicaragua comparing to the other countries around. The impact or contribution by each industrial sector to the economic growth and added value is also considered minimum similar to the current situation. In order for GDP computation, the last 10 year growth rate for the primary industry is analyzed to remain at 4.2%, and the growth rates and sector share of the secondary and tertiary industries are set on the basis of sector-wise development plan considered with the trend of past share value of the Central American countries.

#### (3) Employment population

The productivity index is prepared for each industrial sector in order to evaluate the change of employment share by economic sector. Nicaragua's industrial development plan under PNDH aims primary sector and tourism development to put more effort in order to develop small to medium sized industries, and normalization of informal sector employment is expected to accomplish. Therefore, productivities per capita are assumed not to show larger change, and sector employment share is forecasted based on the future sector GDP.

#### (4) The number of vehicles owned

The number of vehicles owned has been estimated based on a model GDP growth rate, model population growth rate and a model GDP per capita which have been developed for the estimation, and also on forecast figures for the socio-economic framework.

**Table 11.1.1 National Socio-Economic Framework**

Socio-economic Framework	2013	2018	2023	2028	2033
Population	6,032,000	6,381,000	6,702,000	6,995,000	7,257,000
GDP per Capita (USD, 2000 price)	1,211	1,582	2,094	2,805	3,800
GDP (million USD, 2000 price)	7,302	10,096	14,037	19,623	27,574
GDP: Primary Sec (million USD)	1,460 (20.0%)	1,798 (17.8%)	2,213 (15.8%)	2,723 (13.9%)	3,352 (12.2%)
GDP: Secondary Sec (million USD)	1,899 (26.0%)	2,479 (24.5%)	3,236 (23.0%)	4,224 (21.5%)	5,515 (20.0%)
GDP: Tertiary Sec (million USD)	3,943 (54.0%)	5,820 (57.6%)	8,589 (61.2%)	12,675 (64.6%)	18,707 (68.7%)
Employment Population	2,051,000	2,266,000	2,479,000	2,693,000	2,902,000
Primary Sector	789,000	796,000	790,000	773,000	746,000
Secondary Sector	410,000	439,000	462,000	480,000	491,000
Tertiary Sector	852,000	1,031,000	1,227,000	1,440,000	1,665,000
Registered Vehicle	523,000	592,000	684,000	812,000	1,006,000

Source: created by JICA Study Team based on data from the INIDE and IDB

## 11.2 Socio-Economic Framework for Future, by Department

The study team has examined directions of development of individual sectors by applying development potentials and spatial plans of individual sectors in the long-term development vision formulated in Phase-1 to the 17 departments. According to the directions of development of individual sectors in each department and the national socio-economic framework, the team has forecast the population, GDP, employment population, the number of vehicles owned of each department. The following tables list the socio-economic framework by department.

**Table 11.2.1 Population Framework, by Department**

Code No.	Department	Project Year				
		2013	2018	2023	2028	2033
1	Boaco	170,827	177,921	188,074	197,969	206,316
2	Carazo	183,300	189,593	194,172	197,437	198,764
3	Chinandega	415,977	424,741	431,132	436,211	437,619
4	Chontales	185,655	199,570	216,205	233,242	249,122
5	Estelí	221,513	225,282	230,038	236,236	240,192
6	Granada	198,356	206,492	215,068	223,057	229,047
7	Jinotega	419,760	459,268	497,551	531,515	562,160
8	León	397,297	405,667	411,771	416,209	417,967
9	Madriz	155,059	163,104	169,878	176,189	180,921
10	Managua	1,453,990	1,538,517	1,586,642	1,613,321	1,624,162
11	Masaya	352,368	377,848	389,667	396,219	398,881
12	Matagalpa	535,051	560,590	592,578	623,756	650,056
13	Nueva Segovia	243,233	255,600	265,952	273,117	277,691
14	Río San Juan	114,737	123,701	132,053	141,762	150,673
15	Rivas	170,427	172,638	178,038	182,835	185,897
16	R.A.A.N.	446,840	500,999	558,587	602,603	643,632
17	R.A.A.S.	367,562	399,209	444,272	513,087	603,898
	All Department Total	6,031,953	6,380,740	6,701,678	6,994,762	7,257,001

Source: created by JICA Study Team based on data from the INIDE

**Table 11.2.2 Projected GDP, by Sector and by Department (unit: million US\$, Price 2000)**

Code	Department	Sector	2013	2018	2023	2028	2033
1	Boaco	Primary	75	96	122	156	199
		Secondary	14	19	26	35	46
		Tertiary	80	122	188	290	439
		Total	169	237	336	480	684

Code	Department	Sector	2013	2018	2023	2028	2033
2	Carazo	Primary	36	42	49	54	59
		Secondary	83	101	123	149	182
		Tertiary	114	180	278	428	658
		Total	233	322	449	631	899
3	Chinandega	Primary	104	120	139	157	176
		Secondary	147	214	312	454	661
		Tertiary	238	356	536	804	1,190
		Total	489	690	987	1,416	2,027
4	Chontales	Primary	52	66	84	107	137
		Secondary	37	50	66	89	119
		Tertiary	83	127	197	302	457
		Total	172	243	347	498	713
5	Estelí	Primary	51	61	71	80	89
		Secondary	79	109	149	209	293
		Tertiary	104	159	244	371	557
		Total	235	329	463	660	940
6	Granada	Primary	30	34	39	43	47
		Secondary	63	78	97	121	151
		Tertiary	118	197	314	487	758
		Total	211	309	450	651	957
7	Jinotega	Primary	172	223	288	373	483
		Secondary	40	49	60	73	88
		Tertiary	76	125	201	327	530
		Total	288	396	549	773	1,101
8	León	Primary	71	82	96	108	122
		Secondary	118	169	242	348	500
		Tertiary	227	336	500	743	1,097
		Total	415	587	839	1,199	1,719
9	Madriz	Primary	68	85	104	129	159
		Secondary	25	30	37	44	54
		Tertiary	33	61	103	176	274
		Total	126	175	244	349	487
10	Managua	Primary	67	71	76	80	85
		Secondary	905	1,172	1,503	1,909	2,401
		Tertiary	2,216	3,109	4,291	5,895	8,138
		Total	3,189	4,352	5,870	7,884	10,625
11	Masaya	Primary	30	34	37	41	45
		Secondary	154	192	239	298	371
		Tertiary	170	266	425	686	1,065
		Total	354	491	701	1,025	1,481
12	Matagalpa	Primary	207	265	338	421	525
		Secondary	64	82	105	134	171
		Tertiary	213	321	488	743	1,115
		Total	485	668	930	1,297	1,810
13	Nueva Segovia	Primary	81	105	137	177	229
		Secondary	58	71	86	104	125
		Tertiary	63	98	154	245	384
		Total	203	275	377	526	738
14	Río San Juan	Primary	61	76	94	117	146
		Secondary	1	1	2	2	3
		Tertiary	19	32	56	94	164
		Total	81	109	152	214	313
15	Rivas	Primary	41	47	55	63	74
		Secondary	49	62	80	104	136
		Tertiary	75	122	197	302	439
		Total	165	232	331	470	648
16	R.A.A.N.	Primary	101	126	157	198	250
		Secondary	29	38	50	69	95
		Tertiary	63	110	215	380	684
		Total	192	274	422	648	1,030

Code	Department	Sector	2013	2018	2023	2028	2033
17	R.A.A.S.	Primary	212	264	329	416	525
		Secondary	32	42	58	83	119
		Tertiary	51	99	204	399	758
		Total	295	405	590	898	1,402
	Total	Primary	1,460	1,796	2,213	2,721	3,352
		Secondary	1,899	2,479	3,234	4,224	5,515
		Tertiary	3,943	5,820	8,590	12,674	18,707
		Total	7,302	10,095	14,037	19,619	27,574

Source: created by JICA Study Team based on data from the INIDE and IDB

**Table 11.2.3 Projected Employment Population, by Sector and by Department**

Code	Department	Sector	2013	2018	2023	2028	2033
1	Boaco	Primary	38,690	40,475	41,583	42,246	42,243
		Secondary	7,608	8,340	8,978	9,509	9,912
		Tertiary	16,050	19,611	23,709	28,109	32,413
		Total	62,348	68,426	74,270	79,864	84,568
2	Carazo	Primary	18,671	17,742	16,557	14,551	12,587
		Secondary	15,677	15,623	15,289	14,724	13,953
		Tertiary	31,708	39,975	48,365	57,377	67,137
		Total	66,056	73,341	80,211	86,652	93,677
3	Chinandega	Primary	55,831	53,052	49,508	44,588	39,140
		Secondary	29,045	34,635	40,556	46,732	52,989
		Tertiary	60,405	72,289	85,052	98,294	110,664
		Total	145,281	159,976	175,116	189,614	202,793
4	Chontales	Primary	32,084	33,564	34,484	35,033	35,031
		Secondary	10,799	11,838	12,742	13,497	14,068
		Tertiary	23,631	28,958	34,938	41,342	47,591
		Total	66,514	74,360	82,164	89,872	96,689
5	Estelí	Primary	33,599	32,709	30,524	27,491	24,014
		Secondary	22,093	24,794	27,324	30,334	33,138
		Tertiary	31,959	38,979	46,619	54,721	62,522
		Total	87,651	96,483	104,468	112,546	119,674
6	Granada	Primary	15,944	14,786	13,467	11,835	10,238
		Secondary	16,907	17,259	17,299	17,064	16,563
		Tertiary	30,936	41,284	51,561	61,538	72,941
		Total	63,787	73,329	82,328	90,437	99,742
7	Jinotega	Primary	96,605	102,514	106,835	110,097	111,671
		Secondary	7,281	7,257	7,102	6,839	6,481
		Tertiary	23,678	31,164	39,309	49,319	60,791
		Total	127,565	140,934	153,246	166,254	178,942
8	León	Primary	39,240	37,287	34,796	31,338	27,779
		Secondary	33,141	38,973	45,004	51,140	57,185
		Tertiary	65,699	77,889	90,662	103,689	116,528
		Total	138,080	154,149	170,462	186,166	201,492
9	Madriz	Primary	35,769	36,189	35,957	35,328	34,164
		Secondary	6,082	6,062	5,932	5,713	5,414
		Tertiary	11,898	17,479	23,054	30,500	36,113
		Total	53,749	59,730	64,943	71,541	75,690
10	Managua	Primary	27,372	23,815	20,349	17,194	14,299
		Secondary	152,953	162,203	167,309	168,212	164,842
		Tertiary	337,591	378,954	408,622	432,617	454,574
		Total	517,917	564,972	596,279	618,023	633,715
11	Masaya	Primary	22,756	20,593	18,303	16,086	13,914
		Secondary	44,411	45,334	45,442	44,823	43,507
		Tertiary	63,176	79,130	98,713	122,948	145,163
		Total	130,343	145,058	162,457	183,856	202,584
12	Matagalpa	Primary	112,082	117,252	120,464	119,497	116,671
		Secondary	21,089	22,047	22,633	22,864	22,729
		Tertiary	52,897	63,898	75,733	88,895	101,567
		Total	186,067	203,198	218,831	231,257	240,968

Code	Department	Sector	2013	2018	2023	2028	2033
13	Nueva Segovia	Primary	55,178	58,553	61,021	62,885	63,784
		Secondary	12,239	12,198	11,937	11,385	10,686
		Tertiary	19,928	25,043	30,600	37,592	44,739
		Total	87,346	95,794	103,559	111,862	119,208
14	Río San Juan	Primary	28,648	29,263	29,355	29,120	28,431
		Secondary	2,013	2,006	1,963	1,891	1,792
		Tertiary	7,102	9,369	12,778	16,720	22,172
		Total	37,763	40,638	44,097	47,730	52,395
15	Rivas	Primary	29,680	28,203	26,319	24,287	22,059
		Secondary	10,141	10,602	10,884	11,259	11,461
		Tertiary	26,737	34,670	43,670	51,675	57,106
		Total	66,559	73,475	80,873	87,221	90,627
16	R.A.A.N.	Primary	71,241	72,770	73,000	73,460	72,758
		Secondary	8,966	9,599	10,332	11,205	11,957
		Tertiary	22,323	31,460	47,760	65,244	89,356
		Total	102,530	113,829	131,092	149,909	174,071
17	R.A.A.S.	Primary	75,610	77,233	77,477	77,965	77,220
		Secondary	9,555	10,229	11,273	12,810	14,324
		Tertiary	26,281	40,846	65,854	99,421	143,622
		Total	111,446	128,309	154,605	190,196	235,166
	Total	Primary	789000	796000	790000	773000	746000
		Secondary	410000	439000	462000	480000	491000
		Tertiary	852000	1031000	1227000	1440000	1665000
		Total	2,051,000	2,266,000	2,479,000	2,693,000	2,902,000

Source: created by JICA Study Team based on data from the INIDE and IDB

**Table 11.2.4 Projected Number of Vehicles Registered, by Vehicle Type and by Department**

Code	Department	Type	2013	2018	2023	2028	2033
1	Boaco	BIKE	3,032	3,322	3,766	4,384	5,286
		PAX	4,075	4,465	5,062	5,892	7,104
		BUS	254	265	280	294	307
		TRUCK	895	1,096	1,390	1,802	2,373
		OTHERS	367	449	570	739	973
		TOTAL	8,624	9,597	11,068	13,112	16,044
2	Carazo	BIKE	5,221	5,764	6,501	7,631	9,622
		PAX	7,634	8,429	9,506	11,159	14,070
		BUS	1,047	1,083	1,109	1,128	1,136
		TRUCK	1,087	1,341	1,691	2,182	2,899
		OTHERS	505	623	785	1,014	1,347
		TOTAL	15,494	17,240	19,592	23,114	29,073
3	Chinandega	BIKE	14,372	15,710	17,695	20,922	26,572
		PAX	12,060	13,183	14,848	17,555	22,297
		BUS	1,230	1,256	1,275	1,290	1,294
		TRUCK	5,773	7,139	9,113	11,933	15,922
		OTHERS	608	752	960	1,257	1,677
		TOTAL	34,043	38,040	43,891	52,957	67,762
4	Chontales	BIKE	7,047	7,909	9,088	10,648	12,781
		PAX	6,549	7,350	8,446	9,895	11,878
		BUS	375	403	436	471	503
		TRUCK	1,794	2,226	2,843	3,702	4,881
		OTHERS	538	668	853	1,111	1,465
		TOTAL	16,302	18,555	21,666	25,826	31,507
5	Estelí	BIKE	8,089	8,733	9,715	11,306	13,852
		PAX	11,985	12,939	14,395	16,751	20,525
		BUS	684	696	711	730	742
		TRUCK	2,993	3,645	4,576	5,933	7,829
		OTHERS	689	839	1,054	1,366	1,803
		TOTAL	24,440	26,852	30,450	36,086	44,751

Code	Department	Type	2013	2018	2023	2028	2033
6	Granada	BIKE	5,734	6,370	7,279	8,621	10,936
		PAX	7,134	7,926	9,058	10,727	13,608
		BUS	639	665	693	719	738
		TRUCK	1,116	1,411	1,828	2,407	3,275
		OTHERS	363	459	595	784	1,066
		TOTAL	14,986	16,832	19,453	23,257	29,623
7	Jinotega	BIKE	7,750	8,700	9,764	10,995	12,571
		PAX	4,325	4,855	5,449	6,136	7,016
		BUS	361	395	428	457	483
		TRUCK	1,367	1,656	2,031	2,540	3,249
		OTHERS	302	366	448	561	717
		TOTAL	14,105	15,971	18,121	20,689	24,036
8	Leon	BIKE	11,404	12,367	13,749	15,916	19,652
		PAX	14,709	15,951	17,734	20,529	25,347
		BUS	1,372	1,401	1,422	1,437	1,443
		TRUCK	4,113	5,042	6,371	8,256	10,952
		OTHERS	755	925	1,169	1,515	2,010
		TOTAL	32,352	35,686	40,445	47,653	59,403
9	Madriz	BIKE	2,777	3,035	3,336	3,766	4,331
		PAX	2,437	2,664	2,927	3,305	3,801
		BUS	95	100	104	108	111
		TRUCK	408	492	603	770	981
		OTHERS	208	251	308	393	500
		TOTAL	5,926	6,543	7,278	8,341	9,725
10	Managua	BIKE	70,084	80,608	93,478	110,925	137,646
		PAX	161,086	182,467	209,328	246,182	302,476
		BUS	8,355	9,198	11,138	14,403	19,419
		TRUCK	26,485	33,241	41,994	53,741	70,089
		OTHERS	4,564	5,748	7,280	9,330	12,191
		TOTAL	270,574	311,262	363,217	434,581	541,822
11	Masaya	BIKE	8,344	9,349	10,404	11,988	14,543
		PAX	10,522	11,790	13,120	15,118	18,340
		BUS	924	991	1,022	1,039	1,046
		TRUCK	1,905	2,350	2,959	3,870	5,133
		OTHERS	343	423	533	697	925
		TOTAL	22,038	24,903	28,037	32,712	39,988
12	Matagalpa	BIKE	9,261	10,122	11,329	12,908	15,064
		PAX	12,047	13,167	14,737	16,791	19,595
		BUS	997	1,044	1,104	1,162	1,211
		TRUCK	4,101	4,957	6,162	7,795	10,010
		OTHERS	799	966	1,200	1,518	1,950
		TOTAL	27,204	30,257	34,531	40,175	47,829
13	Nueva Segovia	BIKE	5,306	5,778	6,328	7,029	8,030
		PAX	3,566	3,883	4,252	4,724	5,396
		BUS	142	150	156	160	163
		TRUCK	786	938	1,140	1,423	1,813
		OTHERS	300	358	435	543	692
		TOTAL	10,100	11,107	12,312	13,878	16,094
14	Rio San Juan	BIKE	1,226	1,356	1,506	1,707	1,982
		PAX	465	514	571	647	752
		BUS	73	79	84	90	96
		TRUCK	180	214	262	330	431
		OTHERS	44	53	65	81	107
		TOTAL	1,989	2,216	2,488	2,855	3,368
15	Rivas	BIKE	10,424	11,164	12,464	14,324	16,944
		PAX	5,560	5,954	6,648	7,640	9,037
		BUS	387	392	404	415	422
		TRUCK	1,240	1,500	1,895	2,436	3,122
		OTHERS	243	294	371	477	612
		TOTAL	17,853	19,304	21,783	25,292	30,137



Code	Department	Type	2013	2018	2023	2028	2033
16	R.A.A.N.	BIKE	503	574	659	745	861
		PAX	1,573	1,792	2,059	2,328	2,691
		BUS	80	90	100	108	115
		TRUCK	426	518	657	842	1,131
		OTHERS	23	28	35	45	61
		TOTAL	2,605	3,001	3,511	4,067	4,859
17	R.A.A.S.	BIKE	1,346	1,508	1,759	2,166	2,789
		PAX	2,279	2,554	2,979	3,668	4,724
		BUS	120	130	145	168	197
		TRUCK	610	743	959	1,311	1,870
		OTHERS	73	88	114	156	223
		TOTAL	4,428	5,023	5,955	7,469	9,802
	Total	BIKE	171,920	192,368	218,819	255,979	313,462
		PAX	268,007	299,884	341,119	399,047	488,658
		BUS	17,136	18,337	20,611	24,178	29,426
		TRUCK	55,278	68,509	86,474	111,273	145,960
		OTHERS	10,724	13,291	16,776	21,587	28,317
		TOTAL	523,065	592,389	683,798	812,065	1,005,823

Source: created by JICA Study Team based on data from the MTI



## Chapter 12 Future Demand Forecasting

Using data obtained from the transport surveys carried out under this Project, the transport demand and services have been analyzed to create a database and build a transport demand model. Then applying the socio-economic frameworks for future for individual departments set out in Chapter 11 to the model, future transport demand has been forecast. The following sections present the results for each transportation mode.

### 12.1 Future Demand for Land Transport

#### (1) Vehicle trip generation and attraction

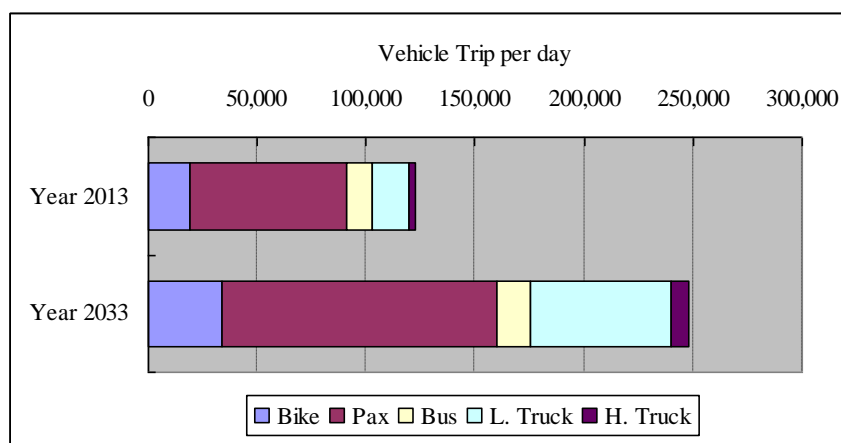
Trip generation and attraction models have been developed for land transport in terms of each type of vehicles – that is, passenger cars, buses, light trucks and heavy trucks. Then trip generation and attraction have been forecast by applying the future socio-economic frameworks to the models.

The trip generation of all vehicle types will increase by some 2.03 times from 122,000 vehicle trips/day in 2013 to 248,000 vehicle trips/day in 2033. By vehicle type, the rate for trucks is estimated to increase conspicuously, by some 3.8 times for the 20 years. The domestic traffic volume and the inflow/outflow traffic volume are estimated to increase by 2.03 times and 2.19 times, respectively, and the through-traffic volume to increase by 3.58 times, most of which will be heavy trucks. Figure 12.1.1 lists the trip generation and attraction of each vehicle type at present and in future. By region, the trip is estimated to increase substantially in the RAAN and RAAS, by 2.59 times and 2.63 times, respectively.

**Table 12.1.1 Forecasts of Vehicle Trip Generation (unit: vehicle trips/day)**

Year	Trip Type	Bike	Pax.	Bus	L. Truck	H. Truck	Total
Year 2013	Intra-Nicaragua	19,110	71,302	11,497	17,028	956	119,894
	IN and OUT Nicaragua	143	490	94	114	1,098	1,938
	Through Nicaragua	10	27	10	26	411	484
	Total	19,263	71,820	11,600	17,168	2,465	122,316
Year 2033	Intra-Nicaragua	33,641	124,947	15,613	64,215	3,760	242,176
	IN and OUT Nicaragua	260	894	139	277	2,668	4,238
	Through Nicaragua	18	50	15	97	1,551	1,731
	Total	33,919	125,891	15,767	64,589	7,978	248,145
Growth Rate(2033/2013)		1.76	1.75	1.36	3.76	3.24	2.03

Source: JICA Study Team



**Figure 12.1.1 Forecasts of Vehicle Trip Generation by Vehicle Type**

Source: JICA Study Team

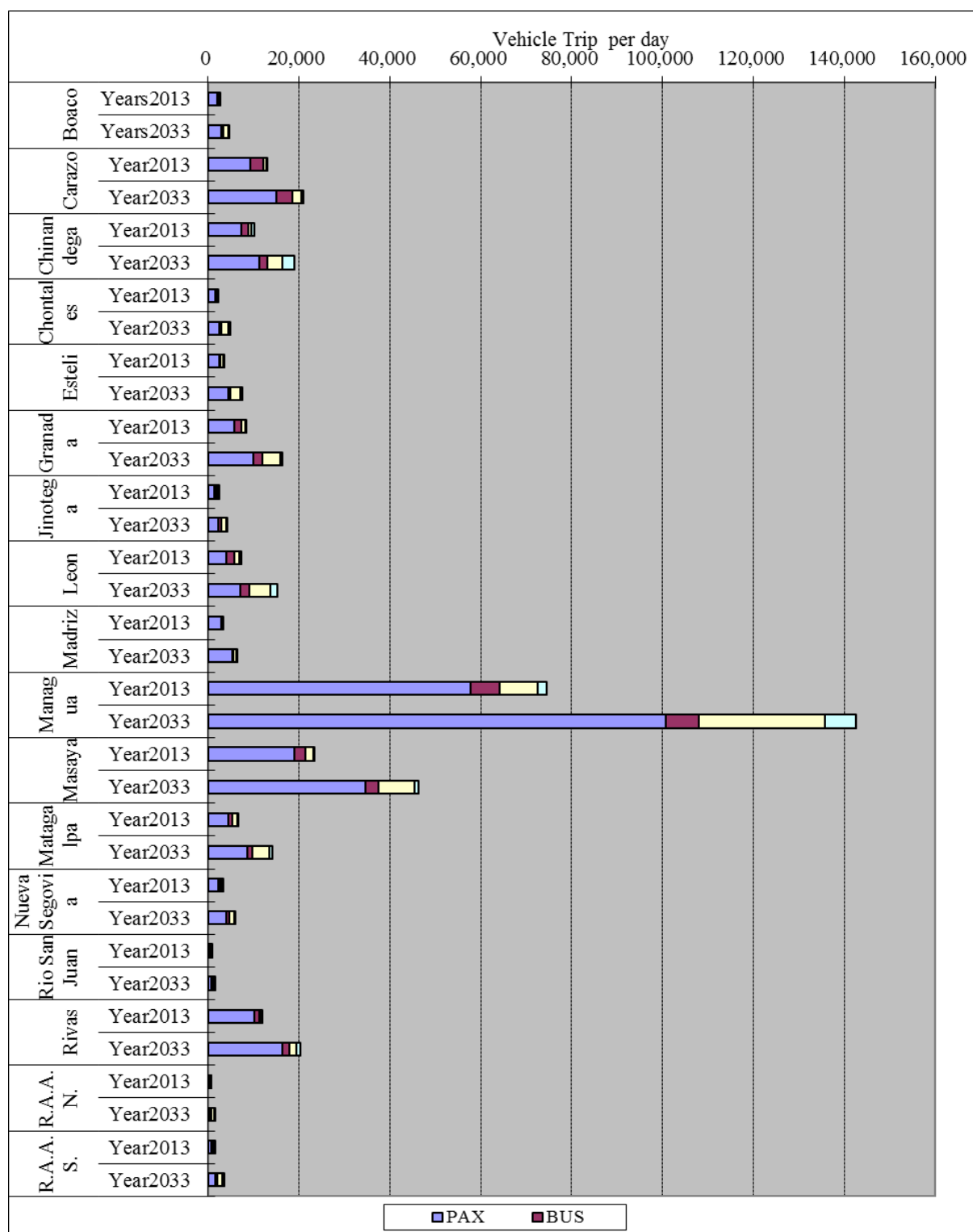
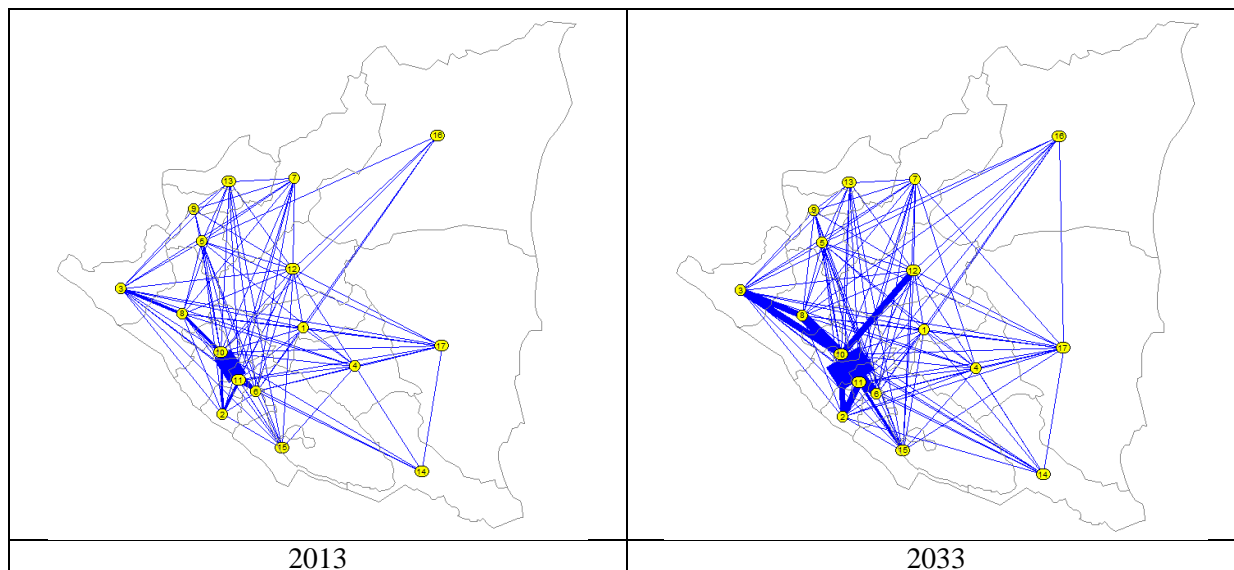


Figure 12.1.2 Forecasts of Vehicle Trip Generation by Department (2013 and 2033)

Source: JICA Study Team

(2) Future vehicle trip distribution

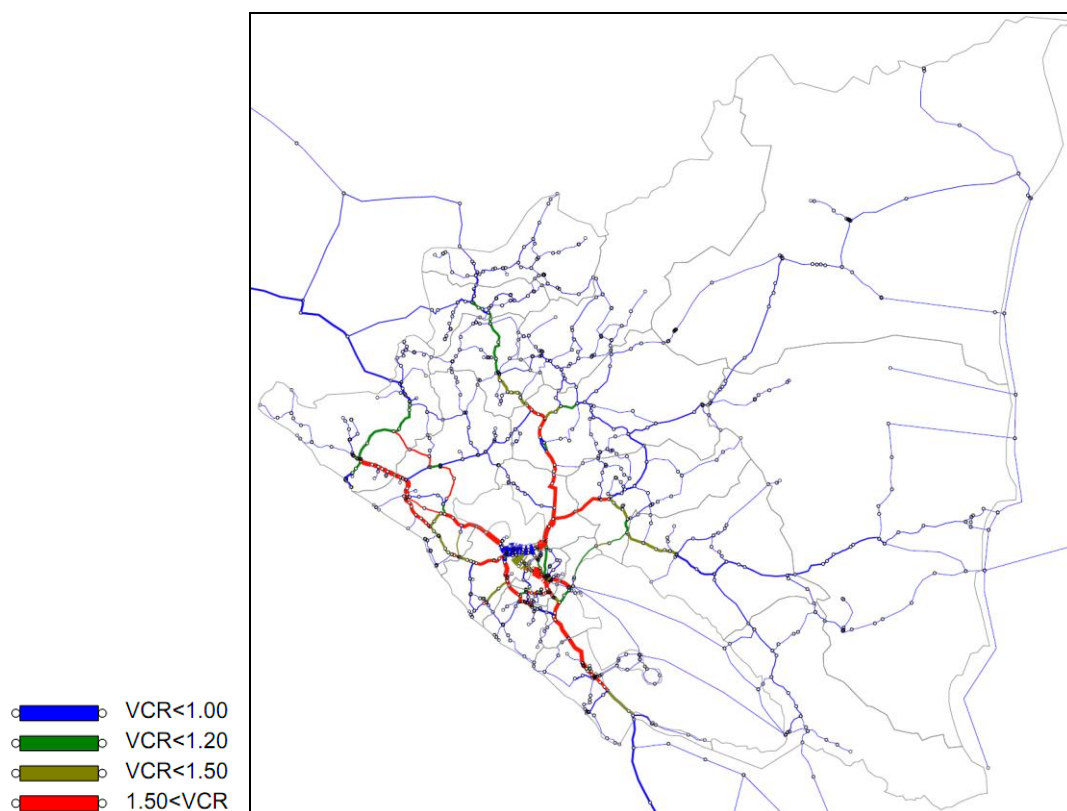
Gravity models have been developed for trip distribution in terms of each type of vehicles – that is, passenger cars, busses and trucks. Then trip distribution has been forecast by setting the distances among zones as explanatory variables. In the Do-nothing case (in which the transport infrastructure and services are as they are, rather than being developed), the volume of traffic related to Managua and mobility in the Pacific Ocean coastal areas are expected to increase substantially from 2013 to 2033.



**Figure 12.1.3 Vehicle Flows**  
Source JICA Study Team

**(3) Future road congestion**

Figure 12.1.4 shows the traffic volumes and road congestions of individual routes estimated according to the distributed traffic model of the JICASTRADA and the vehicle flow data estimated (OD table). The indicators of the entire road congestion shows that, over the 20 years between 2013 and 2033, PCU\*km and PCU\*hours will increase by 2.5 times and 3.5 times, respectively; that the average travel speed will fall from 51km/h to 37km/h; and that the quality of road services will fall. By route, the degrees of road congestion on the arterial roads connecting Managua to the capitals of the neighboring departments are estimated to be 1.5 or higher. The findings suggest the necessity of certain measures in future, such as expansions of these roads or development of bypass roads.



**Figure 12.1.4 Traffic Assignment in Do-Nothing Case 2013**

Source: JICA Study Team, Note: VCT = volume capacity ratio (traffic volume/capacity)

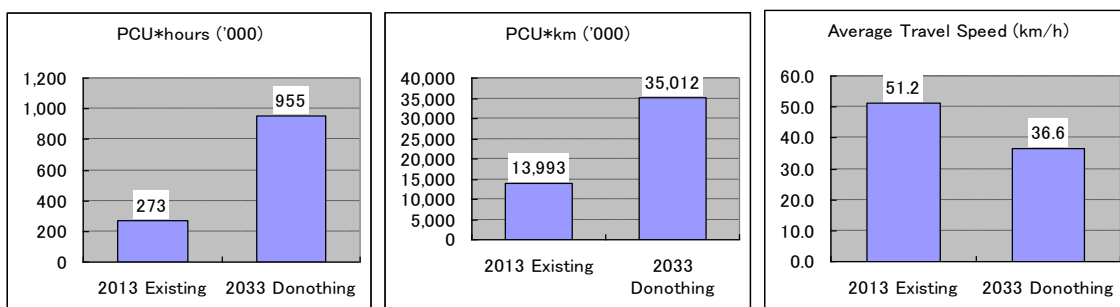


Figure 12.1.5 PCU\*km, PCU\*hours and Average Speed (the Present and Future)

Source: JICA Study Team

## 12.2 Future Water Transport Demand

The water transport demand has been forecast according to the present demand and future socio-economic frameworks obtained from the transport survey data and transport statistical data. Accordingly, the transport demand at the major ports will increase from 4,000 passengers/day in 2013 to 9,200 passengers/day in 2033: that is; an increase by 2.3 times.

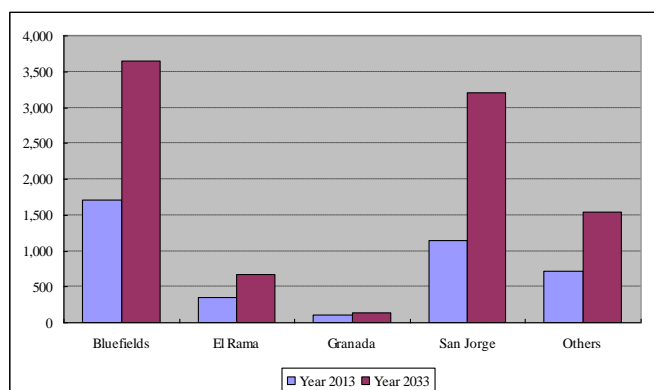
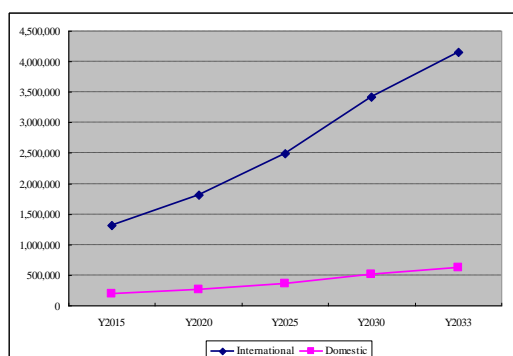


Figure 12.2.1 Water Passenger Forecast Result (2013 and 2033)

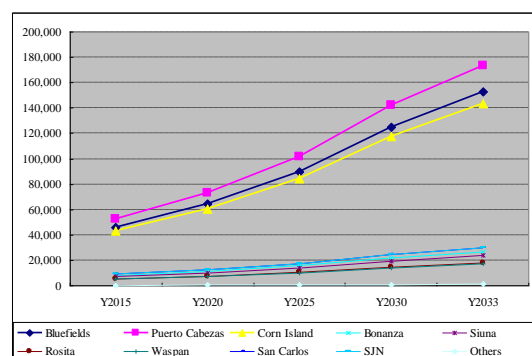
Source: JICA Study Team

## 12.3 Future Air Transport Demand

The number of international air transport passengers totaled 1.13 million per year in 2013 and is estimated to increase by some 3.7 times to 4.14 million per year in 2033. The number of domestic air transport passengers, on the other hand, totaled 163,000 per year in 2013 and increased by some 3.7 times to 622,000 per year in 2033.



(Demand for International Lines)



(Demand for Domestic Lines)

Figure 12.3.1 Air Transport Passenger Forecast (2013-2033)

Source: JICA Study Team

## Chapter 13 Transport Sector Development Strategy

### 13.1 Formulation of Transport Sector Development Strategy

The transport sector development strategy is formulated in light of the long-term development vision for 2033, as well as analyses of the present situation of the sector and forecasts of future transport demand. The transport sector development strategy comprises a vision, policy and strategy. Figure 13.1.1 illustrates the flow of examining and setting out the transport sector development strategy. Following the setting out of the strategy, the planning for individual transport subsectors, project proposals, project evaluations and planning for project implementation are to be carried out.

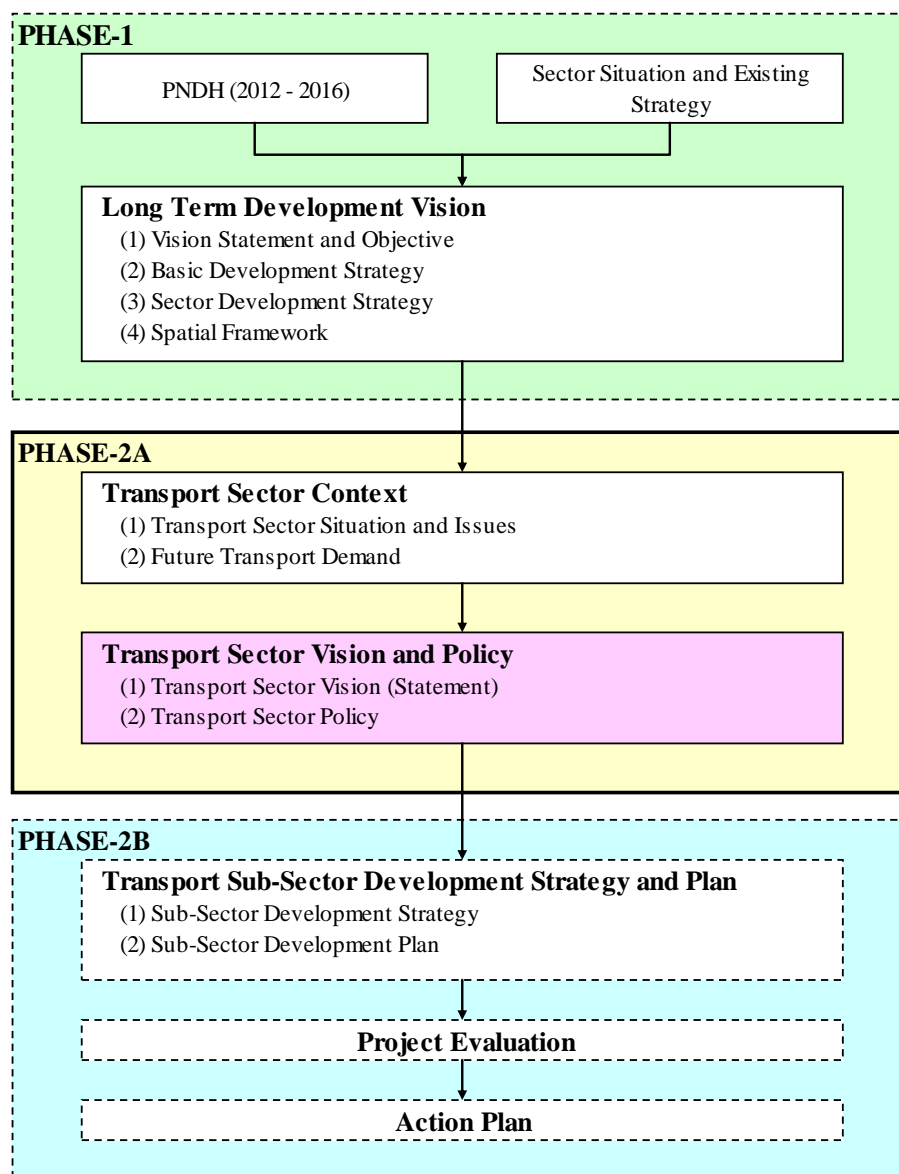


Figure 13.1.1 Process of the Formulation of Transport Sector Vision, Policy and Strategy

Source: JICA Study Team

### 13.2 Transport Sector Development Vision

Improvements in transport services and development of transport play central roles in the fulfillment of the development objectives for the economy, society and environment that are stated in the long-term development visions for 2033 in Phase-1. According to the long-term development visions, issues in the transport sector discussed and analyzed so far, and the results of forecasting of

future transport demand, the development vision and policy have been examined and formulated for the transport sector in Nicaragua.

***“Growing and Greener Transport for NICARAGUA”***

***“Provide effective, reliable, stable and fully integrated transport network and level of service, which will assist the sustainable economic growth; contribute the poverty and regional disparity reduction; improve accessibility, mobility and safety; ensure environment sustainability”***

### 13.3 Transport Sector Development Policy

The transport sector policy is designed to encourage development and efficient management of a safe, widely accessible transport system to ultimately achieve the long-term development vision and the transport sector development vision. It covers key issues related to transport infrastructure planning, development and management, legal, institutional and regulatory framework for the sector, safe and secure transport, and environmental considerations, among others. This study has set out the following five key policies as the transport sector development policy.

<b>Transport Sector Development Policy</b>	
TP-1	Secured and efficient international transport network and operation to support economic growth
TP-2	Reliable national transport network and operation to assist social and economic activity and development
TP-3	Mobile national passenger transport network and operation to assist social and economic activities
TP-4	Organized transport institution, regulation and human capacity to support transport sector development
TP-5	Greener transport system to ensure environmental resilience and tackle on climate change and natural calamity

#### (1) Relationship between transport sector vision and long term development vision

The five transport sector policies contribute to the achievement of the long term development vision, but the closeness between each transport sector policy and long term development vision is different. The following table explains the relationship between the five transport sector policy and long term development vision. The number of symbol ✓ represents the contributing closeness. The three symbols mean the closer than single symbol.



**Table 13.3.1 Contribution Matrix of Transport Sector Policy to Long Term Development Vision**

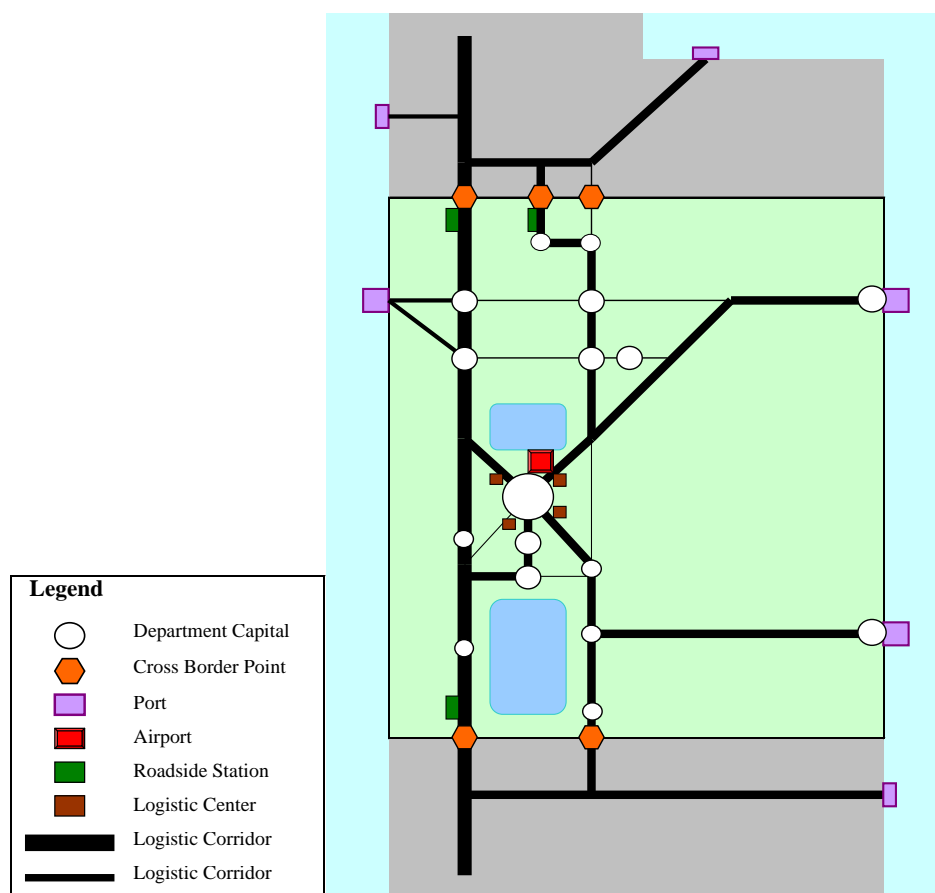
Long-term Development Vision Basic Development and Sector Strategy		Transport Sector Policy				
		TP-1	TP-2	TP-3	TP-4	TP-5
		Efficiency	Reliability	Mobility	Organization	Environment
BS-1	Economic Investment	✓✓✓	✓✓	✓	✓	✓
BS-2	Economic Opportunity	✓✓✓	✓✓✓	✓✓	✓	✓
BS-3	Economic Efficiency	✓✓✓	✓✓✓	✓	✓	✓
BS-4	Economic Solidarity	✓	✓✓✓	✓✓✓	✓	✓
BS-5	Social Redistribution	✓	✓✓	✓✓✓	✓	✓
BS-6	Social Equality	✓	✓✓	✓✓✓	✓	✓
BS-7	Governance	✓	✓	✓	✓✓✓	✓
BS-8	Environment Resilience	✓	✓	✓	✓	✓✓✓
SV-1	Agriculture	✓✓✓	✓✓✓	✓	✓	✓
SV-2	Tourism/ Service	✓	✓	✓✓✓	✓	✓
SV-3	Mining / Energy	✓✓✓	✓	✓	✓	✓
SV-4	Trade/ Industry	✓✓✓	✓	✓	✓	✓
SV-5	Education		✓✓✓	✓✓✓		
SV-6	Health		✓	✓✓✓		✓✓✓

Source: JICA Study Team

**(2) TP1: Secured and efficient international transport network and operation to support economic growth**

This policy focuses on improving inter-regional transportation and logistics systems to assist Nicaragua's target of sustainable economic growth where the role of appropriate investment is crucial. The country is bordered by two oceans and relies on other countries' systems for its global logistics because of poor road infrastructure, and underdevelopment of border facilities, international ports and other logistics bases. To address the above constrains, the following directions should be pursued:

- Improvement of international logistic corridors by strengthening links to local production areas, markets and international gateways to support growth of the economy
- Development of international gateway at the Atlantic Ocean and building of multi-modal transport networks that systematically connect ocean transport to land transport so as to enhance competitiveness of Nicaraguan products at international markets and reduce logistics costs
- Improvement of the facilities and operations at cross border points to reduce economic cost
- Development of logistic centers to build seamless logistic chains



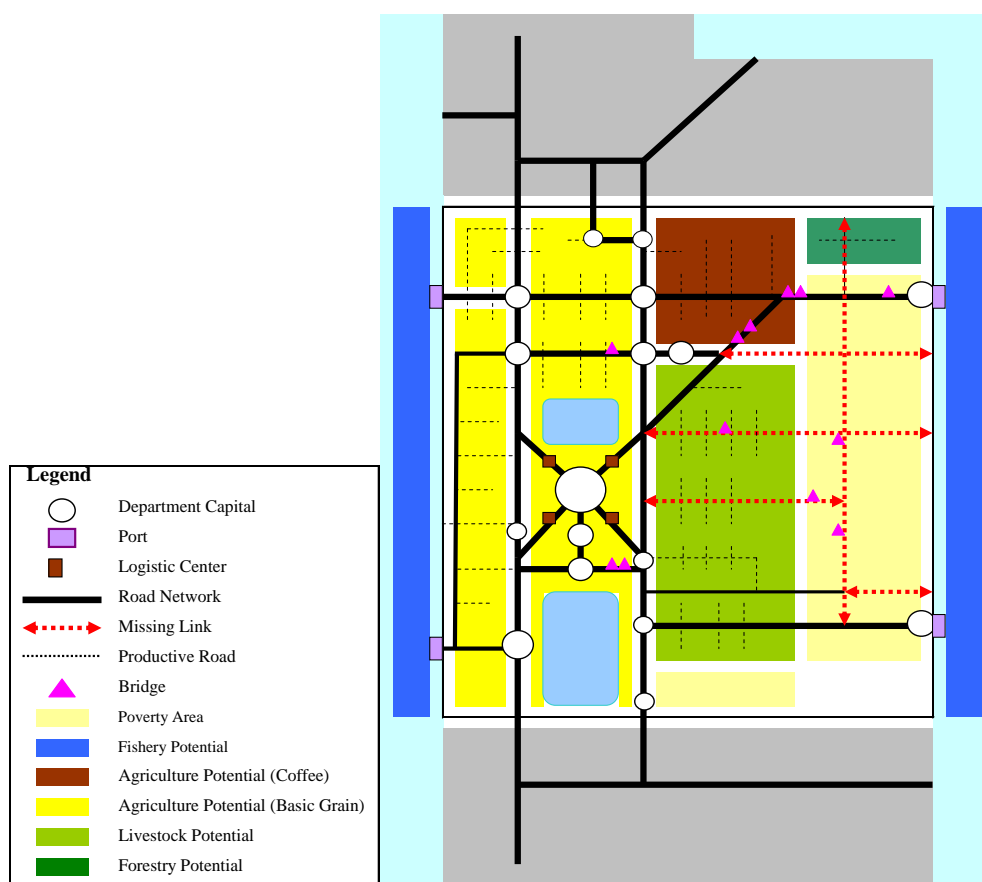
**Figure 13.3.1 Conceptual Image of Transport Sector Policy TP-1**

Source: JICA Study Team

**(3) TP2: Reliable national transport network and operation to assist social and economic activity and development**

This policy targets the improvement of economic and social activities enabling redistribution of wealth and thus poverty reductions and correction of regional disparity. The land transport is an integral part of the transport system, which should be essential for the efficient functioning of the Nicaraguan society and economy but are underdeveloped, so the Caribbean seacoast areas are still obliged to rely on water transport. Thus, for balanced vitalization of society and economy, development of a transport sector that can enhance the regional collaboration is essential. In view the above, the following directions should be taken into account under this policy:

- Improvement of road networks connecting production areas to markets and trunk corridors in order to improve the productivity of areas that have potentials for development and also assist their economic activities.
- Construction of a new land transport system involving poor and isolated areas in order to reduce poverty and regional disparity.
- Promotion of construction and improvement of disaster-resistant transport infrastructures and bridges along the trunk roads in order to offer stable transport and logistic services



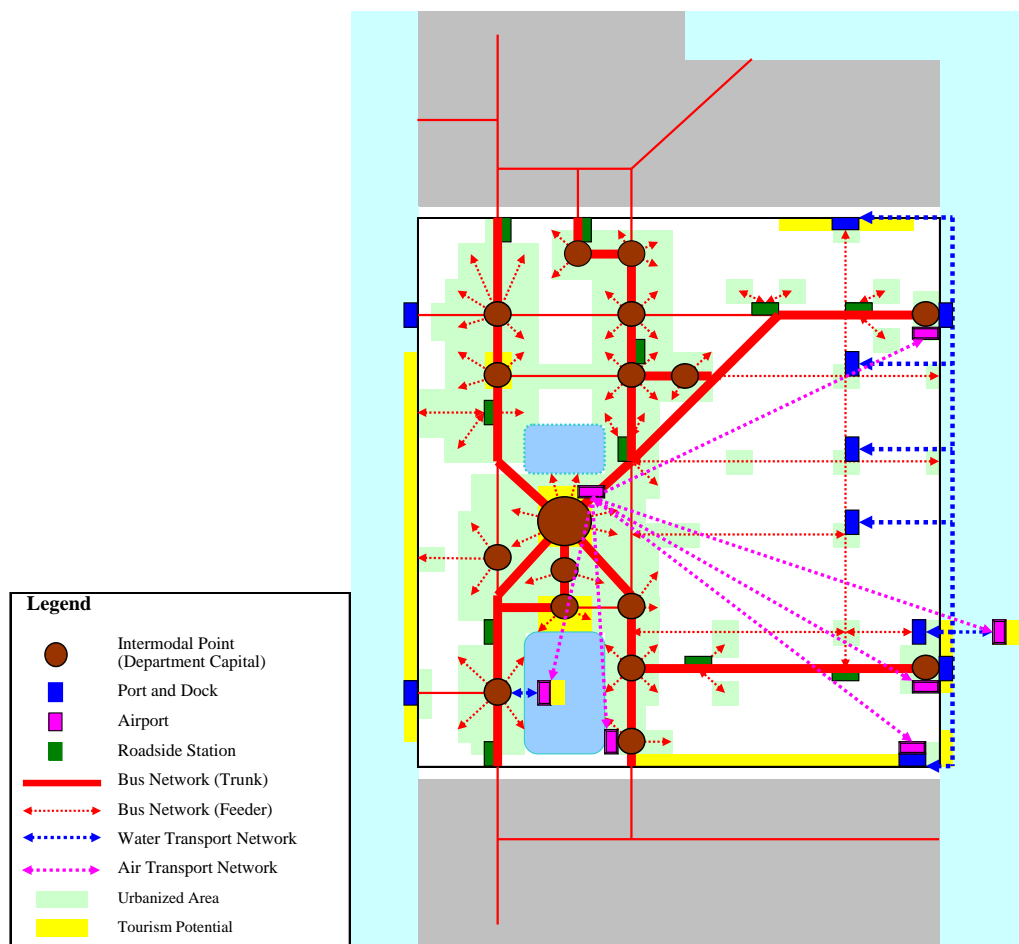
**Figure 13.3.2 Conceptual Image of Transport Sector Policy TP-2**

Source: JICA Study Team

**(4) TP3: Mobile national passenger transport network and operation to assist social and economic activities**

The central theme of this policy is the development and delivery of an attractive public transport system in all the transport modes; that is, land, water and air transport. Public transport is essential for business, education, healthcare, social activities, tourism and various other social and economic activities of the country. The objective here is to develop a public transport system that can support these activities and thus contribute to the development of the country. Such a public transport system must also be attractive, comfortable, easy to use for anyone and integrated. In view the above situation, the following directions should be taken into account under this policy:

- Improvement of public land transport networks supporting social activities
- Improvement of water passenger transport networks and services contributing to poverty reductions and correction of regional disparity
- Improvement of air passenger transport networks and services promoting the tourism sector development and business activities
- Development and improvement of bus terminals, roadside stations and other places that can serve as interconnections of different transport modes in order to build a multi-modal transport system



**Figure 13.3.3 Conceptual Image of Transport Sector Policy TP-3**

Source: JICA Study Team

**(5) TP4: Organized transport institution, regulation and human capacity to support transport sector development**

Improvements of the capacity of various institutions in managing the entire transportation system (road, port, airport and cross border point) of the country are critical to ensure that each mode is operating at its optimum. The ability to come up with development and emergency plans in times of national disaster also depends on the capacity of these institutions. Linked to this institutional capacity issue is a subject related to the skills of personnel undertaking operation and administrative actions that keep the transportation system running. Further, realistic budget that commensurate to the activities in a plan is also an issue that needs to be addressed. Moreover, coordination at the ministry-level, ministry-municipality level and other stakeholders in transport sector needs a serious assessment to eliminate information disparity and to foster closer collaboration. In view the above issues, the following directions should be taken into account:

- Strengthening of the capacity of transport-related organizations so that they will be able to carry out their undertakings
- Improvement of necessary skills of personnel in the transport sector
- Strengthening of mutual adjustment and coordination among key players (at the ministry-, ministry- and public-private sector levels) in the transport sector
- Creation of a framework prompting the private sector to participate in transport infrastructure development

**(6) TP5: Greener transport system to ensure environmental resilience and tackle on climate change and natural calamity**

There are three main driving factors for this policy. First, Nicaragua has many nature reserve areas

for wild animals and natural vegetation. Second, it is in an area with a high seismic risk and has in fact suffered from large earthquakes. And third, it is highly exposed to threats of natural disasters and impacts of climate change. In view of awareness of the above facts and to effect the above policy, shaping of transport system has to take the following:

- Strengthening of an environment-friendly transport system that can effectively handle mass commuting
- Development of a multi-modal transport network system that takes full advantage of extensive natural resources including rivers and lakes
- Development of transport infrastructures that can respond to impacts of climate change and thus has strength to recover environment, and that are also resistant to disasters

## **13.4 Transport Subsector Development Strategy**

### **13.4.1 Road Transport Sector and Logistics Development Strategy**

#### **13.4.1.1 Development Policy for Road Transport Sector and Logistics**

The international freight traffic volume is predicted to increase at around 2.8 times of present volume or increase constantly at 5.3% for the coming 20 years. However, this requires, for example, the enhancement of the capacity of harbors to handle cargos, improvement of customs clearance facilities at the borders, physical development including construction of international ports on the Atlantic Ocean coast, development of the relevant legal system, development of the administrative organizations, and human resources development.

#### **13.4.1.2 Improvement of Freight Transport Corridor and the Capacity of Logistics Services**

##### **(1) Basic development strategy**

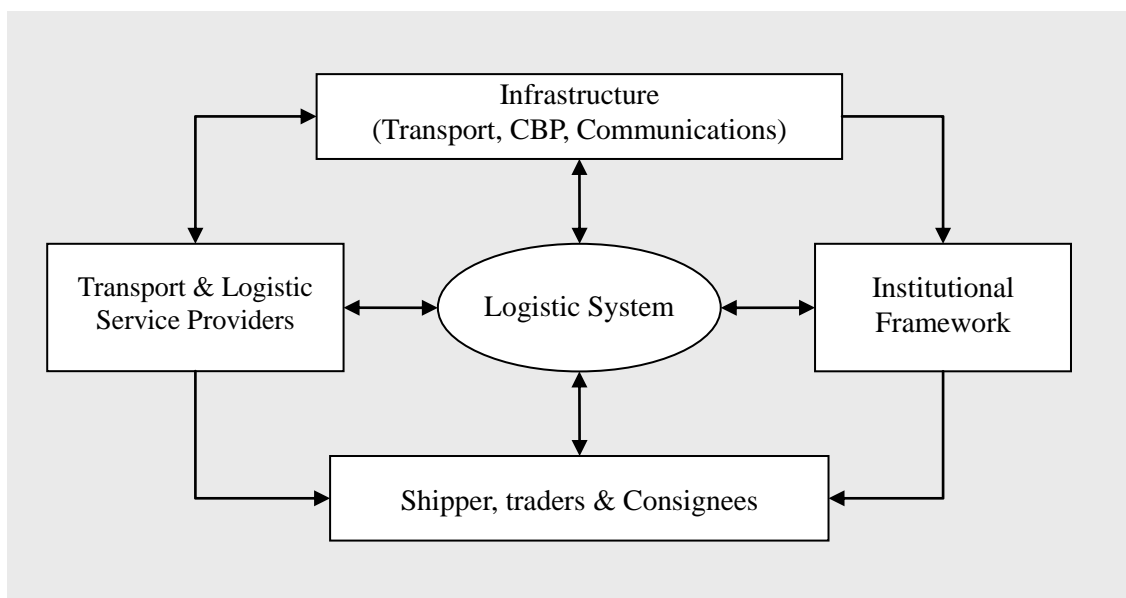
The improvement of logistics services, together with communication technologies developed, has revolutionized production and distribution processes, and has created the “global” market. It is within this competitive environment that shippers and consignees require efficient logistics services that can move their goods at the right place, at the right time, in the right condition, and at the right price. It is, therefore, highly important that regional linkages among neighboring countries are strengthened in the Central American Region to facilitate trade among the countries in this region and develop logistics for better access into the “global” market. Improving logistics in the Central America can provide a foundation for further economic integration. However, for many countries in Central America inadequate transport infrastructure and high logistics service costs have constrained economic corridor development and integration of the region. Physical connectivity between neighboring countries is fair at present because of Pan American Highway that run through all countries of the Central American region although its capacity is anticipated to be insufficient to meet with growing traffic volume.

The improving infrastructure, coupled with expanded cross-border cooperation among the countries of Central America, will accelerate the integration of the region’s transport corridors. A regional logistics system is composed of:

- i) Shippers, traders, and consignees;
- ii) Transport and logistics service providers;
- iii) Policies, and rules of regional and national institutions; and
- iv) Transport, CBP and communications infrastructure.

Figure 13.4.1 shows how these four components combine to determine the performance of each part of the logistics system which is measured in terms of cost efficiency, responsiveness, reliability, traceability and security. The sum of all these factors will determine the competitiveness of the region’s logistics system in general and the country’s logistic system in particular. Logistics development policy is the process of planning, facilitating, implementing, integrating, and controlling the efficient and effective flow and storage of freight, and movement of people and

information within and between logistics systems to enhance traders' competitiveness in order to increase national and/or regional competitive advantage.



**Figure 13.4.1 Four Components of Logistics Subsector**

Source: JICA Study Team

## (2) Corridor development

Transport corridors physically link areas in a region, whereas economic corridors integrate economic activities in a region. The purpose of a transport corridor is to physically link areas that were not previously connected in a country or region. A logistics corridor focuses not only on the physical connection but also on how the flow and storage of freight and movement of people are optimized in the corridor.

In a logistics corridor, the institutional framework takes a leading role in facilitating movement and storage within the corridor. Border crossings are usually the bottleneck in logistics corridors. However, the efficiency of a logistics corridor is determined by the weakest part of the corridor, so border crossings must be dealt with from a holistic perspective.

In an economic corridor, economic development will not be solely concentrated in the large cities located along the transport corridor. Investment and economic development will need to go to smaller towns and rural areas along the corridor. Investment and economic development must be extended to smaller cities and underdeveloped areas of the corridors. The success of an economic corridor will depend on its ability to attract investments. Attracting investment, in turn, relies on appropriate infrastructure and policies to facilitate the movement of people and goods.

Table 13.4.1 Definitions of Corridor Development Levels lists various forms of corridors in terms of development stage. The major corridor in Nicaragua is the transport corridor along the Pacific Ocean coast, which must be developed on to Level 4 to meet the increasing transport demand and promote continuous economic development.

**Table 13.4.1 Definitions of Corridor Development Levels**

Stage	Forms of corridor	Definition
Level 1	Transport Corridor	Corridor that physically links an area or region
Level 2	Multimodal Transport Corridor	Corridor that physically links an area or region through the integration of various modes of transport
Level 3	Logistics Corridor	Corridor that not only physically links an area or a region but also harmonizes the corridor institutional framework to facilitate the efficient flow and storage of freight, and movement of people and related information
Level 4	Economic Corridor	Corridor that is able to attract investment and generate economic activities along the less-developed areas in the region. Physical

		linkages and logistics facilitation must be in place in the corridor as a prerequisite
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Source: JICA Study Team

### (3) Freight transport and logistics system development strategies

The strategies for the development of freight transport and logistics subsector are as follows:

- **Strategy-1 (SL-1):** Upgrading the level of north-south transport corridor to Level-4.
- **Strategy-2 (SL-2):** Developing the inter-oceanic transport corridor connecting both Pacific Ocean and Caribbean Sea coasts to lessen the dependency of seaports of neighboring countries thereby increasing the freight transport efficiency in terms of cost and time.
- **Strategy-3 (SL-3):** Upgrading the inter-oceanic transport corridor to the Level-4 Economic Corridor in a shortest possible timeframe.
- **Strategy-4 (SL-4):** Improving the Cross-border Trade Infrastructure (CBTI) in parallel with the establishment of Cross-border Trade Agreements (CBTA) among countries composing Central America.
- **Strategy-5 (SL-5):** Enhancing the human resources development related to logistics administration, management and operation in both public and private sectors
- **Strategy-6 (SL-6):** Developing the logistics center at strategic location in Managua where the freight transport particularly concentrates aiming at managing the consolidation of LCL and support backhaul freighters for transporters

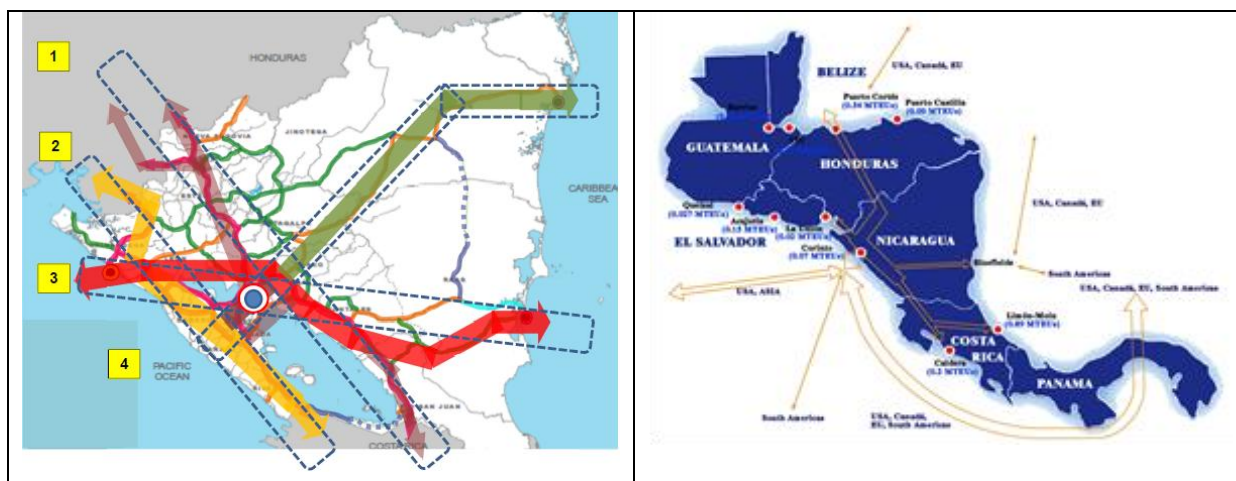
#### 13.4.1.3 Identification of Transport Corridors in Nicaragua

Based on the result of analysis on the trade data of Nicaragua, it became clear that the major transport routes for international and regional trade are composed of four (4) corridors as follows:

1. **The Pacific Corridor:** traversing along the Pacific coastal area between Guasaule CBP on the border with Honduras with the major port of Nicaragua along the Pacific coast, namely the Corinto Port, connecting to Managua. The Pan American Highway forms a southern part of this corridor;
2. **The Atlantic Corridor:** traversing the inner part of the Pacific coast area between Las Manos CBP in Nueva Segovia Department / El Espino CBP in Madriz Department on the border with Honduras and San Ranchos CBP in RAAS on the border with Costa Rica. The Pan American Highway forms a northern part of this corridor;
3. **The Central Corridor:** connecting with the Puerto Corinto in Chinandega Department along the Pacific Coast and El Rama in RAAS. The road linking between the Atlantic Corridor and Bluefields city has been under construction and is expected to be completed by the end of 2014. If the new international port at the Atlantic coast is realized, then this corridor would play an important role to rationalize the international transport pattern especially to and from the countries located at the Atlantic side; and
4. **The Northern Corridor:** connecting with the central Pacific coastal area and Port Bilwi in RAAN. The conditions of the road linking between Puerto Cabezas, a core city of RAAS located along the Atlantic coast, is quite bad and requires a massive road works to complete linkage between the Atlantic coast side and the capital city Managua.

The Pacific Corridor has not only been regarded but functioned as the major regional transport corridor and constituted a backbone of Nicaragua's economy as well as its regional trade. The other corridors that are identified have been still in the initial stage however these corridors link major gateways of Nicaragua at present although they were somewhat new and remained at an infant stage.

Figure 13.4.2 illustrates conceptual image of the routes of these international transport corridors of Nicaragua at present. However, the Central and Northern corridor has not taken their shape yet as both ports located at the Atlantic coast side namely the Arlen Siu Port en El Rama and the Bilwi Port of Puerto Cabezas have not been fully developed yet.



**Figure 13.4.2 Present International Trade Cargo Traffic Pattern and Potential Transport Corridors of Nicaragua**

Legends: Atlantic Corridor, 2) Pacific Corridor, 3) Central Corridor, 4) Northern Corridor

Notes:

- 1) The widths of arrows shown in orange color are not scale of the annual cargo traffic volume in 2010.
- 2) Base map on the right side is of International Maritime Organization

Source: JICA Study Team

### 13.4.2 Road Transport (Road Transport and Facilities) Sector Development Strategy

#### 13.4.2.1 Identified Improvement Measures for Road Transport Sector

The present and future problems and improvement measures discussed in Chapter 8 are summarized as follows:

**Table 13.4.2 Present Problems and Improvement Measures**

Present and future problems of road transport sector	Proposed Improvement Measures
<b>1. Poor Road Network Problems</b> 1.1 Missing access roads 1.2 Lack of bridges connection 1.3 Vulnerability to disaster (flood and landslide)	<b>1. Road network improvement</b> 1.1 Construction of new roads 1.2 Construction of new bridges 1.3 Rehabilitation of road facilities including road surface
<b>2. Insufficient road traffic capacity (traffic congestion)</b> 2.1 Traffic congestion on gateways to major cities  2.2 Environment problems by passing heavy trucks	<b>2. Road traffic capacity improvement</b> 2.1.1 Construction of new roads and bypass 2.1.2 Widening of existing roads 2.2 Introduction of traffic regulations (truck-ban system)
<b>3. Insufficient road service level</b> 3.1 East-west corridor in principal road network 3.2 Access roads in eastern region	<b>3. Road upgrading to required standard</b> 3.1/3.2 Improvement of pavement structure 3.1/3.2 Replacement of temporary, damaged and decrepit bridges 3.1/3.2 Widening of existing roads (if required)
<b>4. Road in poor condition</b> 4.1 Deterioration of road surface pavement  4.2 Vulnerability to flood 4.3 Vulnerability to landslide 4.4 Temporary, damaged and decrepit bridges	<b>4. Road rehabilitation</b> 4.1 Pavement rehabilitation (especially, access roads to areas with industrial potentials) 4.2 Improvement of drainage structures 4.3 Slope protection 4.4 Repairing of damaged and decrepit bridges and replacement of temporary bridges
<b>5. Road maintenance works problems</b> 5.1 Poor equipment of road maintenance 5.2 Insufficient budget of road maintenance 5.3 Vulnerability to disaster	<b>5. Enhancement of road maintenance system</b> 5.1 Replacement and repairing of equipment 5.2 Development of new funding mechanism (fare system) 5.3 Improvement of disaster management system



Present and future problems of road transport sector	Proposed Improvement Measures
<b>6. Insufficient road safety</b> 6.1 Insufficient facilities for road safety 6.2 Weak function of CONASEV 6.3 Insufficient data base of traffic accidents 6.4 Insufficient road safety education	<b>6. Improvement of road safety system</b> 6.1 Installation of road safety facilities 6.2 Practical realization and enhancement for CONASEV 6.3 Introduction of traffic accident monitoring system 6.4 Introduction of effective road safety education

Source: JICA Study Team

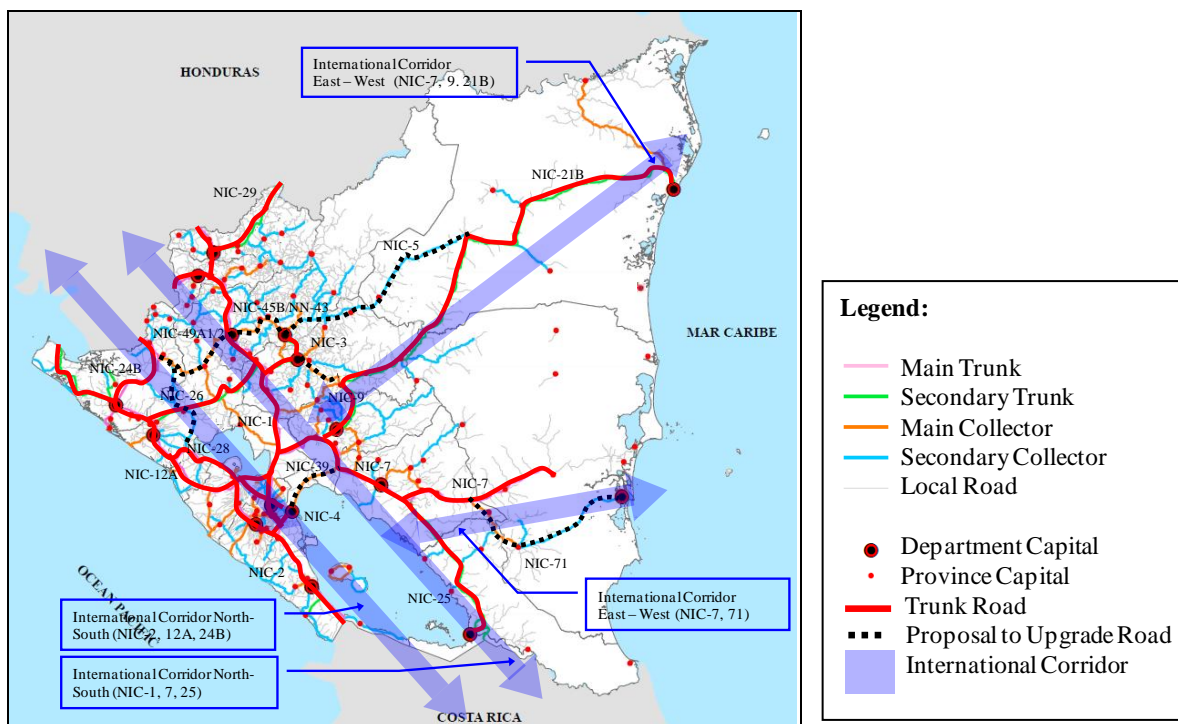
### 13.4.2.2 Road Transport (Road Transport and Facilities) Sector Development Strategy

Based on the analysis of road condition survey and the existing MTI Road Development Plans and the Transport Sector Development Vision and Policy, a road network and infrastructure development plan will be proposed. An appropriate and systematic road network and infrastructure development plan is essential for stable and reliable road network and road function that can ensure sustainable growth in the national economy and reductions of the east-west regional disparity. The following strategies for the road network and infrastructure development plan to achieve this policy are established:

- Strategy 1 (RS-1): Enhancement of Principal Road Network and International Corridors
- Strategy 2 (RS-2): Support of Access to Regional Economy Development
- Strategy 3 (RS-3): Improvement of Gateways around Main City Centers
- Strategy 4 (RS-4): Enhancement of Road Function against Vulnerability to Disaster
- Strategy 5 (RS-5): Enhancement of Road Maintenance System
- Strategy 6 (RS-6): Sustainable Road Safety

#### (1) Strategy 1 (RS-1): Enhancement of Principal Road Network and International Corridors

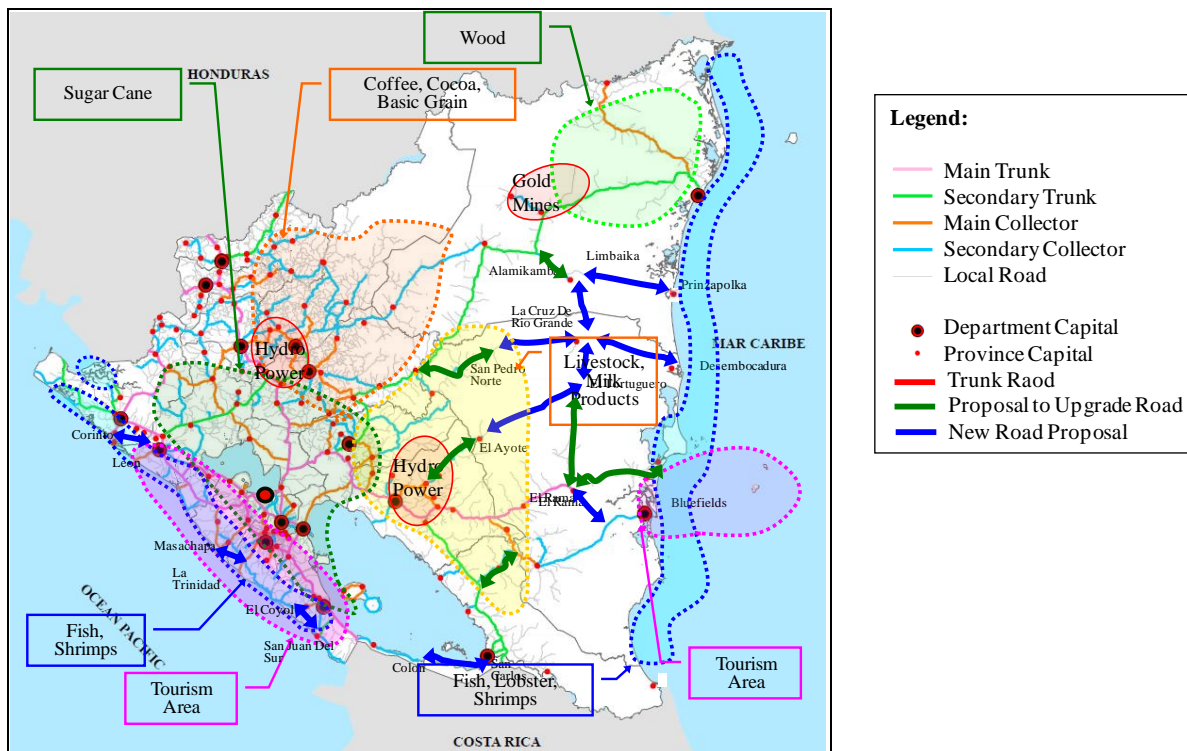
The existing road network in the eastern region of the country is significantly less developed than that in the western region, so the development of the east-west road axis is delayed. For the development of the coastal areas in the eastern region (international cargo port, tourism resources and fisheries resources) and the formation of the trunk road networks connected to the western region, the road standards of the axis will be upgraded as an international corridor, and access to major cities, the bases of regional economic activities, will be made better (See Figure 13.4.3). The north-south international corridor and east-west international corridor should be strengthened in order to correspond with the service level and quality of Mesoamerica Corridor Network in Puebla Panama Plan.



**Figure 13.4.3 Proposed Function of Principal Road Network and International Corridors**  
 Source: JICA Study Team

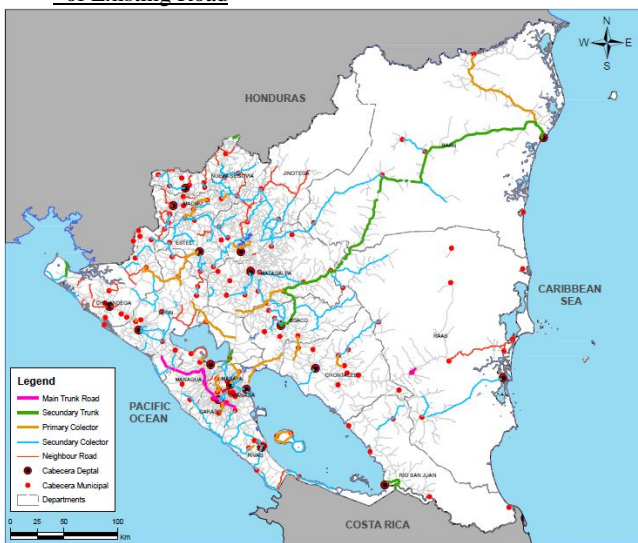
**(2) Strategy 2 (RS-2): Support of Access to Regional Economy Development**

The trunk road network links to the capitals of all the departments, while road accesses to municipal capitals are mainly provided by collector roads. Some 70% of collector roads are unpaved, which is detrimental to the regional economy development. The condition of these roads will require timely and adequate rehabilitation in the future if deterioration continues. In addition, there are missing road links in eastern Nicaragua to access important centers and economic activities. It is necessary that new access roads to the municipal capitals will be developed in order to engage the access transport service. There are currently bridges in poor condition due to several vulnerabilities such as road missing link at river crossing, temporary bridge, damaged bridge and aging bridge. It is necessary to improve the accessibility to high development potential areas and to support accessibility to underdeveloped eastern region for reduction of poverty and regional economic disparity. In this context, the future road network in Nicaragua will be established to improve connectively for national road network with productive potentials.

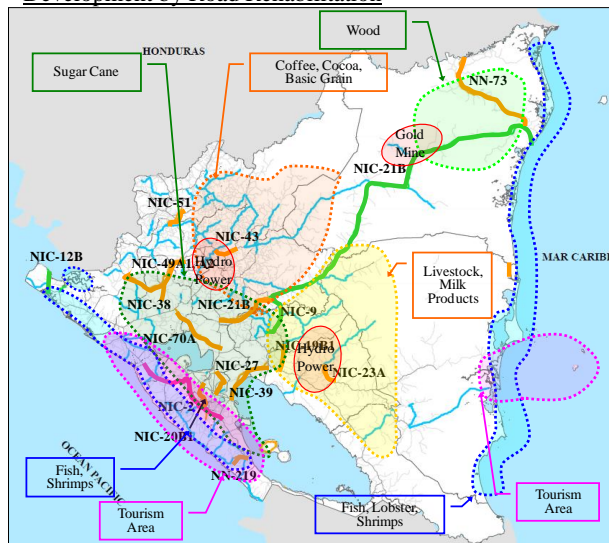


**Figure 13.4.4 Road Network Coverage and Access to Regional Economy Development**  
 Source: JICA Study Team

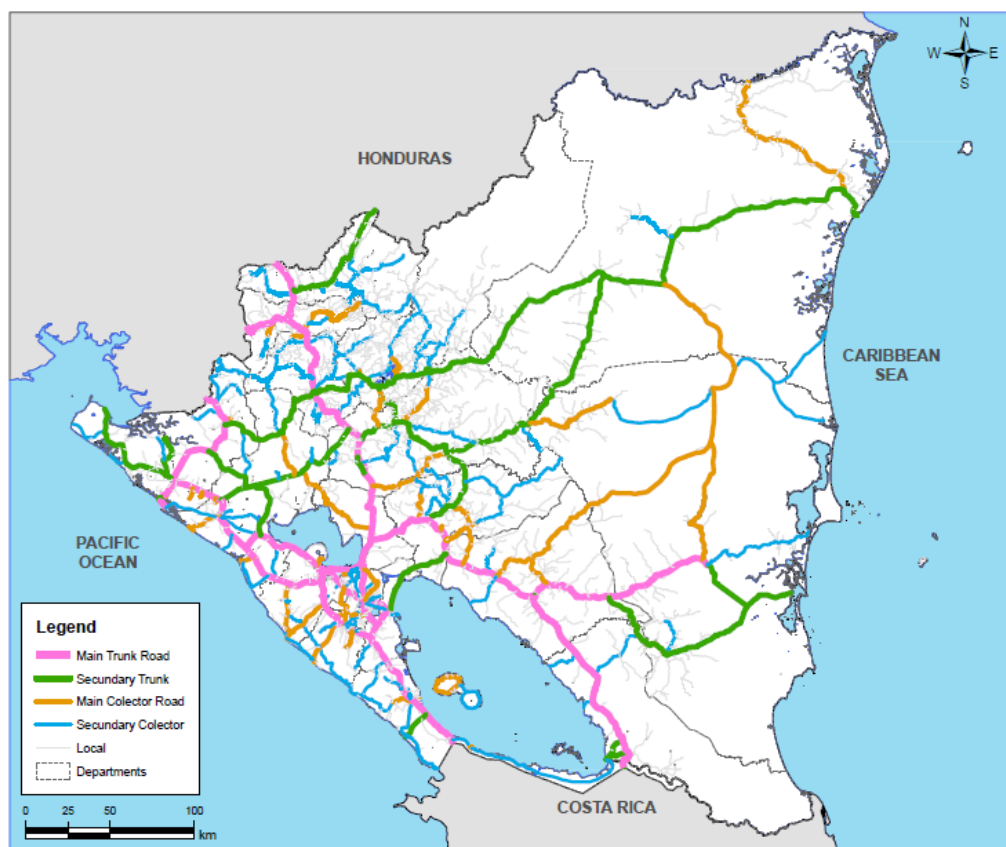
(1) Segments of Poor/Fair Road Surface Condition of Existing Road



(2) Segments on Road Accesses to Regional Economy Development by Road Rehabilitation



**Figure 13.4.5 Proposed Improvement of Road Surface Pavement**  
 Source: JICA Study Team

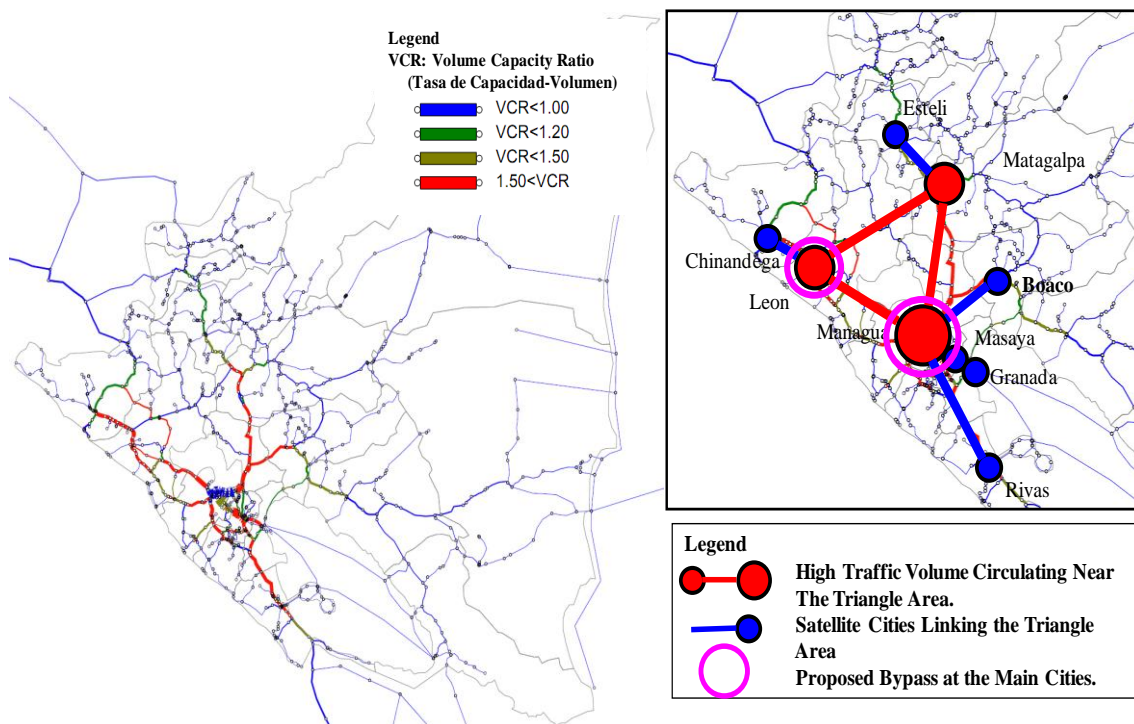


**Figure 13.4.6 Proposed Future Road Network by Functional Classification**

Source: JICA Study Team

### (3) Strategy 3 (RS-3): Improvement of Gateways around Main City Centers

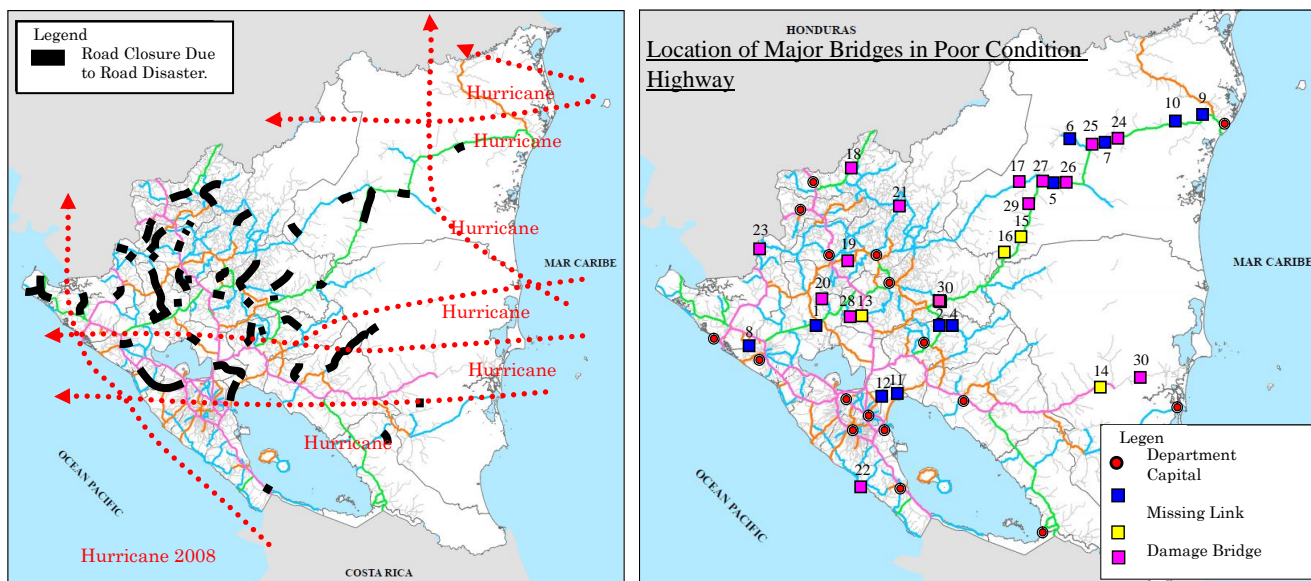
Based on the estimated future traffic volume (Year 2033) in case of “Do-Nothing”, traffic congestion will become very severe on north-south corridor Managua-Matagalpa-Leon-Rivas. The traffic capacity of congested segments in north-south corridor will be increased by 4-lane widening to reduce congestion in middle and long terms. At the same time, for environment and alleviation of traffic congestion, a Truck Bank System will be introduced, whereby heavy freight vehicles are banned from entering city areas.



**Figure 13.4.7 High Traffic Volume Projected on Major North-South Corridor**  
Source: JICA Study Team

**(4) Strategy 4 (RS-4): Enhancement of Road Function against Vulnerability to Disaster**

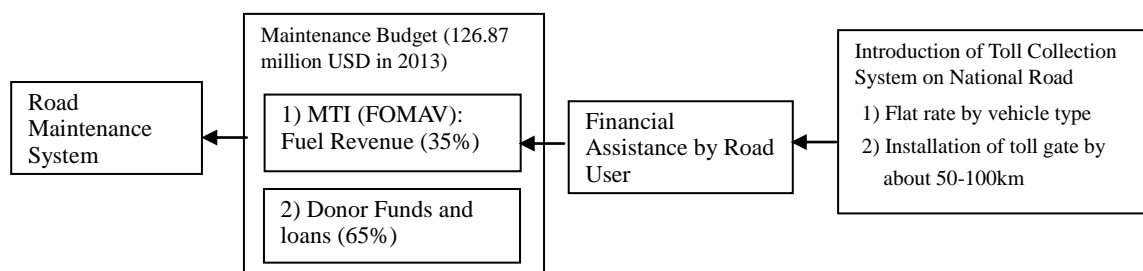
The present national roads are frequently closed due to disasters such as flood and landslide in the rainy season. Thus a disaster management system will be introduced to vulnerable parts of major roads. In addition, the missing links at river crossing were caused by collapsed bridges due to decrepitude or natural disasters of hurricane. And there are damaged bridges and the temporary bridges are mostly located in secondary trunk road, main collector and secondary collector because the structures of these bridges are not resistant enough to natural disasters. For smooth operations of passenger and freight transport and provision of better services for regional industries and community lives, these bridges will be repaired and new bridges constructed.



**Figure 13.4.8 Vulnerability of Road Facilities to Disaster**  
Source: JICA Study Team

**(5) Strategy 5 (RS-5): Enhancement of Road Maintenance System**

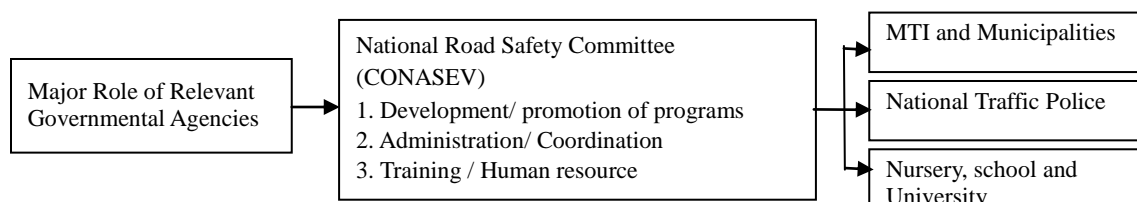
Road maintenance has been a key factor to prolong the road life. The lack of road maintenance has caused the road deterioration. At present, COERCO is in charge of maintenance of roads and bridges. Although most pieces of road maintenance equipment are in bad condition and needs to be repaired, repair is neglected because of a shortage of budget, interfering with road repair works. The road maintenance and management cost has been increasing year after year, so the MTI is obliged to use most of the revenue from fuel tax on the maintenance. To make up for the shortage of the MTI revenue, a new fund-raising mechanism will be established, which asks road users to make financial contributions.



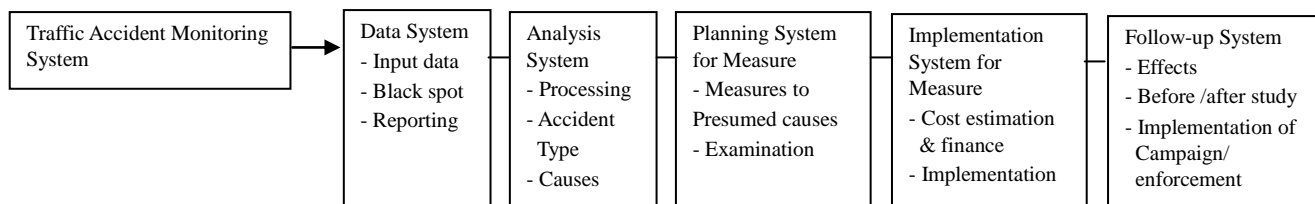
**Figure 13.4.9 Introduction of Toll Collection System on National Road**  
Source: JICA Study Team

**(6) Strategy 6 (RS-6): Sustainable Road Safety**

Road safety is a multidimensional social problem involving many government agencies, so that the central government must play a leading role in initiating, organizing and coordinating on road safety problems in a country. However, the present CONASEV takes no specific actions. Because road safety activities are insufficient in any part of the country, the organizational strength and activities of the CONASEV will be enhanced and improved. To combat traffic accidents, at the same time, the educational scheme for traffic safety addressed to not just drivers and operators but also pedestrians will be improved by introducing a traffic accident monitoring system, which comprehensively covers database, analysis, countermeasures, education, and analysis on the effects.



**Figure 13.4.10 Sustainable Organization for Road Safety**  
Source: JICA Study Team



**Figure 13.4.11 Introduction of Traffic Accident Monitoring System**  
Source: JICA Study Team

**13.4.3 Land Transport (Passenger Transport) Sector Development Strategy**

**(1) Land Transport (Passenger Transport) Sector Development Strategy**

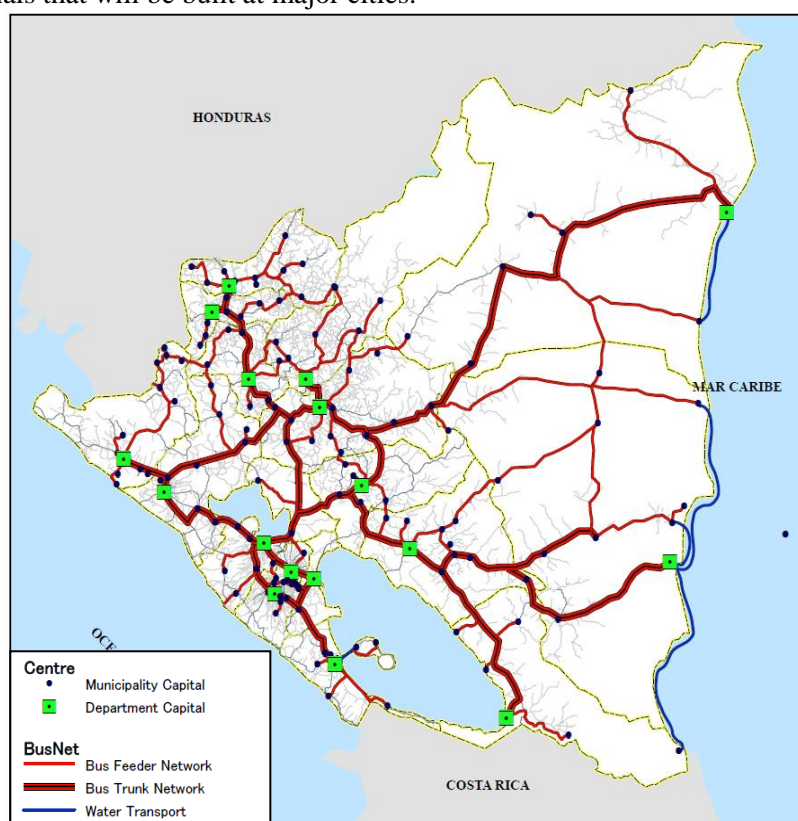
The basic principle for the land transport sector development strategy has been set out as “to strengthen land transport services by developing the supply and rules in response to an increase in

traffic demand, thereby contributing to the economic growth of the country and establishing safe and easy-to-use services". Specific measures to realize this strategy are:

- Bus routes across the country will be efficiently operated and coordinated.
- Roads passable throughout the year including the rainy and dry seasons will be constructed.
- Liaisons between land transport and other transport modes will be established.
- A vehicle inspection scheme will be enhanced, where authorized bodies are allowed to inspect.
- Road safety education addressed to transport businesses, users and the public sectors will be promoted.
- The land transport-related law (Law No.524) and related rules will be amended.
- An organization coordinating public passenger transport will be established by public bodies, transport businesses and community groups.
- A database system providing and recording traffic information will be developed.
- A computer database will be built, which comprises registration of transport businesses, concession (entitled values), business records, fees, statistics on usage, etc.

## (2) Construction of a Trunk-Local Bus Service Network (Hub-and-Spoke) System

- For efficient bus services, a bus network must be built, where trunk services and local services are clearly divided.
- Trunk services connecting various departments will be offered by large buses, and local services connecting various cities and department centers chiefly by minibuses. A hub-and-spoke network system will be built, whereby two types of services are linked at bus terminals that will be built at major cities.



**Figure 13.4.12 (Proposed) Trunk-Local Bus Network System**

Source: JICA Study Team

## (3) Use of buses of larger capacity

To meet the transport demand, buses of various sizes will be flexibly introduced. The introduction of buses with large capacity will contribute to alleviation of traffic congestion.

#### **(4) Construction of bus terminals**

Bus terminals are classifiable into the standard loop and central platform. For bus terminals to which the priority should be given, appropriate types of terminals will be constructed.

#### **(5) Development of roadside stations**

The development of roadside stations and facilities will be promoted for safer and better bus services. A roadside station basically comprises of the following facilities:

- Toilets, parking lots and fuel station
- Tourist information desk
- Local product shops
- Transport terminals linking the local community and roadside station
- Emergency contact facilities (for disasters and accidents)

### **13.4.4 Water Transport Sector Development Strategy**

#### **13.4.4.1 Necessity of Port and Inland Water Transport Development**

The significant needs on the improvement and development of commercial ports and inland waterway system are identified as follows:

- The freight demand forecast predicts that the volume of international freight traffic will increase around 2.8 times in the coming 20-years. The freight handling capacity of those commercial ports are to be increased to meet the increased volume of freight assigned to the ports.
- A new commercial port of international class will be constructed along the Caribbean Coast to handle all inbound and outbound international freight to and from Nicaragua without depending on the ports of neighboring countries so as to rationalize the transport cost. Given almost 70% of the total international freight volume are to and from the countries situated on the Atlantic side of Nicaragua namely the eastern part of the USA, EU and Latin American countries, the provision of a new port that can handle such freight volume is imperative. If the volume of freight generated or destined to and from Nicaragua to those ports of neighboring countries can be shifted to such a new port on the Caribbean Coast of Nicaragua, the port will certainly be worth investment from the viewpoints of both the national economy and finance.
- Bridging the economic disparity between the western part (Pacific Side) and the eastern part (Atlantic Side) of the country is one of the most important issues to be addressed. The development of a new port of the international class along the Atlantic Side is needed to create an effective growth basis on the Atlantic Side. The port will play an important role to develop the economy of the eastern side of the country as a terminal point of the transport corridor which is considered as an economic development corridor as well.
- Improvement of accessibility and connectivity to and from department capital city and rural villages scattered throughout the RAAN and RAAS or the eastern side of Nicaragua is needed to ensure an equitable development of the country. Where the development of road is technically difficult and financially unfeasible, the river and inland waterway should be utilized and reinforced for transport of freight for economic activities and for livelihood as well as passenger.

#### **13.4.4.2 Port and Inland Water Transport Development Strategy**

The port and inland water transport subsector development strategy can be summarized as follows:

- **Strategy-1 (SP-1):** Expansion of the port capacity and improvement of the freight handling system of the Puerto Corinto Port is imperative to meet the growing freight demand and to avoid the use of the ports along the Pacific Coast in neighboring countries.
- **Strategy-2 (SP-2):** Dew ports along the Caribbean Coast will be developed to lessen the



dependency on the ports situated along the Caribbean Coast in neighboring countries namely Puerto Cortes Port in Honduras and Puerto Limon Port in Costa Rica; and to reduce the inland transport cost for international freight traffic.

- **Strategy-3 (SP-3):** The ports along the Pacific Coast will be developed to enhance tourism.
- **Strategy-4 (SP-4):** The inland water transport system will be rehabilitated and improved as a whole especially in the RAAN and RAAS where the improvement of connectivity and linking of towns is not easy by expansion of road network in technical and economic aspects.
- **Strategy-5 (SP-5):** The development plan for creation of transport and economic corridor as East-West axis in an integrated manner composing all economic infrastructure (road, port, power generation and transmission, welfare, etc. ) as well as an industrial estate based on agro-processing activities will be formulated so as to realize the optimum development effect by concentration of investment.

### 13.4.5 Aviation Sector Development Strategy

#### 13.4.5.1 Necessity of Aviation Sector Development

According to the air traffic demand forecast, the total number of air passengers will double by 2020 and triple by 2030 from the present number. The capacity of international and domestic airports must be increased.

Air transport is important for tourism development of Nicaragua especially in remote areas and islands to which people have little access by other transport means. To attract more international tourists to Nicaragua, attractive international airports and efficient domestic air transport system must be developed.

Augusto C. Sandino International Airport plays an important role as a gateway airport for international air traffic and a hub airport for domestic flights. The development of the airport is the most important for aviation development in Nicaragua.

#### 13.4.5.2 Aviation Sector Development Strategy

##### (1) Objectives of the Strategy

- To contribute to economic development of the country by attracting more tourists from abroad and handling the increased international tourist demand
- To contribute to development of international trade by developing an air transport system for high value sea products and agricultural products
- To promote regional tourist development by developing more regional air routes.

##### (2) Measures to be taken

To handle the future air traffic demand, the airport capacity. In particular, Augusto C. Sandino International Airport must be improved in the following aspects:

- Extension of the taxiways and apron system for efficient aircraft flow
- Extension of the runway
- Expansion of the international and domestic passenger buildings
- Expansion of car parks
- Development of an air cargo terminal that can handle perishable products

Expansion of Bilwi and Bluefields Airports must be conducted in line with multimodal components of the road network and the port.

##### (3) Aviation sector development strategy

The development strategy for the aviation subsectors are summarized as follows:

- **Strategy-1 (SA-1):** Expansion of the airport capacity and improvement of cargo handling

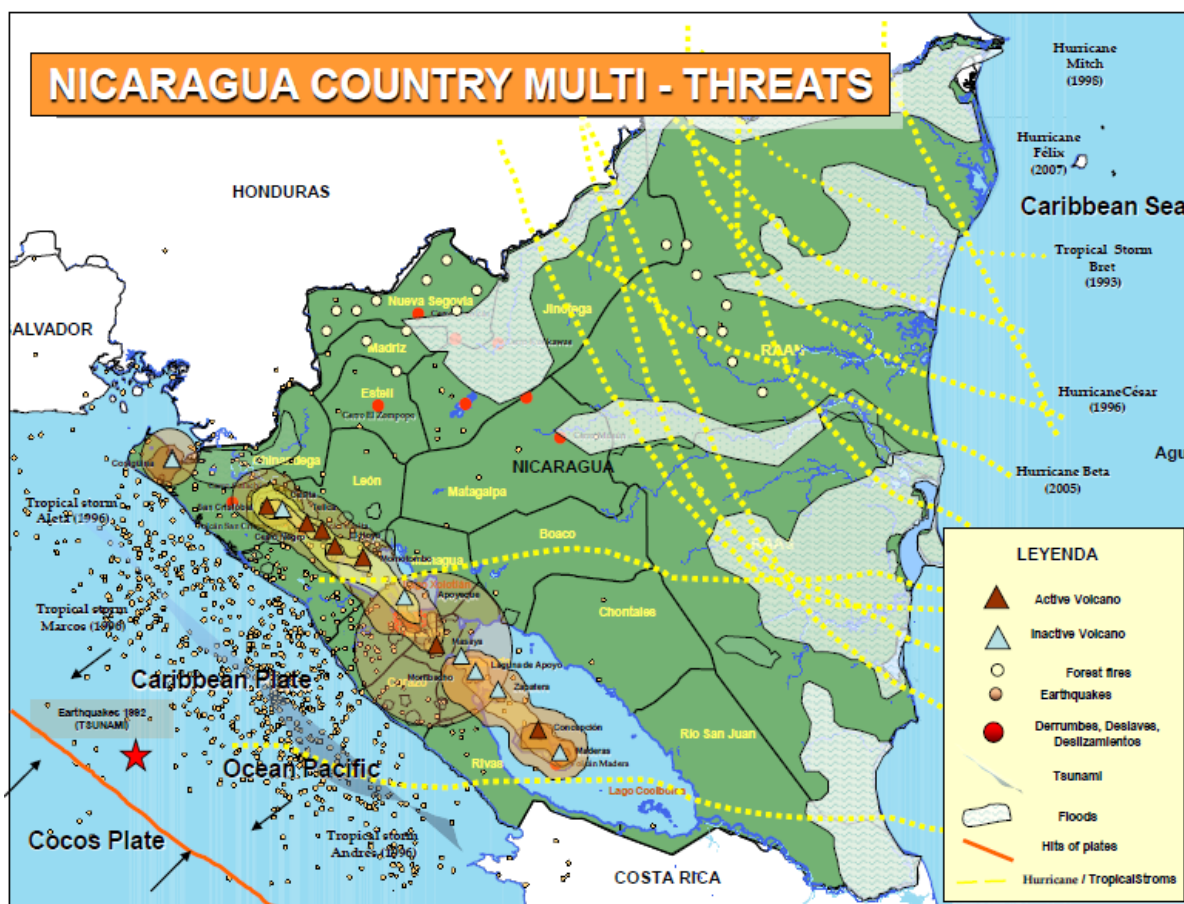
system of Augusto C. Sandino International Airport, Bilwi Airport, Bluefields Airport, and other regional airports in order to meet the growing passenger and cargo demands

- **Strategy-2 (SA-2):** Planning of expansion, improvement, relocation, etc. of Augusto C. Sandino International Airport in short-, medium- and long-terms in order to meet ever increasing passenger and air cargo demands
- **Strategy-3 (SA-3):** Formulation of a plan for refrigerated storing facilities for perishable goods
- **Strategy-4 (SA-4):** Rationalization of the air landing schedule to optimize the space of passenger terminal and the number of airport ground service staff
- **Strategy-5 (SA-5):** Formulation of expansion and improvement plans of airports in general but Bilwi and Bluefields airport taking into consideration of realization of well-planned multi-modal freight transport complex.

## Chapter 14 Integrating Climate Change into Transportation Planning

### 14.1 Understanding Climate Change

The Global Climate Risk Index 2013, published in November 2012, has identified Nicaragua as the third most affected by the climate change based on the data from 1992 to 2011. The country is just behind Honduras and Myanmar which occupied 1<sup>st</sup> and 2<sup>nd</sup> positions respectively. The study analyzed to what extent countries have been affected by the impacts of weather-related loss events (storms, floods, heat waves etc.) as shown in the figure below.



**Figure 14.1.1 Natural Disasters Threat to Nicaragua**

Source: Disaster Risk Reduction National Coordination Mechanism in Nicaragua, Workshop on National Platforms, Davos, Switzerland, 2008

In the future, an increase of 1°C and 2°C in the average temperature of the country are projected for 2020-50, and between 3°C or 4°C by the end of the century (UNFCC, Second National Communication, MARENA, 2008). By 2090, temperature projections indicate that country’s mean annual temperature will rise by 1.2 °C to 4.5 °C, and that there will be more rapid warming in the northeast of the country. (UNDP Climate Change Country Profile, 2010). The results of the analysis of the impacts of weather-related loss events (storms, floods, heat waves, etc.) in Nicaragua are described in the following table.

**Table 14.1.1 Expected Climate Change Impacts in Nicaragua**

Sector	Expected Impacts
Health	<ul style="list-style-type: none"> <li>• An increase in temperature would cause an increase in cases of malaria and other diseases.</li> <li>• Alteration of the territorial patterns and epidemiologic behavior of hydric, vectorial, allergic and respiratory diseases.</li> <li>• Greater expenses in the public health sector and in services to the most vulnerable population (children and senior citizens) due to an increase in viral and bacterial diseases.</li> </ul>
Agriculture	<ul style="list-style-type: none"> <li>• Recurrent droughts, heat waves and extension of summers would result in a decrease of agricultural production and the loss of crops within the Pacific and Central regions.</li> <li>• Severe impacts in areas that are currently suitable and safe for the production of basic grains.</li> <li>• Severe falls in the productivity of the Chinandega, León, Managua and Masaya departments, which could create greater social conflicts since these departments are home to more than 65% of the rural population.</li> <li>• Scarcity of food in the cities; loss of crops in the country; drop in the national food security.</li> <li>• Greater displacement of population from the countryside to the city, due to the lack of economic opportunities in the agricultural and fishing sectors.</li> </ul>
Water Resources	<ul style="list-style-type: none"> <li>• An increase in conflicts due to the use and distribution of water resources.</li> <li>• A decrease in drinking water availability in urban centers.</li> <li>• Sustained reduction of water recharges due to an unsustainable use of freshwater resources.</li> <li>• Diminished aquifer levels of up to 2 m and a decrease in the flow rate caused by recurrent droughts and the overuse and contamination of underground water sources.</li> <li>• Increased competition for water resources, especially during drought seasons, which would seriously affect the productivity of hydroelectric plants.</li> </ul>
Coastal Systems	<ul style="list-style-type: none"> <li>• Loss in the fishery sector due to floods, coastal sinking and sedimentation (i.e., scarcity of products such as shrimp and fish, decrease in productivity and exports).</li> <li>• Threats to ecosystems such as wetlands, mangroves, coastal lagoons and coral reefs due to coastal erosion.</li> <li>• Socio-economic losses for coastal populations due to floods, sea level increase and coastal erosion (leading to displacement of populations settled within the Pacific and Caribbean Coasts).</li> <li>• An increase in the vulnerability of the tourism sector - the second most important income-generating sector - and real estate in coastal zones due to erosion, coastal sedimentation and greater frequency of extreme events.</li> <li>• An increase in the vulnerability to extreme events and a decrease in income from tourism activities for indigenous and African descent communities in the Atlantic, who promote and rely on community tourism for income generation.</li> </ul>
Ecosystems	<ul style="list-style-type: none"> <li>• Disappearance of very humid sub-tropical and pre-mountainous sub-tropical forest areas, which would affect the species of flora and fauna that depend on these ecosystems.</li> </ul>
Housing and Settlements	<ul style="list-style-type: none"> <li>• Substantial damage to the infrastructure and to the unstable settlements in high-risk areas, due to the increased frequency of extreme events (floods, tropical storms and landslides), which would negatively affect living conditions of the vulnerable communities established in these areas.</li> <li>• Increase in permanently displaced populations.</li> <li>• Increased sensitivity and vulnerability of human settlements and land use practice due to changes in the usual supply and demand of water.</li> </ul>

Source: Mainstreaming Climate Change in Nicaragua, UNDP, 2010

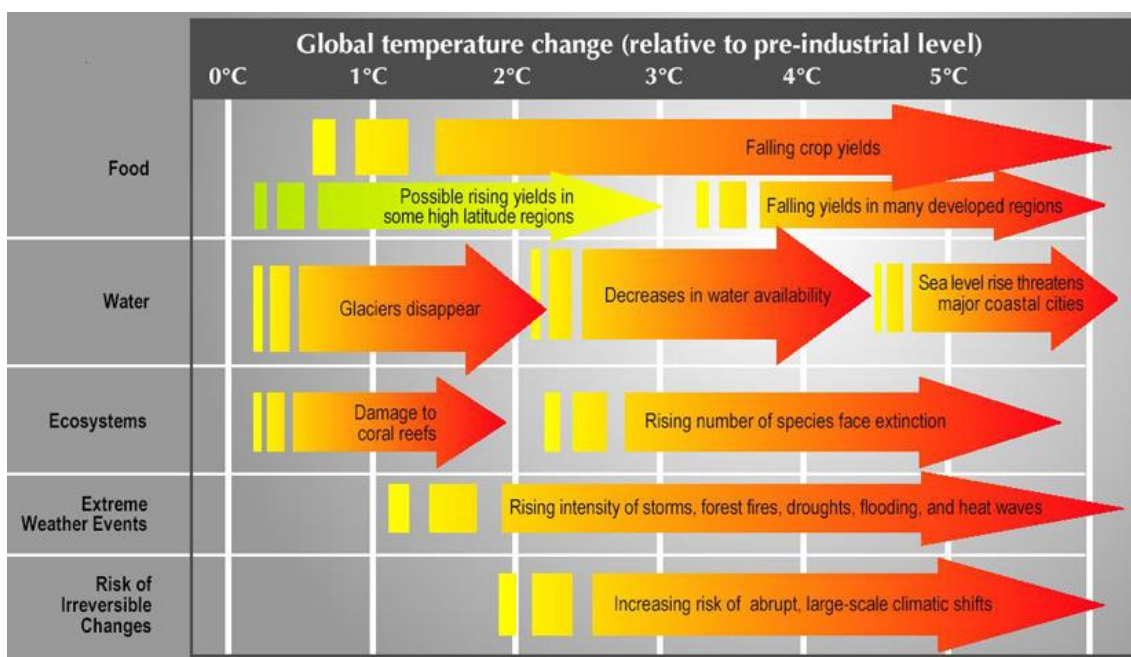
## 14.2 Climate Change and Potential Impacts on Different Sectors

Climate change will affect the basic elements of life for people around the world, i.e. access to water, food production, health, and the environment. Hundreds of millions of people could suffer hunger, water shortages and coastal flooding as the world warms (see Figure 14.2.1). The report further argued that if no action is taken to reduce emissions, the concentration of greenhouse gases in the atmosphere could reach double its pre-industrial level as early as 2035, virtually committing us to a global average temperature rise of over 2°C. All countries will be affected by this global

phenomenon and the most vulnerable, i.e. the poorest countries and populations will suffer earliest and most, even though they have contributed least to the causes of climate change as further predicted by the report. The costs of extreme weather, including floods, droughts and storms, are already rising, including for rich countries.

Among the impact of climate change, the following has major effect on transport infrastructure:

- Increased temperature and more heat waves
- More frequent droughts (and less soil moisture)
- Sea level rise and coastal erosion More extreme rainfall events and flooding
- More intensive and frequent storms



**Figure 14.2.1 Projected Impacts of Climate Change**

Source: Compiled by JICA Study Team based on Stern Review:  
The Economics of Climate Change, UK, 2006

Nicaragua's development is already compromised by climate phenomena. The damage in road infrastructure has risen to several million of dollars. It is expected that related threats to climate change will increase even more in the next few decades. During the period of 2007-2012, the strong rains provoked flooding, infrastructure collapse and other damage that caused loses of around USD 30.23 Million. More than 2,000 km damaged road of which 1,142 km have received damage during 2012. The vulnerability to climate change of the road network in Nicaragua is associated with the following:

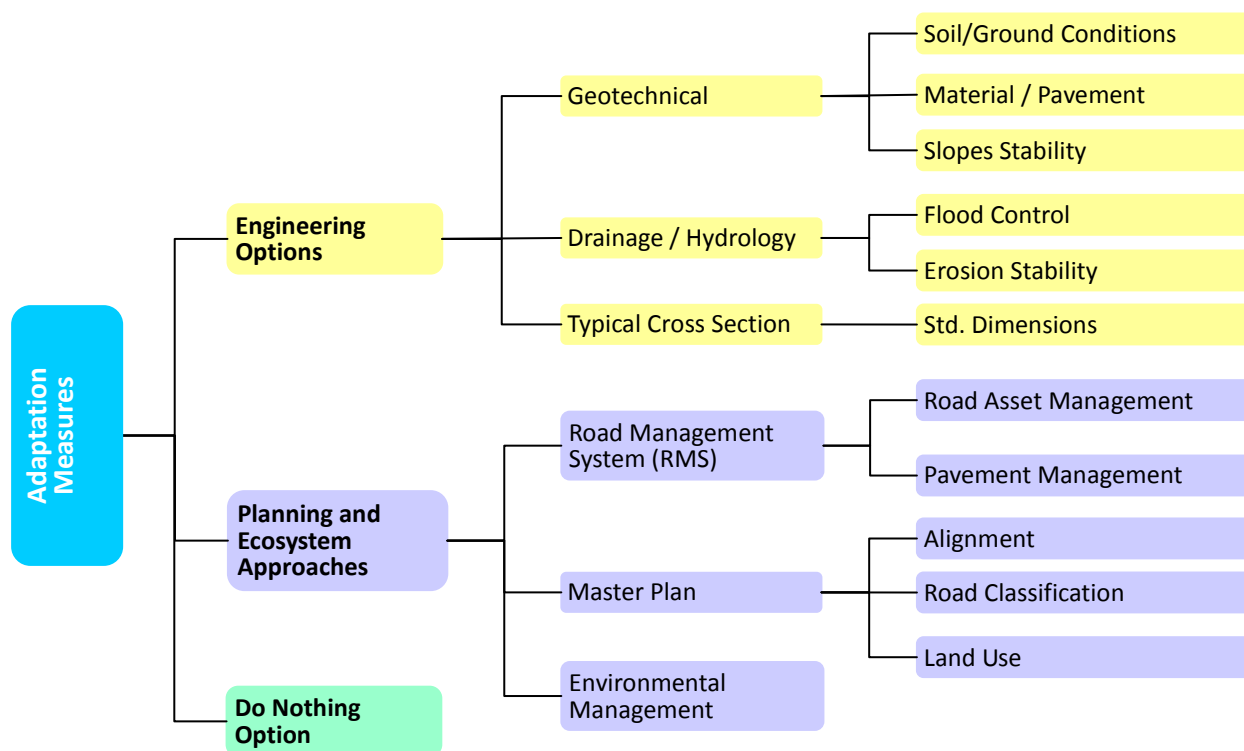
- Obsolete infrastructure
- Some routes passes through highly unstable geological areas.
- Inadequate design for the geology or hydrology.
- Accelerated conversion of the use of land that changes the patterns of surface run-off water.
- Modifications during construction for economical reasons.
- Lack of implementation of a program for vulnerability adjustment.
- Prevalence of temporary repairs against permanent repairs.
- Many rural road pavements do not take into account a geometric improvement.
- Lack of timely and adequate maintenance

### 14.3 General Measures to Climate Change in the Transport Sector

#### 14.3.1 Adaptation Measures to Climate Change in the Transport Sector

Generally, there are two groups of complementary measures that can be achieved to address climate change. First is through adaptation, and second by the mitigation. Mitigation take direct action seeking the causes of climate change (reducing GHG emissions) to protect transport infrastructures. Adaptation measures indicated in Figure 14.3.1 involve the provision of flexibility to climate change regarding to the development of basic and essential transport infrastructure (road, port and airport). The main adaptation measures can be summarized as (i) Engineering Options, (ii) Planning and Ecosystem Approaches and (iii) Do Nothing Approach. Some actions in line with the above measures might include:

- More resilient design standards and materials for infrastructure construction;
- Improved drainage systems;
- Regular maintenance of all infrastructure;
- Planning that avoids high risk areas;
- Minimize the need for road infrastructure through compact urban planning;
- Provide sufficient redundancy to allow for alternative ways of passage, when obstruction occurs.
- Environmental management to avoid soil erosion, flooding, etc.



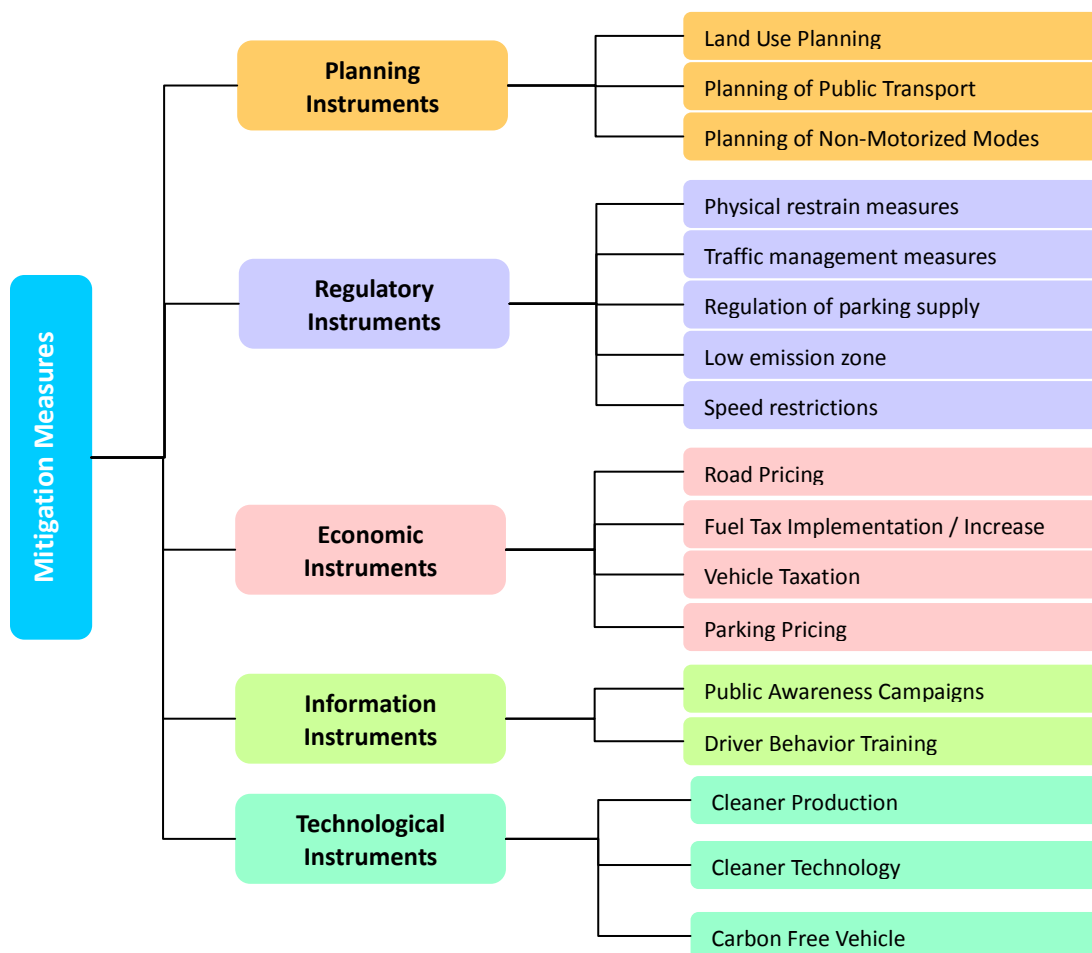
**Figure 14.3.1 Adaptation Measures**

Source: Compiled by JICA Study Team based on “Adapted with modification from Guidelines for Climate Proofing Investment in the Transport Sector, ADB, 2011”

#### 14.3.2 Mitigation Measures to Climate Change in the Transport Sector

The mitigation strategies focused on available measures that can be deployed to reduce the GHG emissions from transport sector. These mitigation measures include some innovative instruments which require installation of sophisticated technologies like road pricing, electric vehicle, low-carbon vehicle, etc. Likewise, these instruments are most successful in reducing greenhouse gas emissions and achieving other benefits when implemented as a package of measures.

For instance, a comprehensive approach will typically include the improvement of public transport services and provision of cycling and walking facilities to encourage modal shift from private vehicle; it will make use of measures that restrict the use of the car; it will help establish of good land use planning practices; it will promote technological improvements such as cleaner fuels; among others. The transport instruments are grouped into five as illustrated in Figure 14.3.2.



**Figure 14.3.2 Mitigation Measures**

Source: Compiled by JICA Study Team based on “Adapted with modifications from Transport and Climate Change, GTZ, 2007”

## 14.4 Recommendation on Measures to Climate Change in the Transport Sector Nicaragua

As mentioned, Nicaragua has experienced several natural disasters attributed to climate change. During the period of 2007-2012, strong rains provoked flooding, infrastructure collapse and other damage that caused losses of around USD 30.23 Million. More than 2,000 km damaged road of which 1,142 km have received damage during 2012. It is expected that related threats to climate change will increase even more in the next few decades.

There has been notable progress by the government in their effort to address this phenomenon and one of their key initiatives to date which is undertaken by MTI is the formulation of “Strategy for Adaptation and Reduction of Climate Change Risk in Nicaragua’s Road Infrastructure (2012-2016)”. The proposed strategy aims to strengthen and incorporate risk management criteria and adaptation to climate change in planning, design, supervision and execution process of road infrastructure.

Another step forward undertaken by the MTI is the articulation of the Ministry’s policy concerning

environmental issues including climate change. Although still in a draft form, the policy document titled “Environmental and Adaptation Policy to Climate Change” aims for:

“Guarantee that institutional decision making process as well as planning, programs and projects that the institution executes, are integrated in the environmental aspects, risk management and climate change adaptation. In the same manner, promote knowledge and transfer proper practices to all Environmental Management involved individuals, through broader scenarios where the institution influences.”

Recently, the MTI has managed to gain support from various financial institutions (e.g. IDB, World Bank and Nordic Development Fund) to implement activities and measures to reduce the vulnerability of the road network to climate change. This is another milestone in the Ministry attempt to mainstream climate change adaptation from planning (integrate into existing policies and plans).

In view of the above, the JICA Study Team’s policy towards climate change is consistent with the government policy and summarized as follows:

- Promotion/Enhancement of environmentally friendly transport that serve mass movement of commuters
- Development of multi-modal transport that take full advantage of extensive natural network of rivers and lakes
- Encourage the development of transport infrastructure resilience to the impact of climate change



## Chapter 15 Preliminary Project Cost Estimation

This chapter describes the basic conditions and unit prices adopted to estimate the costs of projects that will be proposed in line with the National Transport Plan. Then, the preconditions for cost estimation and its unit prices quoted in this chapter were established after the consultations and discussions held with the competent directorates of MTI and agreed to apply in this Study.

### 15.1 Precondition of Cost Estimation

#### (1) Precondition

All the subject projects will be awarded by contract through general international bids.

#### (2) Estimation time

Nov 2013

#### (3) Exchange Rate

The exchange rate of Nicaragua currency Córdoba (C\$) used to calculate the cost estimation is "1 USD = 25.00 C. \$", the same rate used for the MTI 2013 budget planning.

#### (4) Project Costs

The project cost is composed of six costs; construction cost, engineering cost, contingent cost, IVA cost (tax), land acquisition/compensation cost, and administration cost.

**Table 15.1.1 Project Cost and Cost Components**

	Project cost components
1	Construction cost
2	Engineering cost
3	Contingency
4	Tax
5	Compensation cost
6	Administration cost
Total	Project cost

Source: JICA Study Team

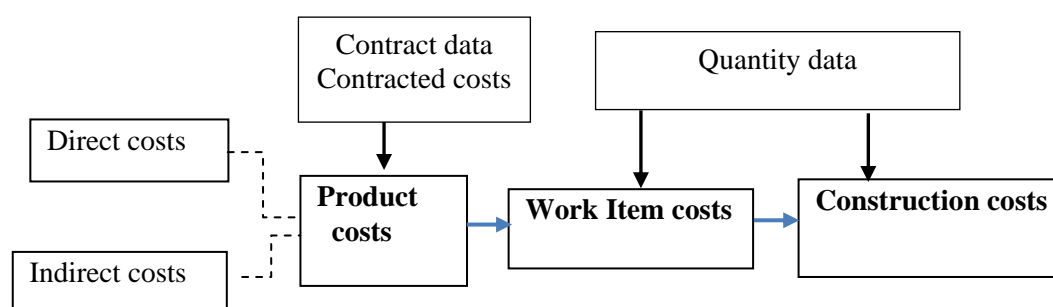
### 15.2 Construction cost

#### (1) Estimation Method

Construction costs are composed of the work items, which are administration, preparation, earth, pavement, drainage, structure, housing, management, environment, and other work. Each work item costs are composed of product costs which are unit cost of soil excavation, rock excavation, borrow excavation etc.

Product cost is composed of direct cost (labor, machine, and material), and indirect cost (overhead, temporary facility, field office fee, insurance, etc.).

Generally contracted unit cost is equal to product cost, and each work item costs are calculated by using those costs. Figure 15.2.1 shows the estimation process of the construction cost



**Figure 15.2.1 Estimation Process of Construction Cost**

Source: JICA Study Team

## (2) Product cost samples

Set upped product costs sample from contract data is shown in Table 15.2.1. Table of Product Cost shows the basic unit prices to be applied for this study, which were agreed by the relevant addresses MTI after deliberations based on the costs of the project implemented by the MTI in Nicaragua seasonally adjusted prices of October 2013.

**Table 15.2.1 Product Cost Sample**

Work items and product cost		Unit	Unit prices	
			C\$	US\$
100	Accommodation and site administration			
	101 Accommodation	Km	100,000	4,000
	102 Standby	Km	67,500	2,700
	103 Management	Km	125,000	5,000
200	Preparatory work			
	201 Site clearance	m <sup>2</sup>	8	0.31
	202 Tree trimming	m <sup>2</sup>	26	1.03
	203 Land leveling	m <sup>2</sup>	31	1.24
300	Earth work			0
	301 Cleaning and Grubbing	m <sup>2</sup>	38	1.50
	303 Embankment	m <sup>3</sup>	112	4.46
	304 Road Excavation (Soil)	m <sup>3</sup>	51	2.03
	305 Road Excavation (rock)	m <sup>3</sup>	500	20.00
	306 Transportation of material	m <sup>3</sup> -km	5	0.21
400	Pavement work			
	401 Excavation of existing road	m <sup>3</sup>	45	1.79
	402 Subgrade preparation	m <sup>2</sup>	11	0.45
	403 Sub-grade Gravel T=300	m <sup>3</sup>	294	11.77
	404 Sub-base T=100	m <sup>3</sup>	325	13.00
	409 Base course (Mixing) T=150	m <sup>3</sup>	375	14.99
	410 Base course Stabilization cement100kg/m3	Kg	10	0.40
	411 Prime coat	m <sup>2</sup>	38	1.50
	412 Base course Stabilization T=100	m <sup>3</sup>	910	36.40
	413 Bituminous Treated Base Course T=100	m <sup>3</sup>	6,450	258.00
	414 Tack coat	m <sup>2</sup>	25	1.00
	415 Asphalt Concrete Surface Course T=50	m <sup>3</sup>	7,650	306.00

Source: MTI and JICA Study Team

## (3) Road construction cost (Excluded structure cost)

Table 15.2.2, Table 15.2.3, Table 15.2.4 and Table 15.2.5 show the construction road cost per Kilometer.

**Table 15.2.2 New Road Construction Cost**

Unit : Km

Road Class	Numbers of lane	Topography	Cost(thousand)	
			C\$	US\$
MT	4	Built up	49,450	1,978
	4	Rural	37,100	1,484
	2	Rolling and level	22,175	887
ST	2	Rolling	18,975	759
	2	Level	23,950	958
MC	2	Rolling	11,700	468
	2	Level	15,750	630
	2	Mountainous	12,225	489
	2	Built up	30,075	1,203
SC	2	Rolling	10,750	430
	2	Level	15,625	625
	2	Mountainous	11,725	469
	2	Built up	28,800	1,152

Source: JICA Study Team

**Table 15.2.3 Road improvement (widening) cost**

Unit: km

Road Class	Up grade		Topography and land use	Cost(thousand)	
	C\$	US\$			
MT	2 lanes	to 4 lanes	Rolling	36,775	1,471
	2 lanes	to 4 lanes	Mountainous	40,700	1,628
	2 lanes	to 4 lanes	Built up	56,500	2,260
	2 lanes	to 4 lanes	Central	62,400	2,496
	4 lanes	to 6 lanes	Rolling	53,875	2,155
	2 lanes	to 4 lanes	Central	69,950	2,798
ST	MC	to MT	Level and rolling	40,450	1,618
	MC	to ST	Level and rolling	14,725	589
	MC	to ST	Mountainous	13,000	520
Mc	SC	to ST	Level and rolling	15,050	602
	SC	to MC	Level and rolling	12,175	487
SC	SC	to MC	Mountainous	9,450	378
	Lo	to SC	Level and rolling	9,450	378

Source: JICA Study Team

**Table 15.2.4 Rehabilitation cost**

Unit: km

Road Class	Numbers of lane	Topography	Cost(thousand)	
			C\$	US\$
ST	2	Rolling	16,875	675
	2	Level	19,425	777

Source: JICA Study Team

**Table 15.2.5 Reconstruction and pavement cost**

Unit: km

Road Class	Pavement work		Cost(thousand)	
	C\$	US\$		
ST	Gravel	to Pavement	8,875	355
	Pavement	to Pavement	8,100	324
MC	Gravel	to Pavement	7,850	314
	Pavement	to Pavement	7,175	287
SC	Gravel	to Pavement	6,600	264
	Pavement	to Pavement	6,250	250

Source: JICA Study Team

**(4) Structure cost**

Table 15.2.6 and Table 15.2.7 show construction cost Per m<sup>2</sup>.

**Table 15.2.6 Construction cost of box culvert**Unit: m<sup>2</sup>

Type of construction method	Cost/m <sup>2</sup>	
	C\$	US\$
New Construction	24,475	979
Widening 2 Lanes	32,825	1,313
Widening 1 Lane Both side	50,125	2,005

Source: JICA Study Team

**Table 15.2.7 Construction Cost of bridge**

Span length less than 25m			Cost/m <sup>2</sup>	
Bridge construction	m <sup>2</sup>	Bridge length(m)	C\$	US\$
		Less 60m	52,500	2,100
		60-100	42,500	1,700
		100-200	32,500	1,300
Span length more than 30 m			Cost/m <sup>2</sup>	
Long span construction	m <sup>2</sup>	Span length(m)	C\$	US\$
		30	75,000	3,000
		40	92,500	3,700
		50	115,000	4,600
		55	130,000	5,200

Source: JICA Study Team

**(5) Water transport construction cost**

The table below shows the unit price for the construction of water transport infrastructure by work items.

**Table 15.2.8 Water transport construction cost**

Work Items		Unit	Unit cost	
			C\$	US\$
1	Container Wharf	m <sup>2</sup>	52,500	2100
2	Facilities of Wharf	m	300,000	12,000
3	Container Yard Pave	m <sup>2</sup>	750	30.0
4	Revetment	m <sup>3</sup>	1,755	70.2
5	Excavation (Dredging)	m <sup>3</sup>	125	5
6	Utilities of port	set	12,500,000	500,000
7	Canal (Bare area)	m	2,852,150	114,086
8	Canal General	m	3,742,450	149,698

Source: JICA Study Team

**(6) Architectural structure**

Table 15.2.9 show the architectural structure costs per square meter, these costs are included the utilities facilities costs.

**Table 15.2.9 Architectural structure construction cost per m<sup>2</sup>**

Building	Cost	
	C\$	US\$
House	20,000	800
Office	18,750	750
Warehouse	16,250	650
Big scale building	60,000	2,400

Source: JICA Study Team

**(7) Plant and machine cost**

Air transport facilities cost are listed in Table 15.2.10 and show the plant and machine cost.

**Table 15.2.10 Air Transport Facilities Cost**

Facilities	Unit	C\$	US\$
West processing plant	set	12,500,000	500,000
Gantry crane	set	45,000,000	1,800,000

Source: JICA Study Team

**(8) Economy cost**

Estimated construction cost includes import tax of construction material and shadow of unskilled labor cost which is 1% of the construction cost.

**(9) Engineering cost**

It is simply estimated as 10% of total construction cost.

**(10) Contingency**

This is the physical contingency cost which includes unexpected costs such as for unexpected rock excavation or work delay by unusual weather. In this plan, 10% of the total construction cost and engineering cost is assumed as contingency cost.

**(11) Tax**

Tax is the sixteen percent of the total construction cost, engineering cost and contingency according to the Nicaragua tax system.

**(12) Compensation**

Information for estimating unit for land acquisition and compensation for demolished houses is available from two major sources the tax assessment data and market prices of Municipality Catastro Office, which are revised occasionally. For the present cost the Nicaragua land prices rate method which are half value of total prices of tax assessment and the market is used for land acquisition cost.

Economy cost is used Land opportunity costs which are calculated the production value in 25 years is used for economy cost. Compensation cost is shown in Table 15.2.11.

**Table 15.2.11 Compensation cost**

Location	Financial				Economy			
	C\$		US\$		C\$		US\$	
	Managua	Local	Managua	Local	Managua	Local	Managua	Local
Built up	1,300	338	52	13.5	250	100	10	4
Residence	338	75	13.5	3	75	33	3	1.3
Farm	38	25	1.5	1	25	13	1	0.5
Forest	25	13	1	0.5	5	5	0.2	0.2
Other	0	0	0	0	0	0	0	0

Source: JICA Study Team

**(13) Administration of project**

Based on the management costs of the projects implemented by MTI and the cost estimation realized for the international construction projects, an additional 3% of construction, engineering, and contingency cost is estimated as a cost to cover the administration expenditure of MTI for tender processing, contracting and project management.

## 15.3 Road Maintenance Cost

### (1) Definition

Generally maintenance cost is categorized into routine maintenance and periodic maintenance. Routine maintenance, which occurs regardless of the condition of road surface and traffic volume, includes grass cutting, cleaning the road surface and side ditch, road patrol, road signs, repairing works on the damage of shoulders, etc. On the other hand, periodic maintenance, which occurs depending on the condition of road surface and traffic volume, includes repairs of road surface such as overlay, patching, sealing, etc. and bridge floor slab rehabilitation.

Minor existing road improvement such as the addition of shoulder and side ditches, which are usually included in road maintenance cost in Nicaragua, but shall be treated as a part of the initial cost in master plan study.

**Table 15.3.1 Maintenance Items**

Description		Frequency
I	Routine Maintenance	
1	Grass Cutting and Drain cleaning	1 time/year
2	Routine run and inspection of Structure	1 time/year
3	Traffic sign board	1 time/10 years
4	Traffic sign repair	1 time/10 years
5	Gravel road leveling	1 time/year
6	Shoulder	1 time/5years
II	Periodic maintenance	
1	Overlay	1 time/13 years
2	Pavement Marking	1 time/8 years
3	Gravel road re-surfacing	1 time/5years

Source: JICA Study Team

### (2) Maintenance cost estimation

The project subject to this master plan study will, when implemented and completed, affect amount of government fund required for the road maintenance from year to year.

The maintenance cost of the subject projects is estimated excluding the cost of minor improvement work although presently included by the government and assuming a higher maintenance level, such as more frequent renewal of road markings, than now actually executed. As defined above, the cost is estimated in term of direct construction cost of each works item; routine maintenance cost which is given as a fixed amount, and periodic maintenance, which inherently varies depending on the traffic volume and lane width, besides being proportional to the number of lanes. Work and frequency are given in Table 15.3.1.

Table 15.3.2 shows the estimated maintenance cost by road class and number of lanes.

**Table 15.3.2 Maintenance Cost**

Road Class	C\$		US\$	
	Financial	Economy	Financial	Economy
Main and Sub Trunk				
6 lanes	1,550,000	1,300,000	62,000	52,000
4 lanes	1,250,000	1,050,000	50,000	42,000
2 lanes	525,000	450,000	21,000	18,000
Main collector				
2 lanes	400,000	350,000	16,000	14,000

Unit: /year km

Road Class	C\$		US\$	
	Financial	Economy	Financial	Economy
Sub collector				
2 lanes	300,000	250,000	12,000	10,000
Gravel	375,000	325,000	15,000	13,000
All season	200,000	175,000	8,000	7,000
Dry season	100,000	75,000	4,000	3,000

Source: JICA Study Team

