III. OVERVIEW

III. 1 INTRODUCTION

The project subject of this environmental impact assessment involves the construction of a road that will serve to bypass San Miguel City, skirting the city so that drivers do not have to cross through the downtown when travelling to different points in the country's eastern zone.

Of the 25.02 km comprising the project, a total of 3.66 km correspond to extension works of the current Pan American Highway between San Salvador and San Miguel, starting about 5.00 km before the detour to Moncagua. The remaining 21.36 km are new construction works connecting with the Military Route Highway (RN18), the road to La Union and ultimately with the detour road to El Delirio (RN17).

III.1.1 Location

The San Miguel Bypass is located in the municipalities of Moncagua, Quelepa and San Miguel, all of the department of San Miguel.

III.1.2 Road Expansion Section

The expansion stretch of 3.66 km along the Pan American Highway begins at Km 128 051, at the detour area of the Pan American Highway (CA-1) leading to the City of Moncagua, heading southeast alternating tangents and curves to the traffic detour destination, located between Km 131.91 with Latitude 13 ° 30'9 .10 "N Longitude 88 ° 13'14 .20" W of the Pan American Highway (CA-1).

III.1.3 Road Construction Section

The Road Construction Section, starts from the diversion of the Pan American Highway north bound, alternating tangents and curves, finishing in the junction of the road to El Delirio (RN17).

Main locations:

- Runs 5.20 km to the place where it crosses over Río Grande de San Miguel.
- After crossing Río Grande de San Miguel it continues mainly South East alternating tangents and curves through 4.10 Km until reaching the location where it intercepts with the road known as Ruta Militar (RN18) between km 4 and 4.5 Km measured from the Triangle of San Miguel at coordinates Latitude 13°30'33.20"N Longitude 88°09'09.30"W.
- From there it continues SE and with one tangent it runs 0.65 Km until the place where it crosses over Río Taisihuat, continuing mainly towards the South East alternating tangents and curves for 7.90 Km until reaching the area where it intercepts with Carretera Panamericana CA-1 between Km 144+500 and Km 145+000 at coordinates Latitude 13°26'59.30"N Longitude 88° 8'7.40"W.

From where it continues predominantly towards the South West alternating tangents and curves running 3.00 Km until reaching the place where it crosses Río Grande de San Miguel for the second time, following to the South East and running with one tangent 0.19786 Km until it intercepts with the San Miguel road to El Delirio (RN17) detour between Km 145+000 and Km 145+500 coordinates Latitude 13°25'46.20"N, Longitude 88°09'13.20"W.

III.1.4 *Methodology*

Project information and general information was obtained from the following documents:

- Study profile: "Apertura Tramo CA:1 - El Papalón - Hato Nuevo - Carretera Panamericana.(By Pass San Miguel)", of the MOP.
- "Preparation study for Construcción de Carreteras Troncales en El Salvador", Intermediate report , dated July 2011, by Nippon Koei Co., Ltd., Nippon Koei LAC Co., Ltd., KRI International Corp. and Central Consultant Inc.
- Project blueprints and feasibility study are still ongoing together with the Environmental Impact Assessment.

The physical, biological, social and economic features of the environment were characterized to describe it by applying two types of tasks:

- Office work, consisting in:
- Support information collection (topic background) and from the Project reception region,
- Outcomes discussion and analysis .
- Field work consisting in:
- Direct observations, and
- Field data collection.

These activities are not necessarily sequential, and at times run parallel, getting feedback from each other, on the progress of outcomes. At each stage, we had the participation of specialists in the field, which supported and became part of the analysis of activities in the multi-disciplinary team responsible for the evaluation of environmental impacts.

The "Relevant Integrated Criteria Methodology", was used for the environmental impact assessment as suggested by Panamanian and Yanez, 1993, considering the guidance given by Weitzenfeld, 1990, Lopez, 1994; Sadar, 1994; CRICA, 1995; Ridgwey et al ., 1996, among others, to determine the magnitude of the expected effects on the different project activities. Since there is no legal standard for the submission of reports, we followed Ridgwey et al., 1996, suggestion for the process, adapting the multidisciplinary work methodology to provide follow up.

Following are the stages of the "Relevant Integrated Criteria Methodology":

1. Breakdown of project activities.
2. Breakdown of environmental factors likely to be impacted.
3. Confrontation of activities and environmental factors.
4. Impact assessment and prioritization.

III.1.4.1 Reference Documents and Maps

The background literature related to the subject was reviewed (publications, consultations with specialists) as well as the existing conceptual framework of the topic. This secondary information will be systematized so that it can be validated by theoretical proof.
Similarly, background information on the region in which the project will be established was also reviewed in order to allow a better view of the conditions in the project's direct and indirect influence areas under actual conditions or "without the project."
MARN and SNET maps were employed as a basis in the areas of: land use, agrological map, pedological map, geological map, watersheds, among others. The following were used for consultation purposes: 1:25,000 National Geographic Institute: 2556 SW I, NE II 2556, 2556 and 2556 IINW IV SE.

Information related to similar projects in this area was used as well as the document called San Miguel, 1:100,000 scale, which corresponds to one of the six panels that make up the geological map of El Salvador, prepared by the German Geological Mission and published in 1970.

III.1.4.2 Field data collection

The determination of the different aspects was based on a series of inspections and field trips, mostly following the path indicated for the project, in areas previously analyzed, and using decimal and geodetic coordinates, the latter converted to degrees minutes and seconds for use in GPS, especially in those parts of the stretch that had not yet been surveyed.

The route of interest was developed in the most accurate manner possible within the proposed project outline, which required the use of two GPS, configured as follows:

- Position format: hddd°mm'ss.s"
- Map data: spheroid WGS 84
- Distance/speed: metric
- Height: meters
- Vertical speed m/min
- Depth: metric

Setting the compass:

- Screen: degrees
- North reference: magnetic
- Magnetic variation 002o E

It should be added that two lists of coordinates were provided, one corresponding to 423 geodetic coordinates and the second corresponding to 1557 decimal coordinates (GPX). Both lists indicate the center line. For navigation purposes, GPS was used and its location with Google Earth. The following were taken from the second list: decimal coordinates representing distances from one another, ranging from 80 to 100m approximately, which were converted into directions for GPS use, through the website, http://www.vermiip.es/gps

Given that the result of the conversion gives four digits after the point in the seconds, the author makes the approximation after number 7, because the GPS only supports one digit after the point in the seconds. The margin of error estimated at the field is 4 to 6m, so every other distance it was necessary to set positions called "test points" and then corroborate them in "Google Earth", added to this, is the margin established by the potential deficiency of satellites, cloudiness or weak signals due to topography or trees.

The main difficulties arose when the integrity of the team confronted topographical difficulties or well developed and thick vegetative obstacles or simply the denial of a permit to cross harvest areas close to mature crops, new crops just sprayed with pesticides or under that process. As a result of this the team was forced to circle areas more than once and seek alternative steps to move ahead in the outline planned for the Project.

In some areas, due to the perception of a greater margin of error because of weak satellite signals, it was necessary to widen the gap of review. On the other hand, the accuracy of the boundaries of different characteristics was extrapolated slightly beyond 100 m from the estimated limit at field level from the range of interest for this project.

III.1.4.3 Data collection and processing procedure and method

III. 1.4.3.1 Physical Aspects

- Climate and air quality

The National Service of Territorial Studies-SNET-started the research with related environmental parameters and existing records for the zone. Data were supplemented with serum records taken by the Meteorological Service / MAG.

To characterize air quality, a sampling of particulate matter was performed (with equipment HiVol),in addition to NOx, SOx, (using passive sampling of at least one month) and also VOC, CO and CO2 with equipment for this purpose. Sampling was conducted at five points that were selected in the course of the project, to characterize the current air quality in the area. A noise sampling was also conducted.

- Geomorphology, geology and soils

The shape of the land or landform was verified based on above mentioned mapping and field verification: altitude, slope, roughness, physiographic units, active or latent processes in the short / medium term (landslides, collapse, flood susceptibility, etc.), geology, soil type and class.

The entire project was toured to evaluate and diagnose the general and actual conditions regarding topography and morphology of the longitudinal section of the project and the geomorphology, geology, soils and structures. Sampling of ground vibrations was also performed.

Fieldwork for this component, resulted in a set of data which was recorded for later interpretation in the drafting of the report, collection of geological material or reference soils for a more in depth analysis at an appropriate site, at the discretion of the technical consultant

- Hydrology

There were tours along the layout of the project, identifying the different waterways that cross the project, establishing the degree of impact caused by the new works. Having identified the different waterways that cross the project we then proceeded to collect information about their flow regime, from the institutions in charge for those that have historical records. With the information gathered we proceeded to describe the different landforms and geographical features in the water network inside the project, classifying them by basins, and level of importance of the watersheds.

A total of 8 points along the project were sampled to characterize water quality sampling: 4 streams and four existing wells along the path. The decision was made not to sample the Rio Grande de San Miguel, considering that its flow is negligible for project purposes.

III. ***1.4.3.2*** *Biological Aspects*

There was a determination of the flora along the project regarding trees, shrubs and herbaceous. Regarding wildlife, vertebrate fauna was assessed. We conducted a detailed survey of plots which were located after a reconnaissance tour and identified areas with the greatest presence of vegetation. In agricultural areas or grasslands, only observation tours were conducted.

Information was supplemented with the tree census throughout the project, trees with a DBH greater than 20 cm, were located into a map. Tree counting will be made through several field methods recommended by authors as Flowers in 1980 and Lauer in 1954. Shrubs and herbs were not counted.

The presence of protected natural areas or those with the potential to become one was considered, and two were identified among the latter and then we proceeded to document the fact that these would not be impacted, and requested the Ministry of the Environment and Natural Resources to evaluate the lava flows existing within the project area and their status. A note was received dated MARN-DGGA-PN-GANP-CB-0720/2012 code May 17, 2012 in which the resolution identified the property with "potential to become part of the System of Natural Protected Areas". At present this area does not enjoy any formal protection but nevertheless it has been considered, as recommended, within the compensation for areas to be waterproofed. (See Annex III.3)

The other area considered, is among project stations: 3+750 and 4+060 and the Salvadoran Institute for Agrarian Transformation (ISTA) was consulted about the impact on the proposed protected area called The Obrajuelo, to which they responded through note DR.00.352.12 that having assessed the area, the Bypass project does not affect the area of that estate. (See Annex **III.4**)

We determined the ecological significance of the species, their ecological status, as set forth in the Official List of Threatened or Endangered Species, promulgated by the Ministry of Environment and Natural Resources-MARN. Significance by biomass was determined for trees: specimens having a diameter at breast height greater than 100 cm (DBH> 1.00 M). Cultural or anthropogenic significance, knowing the features and uses of a given species.

♦ *Methodology for flora*

The area under study was recognized along the line where the Bypass of San Miguel will be built; sampling points were located in the most representative sites for vegetation inventory and quantification, including the tree , shrub and herbaceous strata. Four types of plant communities or ecosystems were identified as follows: Road Expansion Section, City Forest, area crop and grassland areas and riparian forests. This classification was made based on criteria such as the type of ecosystem present: natural or artificial, the degree of disturbance, productive activities, the degree of fragmentation of the ecosystem and habitat diversity produced naturally or by anthropogenic disturbances (Meffe and Carroll, 1994, cited by MARN, 2003).
There were two types of samples:

1. Arboreal Census along the areas under analysis in the area of direct influence.
2. Quantification of trees in sample plots, in and out of the area of direct influence.
3. Registration of species of shrubs and herbs, without quantifying sampling plots, inside and outside the area of direct influence

A non-probability sampling was run, choosing those areas with greater representation in both species abundance and richness (Fernandez and Fernandez, nd), emphasizing on trees with a diameter at breast height (DBH) of 1.3 above the ground equal to or larger than 20 cm.

A total of 34 sampling plots were established with an area of 20x30m (600 m2), amounting to an area of 20,400 m2, equivalent to 2.04 ha. Orientation was performed with a compass built-in a Suunto clinometers, and areas were delimited with 30m tape (Figure 1) . In each plot we recorded the common name of each species, the number of individuals per species, girth at 1.3 m above ground (CAP) with a sewing tape and the height in meters (Young, 1991). Each plot is geographically referenced with a Garmin Etrex GPS and located at 10m away from roads or alterations to reduce the edge effect (MARN 2003).

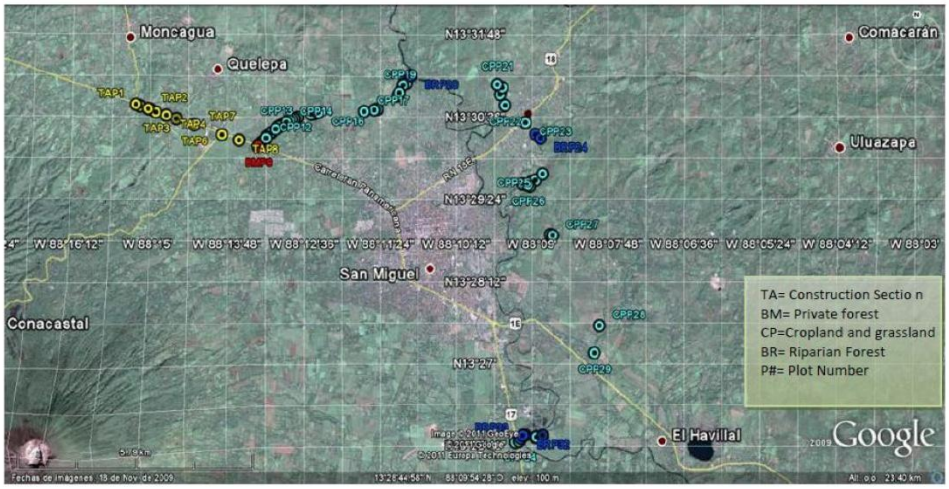
For the establishment of 600 m2 plots the criteria proposed by Meló Cruz and Vargas Rios (2003)was followed, in which the size of the sampled unit expresses the organization of the forest, floristic composition and diversity monitoring. Vester and Saldarriaga (1993) cited by Melo Cruz and Vargas Rios (2003) used plots of 400 and 500 m^2 to assess structural, architectural and floral features, in secondary forests of Colombian Amazonia.

The number of plots and sampling depends on the spatial pattern of distribution of trees in the forest as well as the size, richness and diversity. If it is random, you can use any size, if gregarious or clustered, sampling is increased (Maetteucci and Colma 1982 cited by Melo Cruz and Vargas Rios 2003.

The difficulty encountered was that some points coincided or were located on private property and in some cases, natural barriers made access difficult such as the Rio Grande, or sites considered highly dangerous.

Species were identified in the field where possible, we gathered botanical samples of the species that could not be determined, which were subsequently identified in the ITIC herbarium of the University of El Salvador, as established by Gaviño Torres et al. (1995). The photographic record with a digital camera with a resolution of 8 MP was made, to complement the taxonomic identification and the different vegetation nuclei.

With the records obtained we prepared a list of species with the taxonomic categories of family, genus and species. We also determined the abundance of species, the distribution of diameter classes and the height of the trees.



Source: Eco Ingeniero Team

Figure No. III.l. Location of sampling plots and observation sites alongside the proposed project path.

The following table and figure show the location of plots.

TABLE No. **III.l.** COORDINATES OF SMBP PLOTS

NAME	COORDINATES		SECTORS
PASSWORD	NORTH LATITUDE	WEST LONGITUDE	
TAP1	13°30'47.40"	88°15'13.20"	*Road Expansion Section*
TAP2	13°30'43.70"	88°15'1.80"	*Road Expansion Section*
TAP3	13°30'40.68"	88°14'54.60"	*Road Expansion Section*
TAP4	13°30'37.90"	88°14'44.70"	*Road Expansion Section*
TAP5	13°30'35.00"	88°14'35.20"	*Road Expansion Section*
TAP6	13°30'29.50"	88°14'18.50"	*Road Expansion Section*

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NAME PASSWORD	COORDINATES		SECTORS
	LATITUDE NORTH	LONGITUDE WEST	
TAP7	13°30'21.00"	88°13'52.70"	*Road Expansion Section*
TAP8	13°30'16.28"	88°13'36.68"	*Road Expansion Section*
BMP9	13°30'11.20"	88°13'18.60"	*City Forest*
BMP10	13°30'12.50"	88°13'17.20"	*City Forest*
BMP11	13°30'14.02"	88°13'15.76"	*City Forest*
CPP12	13°30'18.00"	88°13'11.10"	*Croplands and Grasslands*
CPP13	13°30'26.10"	88°13'1.90"	*Croplands and Grasslands*
CPP14	13°30'32.10"	88°12'51.90"	*Croplands and Grasslands*
CPP15	13°30'36.40"	88°12'41.20"	*Croplands and Grasslands*
CPP16	13°30'40.70"	88°12'22.00"	*Croplands and Grasslands*
CPP17	13°30'41.80"	88°II'38.80"	*Croplands and Grasslands*
CPP18	13°30'43.80"	88°II'26.10"	*Croplands and Grasslands*
CPP19	13°30'58.40"	88°II'5.20"	*Croplands and Grasslands*
BRP2O	13°31'13.40"	88°10'54.20"	*Riparian Forest*
CPP21	13°31'5.62"	88° 9'32.36"	*Croplands and Grasslands*
CPP22	13°30'47.30"	88° 974.76"	*Croplands and Grasslands*
CPP23	13°30'32.20"	88° 9'5.60"	*Croplands and Grasslands*
BRP24	13°30'18.40"	88° 8'51.50"	*Riparian Forest*
CPP25	13°29'47.30"	88° 8'49.60"	*Croplands and Grasslands*
CPP26	13°29'37.60"	88° 9'3.40"	*Croplands and Grasslands*
CPP27	13°28'53.30"	88° 8'39.90"	*Croplands and Grasslands*
CPP28	13°27'34.30"	88° 7'55.30"	*Croplands and Grasslands*
CPP29	13°27'10.10"	88° 8'0.00"	*Croplands and Grasslands*
BRP3O	13°25'58.00"	88° 8'49.50"	*Riparian Forest*
CPP31	13°25'56.10"	88° 8'56.50"	*Croplands and Grasslands*
BRP32	13°25'57.90"	88° 9'8.00"	*Riparian Forest*
BRP33	13°25'55.20"	88°9'10.20"	*Riparian Forest*
CPP34	13°25'52.80"	88°9'11.50"	*Croplands and Grasslands*

The alpha diversity value for each of the sectors was obtained, we used the formula proposed by (Moreno 2001, Smith and Smith 2001; MARN 2003), these calculations were performed in Microsoft Excel 2007. In addition, the importance value index (FVI) for tree species of the forest was determined, for this, we used the values in relative dominance terms, frequency and basal area in square meters (Smith and Smith, 2003), whose formulas are listed below

.

$$IVI = Fr + Dr + ABr$$

Where:

$$Fr = \frac{frequency\ of\ a\ species}{\sum frequency\ of\ all\ species} * 100$$

$$Dr = \frac{\#\ of\ individuals\ of\ a\ species}{total\ of\ individuals} * 100$$

$$ABr = \frac{basal\ area\ of\ a\ species}{\sum basal\ area\ of\ all\ species} * 100$$

♦ *Methodology for fauna*

Species were observed for fauna registration. The scope of the study did not include population determination or inter- specific dominance of the species observed, although the populations were counted when possible and recorded and the number and location of sightings were annotated, applied to four groups of determined vertebrates and invertebrates. Direct observation will be enhanced with the use of binoculars, when possible, mainly for watching birds in flight.

Sampling was done on July 30 and 31, August 1 and 5, and October 1 and 2, 2011. Tours along project area took place from 6:00 am until 5:00 pm. For security reasons night tours were not possible.
Fauna species detected crossing the line proposed for the Bypass project, were recorded. During the tour all terrestrial vertebrate species that were observed on site were recorded. Observation frequency was recorded for each one.

- For the group of birds: Presence of characteristic nests, singing (at the time of the visit), collection of feathers and the recording of nesting, feeding and distribution areas were considered.
- Mammals and reptiles: presence of burrows as well as signs of tracks, excreta, burrows, currycombs or scratching areas and bones. (Aranda 1991, Reid 2006).
- Amphibians and reptiles: sounds, and eggs found in creeks and areas of high humidity, the method used was the turning over of stones and fallen trees, fences, clearings; concentrating on areas where ponds and slow-flowing rivers cross.
- Invertebrates: honeycombs, characteristic cavities, "talchinoles";

There were also interviews with people who live around the site to identify the presence of some species, especially reptiles and mammals. For this we used field identification guides, which supported the sighting and vestiges of the species. This data is placed into an additional table (See Table No. IV.48)

All results from direct and indirect observation of wildlife in the project will be reported using the common name of the species observed, in addition to the scientific name.

III. 1.4.3.3 Social and Economic Aspects

The aim of the study is to define social, economic and cultural characteristics of the population living in the direct and indirect area of influence.

♦ Bibliographic Research

Internal sources, such as municipalities, health units and government agencies, etc. will be used to collect bibliographic information. Each municipality will be required to provide the city´s blueprints. The type of information to be collected is: Overview of the Municipality, History of the municipality, Political-Administrative Division, data on the general population of each municipality, data on the townships and communities directly influenced, socioeconomic impact indicators, maps, plans, studies on land use, etc

- Fieldwork

The following methodology will be used to carry out the social and economic study:

- Identification of owners. Cadastral sheets were obtained for the area at the National Registry (CNR). For specific land plots whose data differed from the data provided in the field, the cadastral location was requested for verification purposes. Using the cadastral documents and supported by aerial photos, a tour was carried out to verify the names of current plot owners. In the specific case of the Road Expansion Section plots were measured widthwise, to determine the number of plots and / or owners.
- Census. The census was conducted for every family and / or owners affected by the Project. Photographs were taken of the plot and / or house. The aim of the census is to

provide a basis for the resettlement program. They were asked if they owned the land and whether they had their deed of land tenure. A copy was requested .

- A survey, using a predefined format, was passed to families in the area of direct and indirect influence. A survey was conducted on a representative sample selected among those affected either directly or indirectly by the project. A percentage of the surveys were for those affected by the right of way. For the area of indirect influence, the sample was designed to be distributed among the population in the areas.
- Interviews with renowned community members were held for a period of 30 to 40 minutes. Interviews with key members of the community, among which are included: Municipalities, Health units, community leaders, among others.
- Field observation of the affected areas

The survey collects socio-demographic information of households (age, sex, educational level, occupation). Economic information such as: income, sources of income, economic activity, migration. Social information regarding coexistence, values, traditions, beliefs, forms of organization and the reproduction of the group´s immediate environment: householders, housing, access to services, fuel for cooking and lighting, community problems, general morbidity and child morbidity.
Out of the group of techniques two types of data will be extracted: quantitative and qualitative. For the processing and systematization of the former the computer program SPSS stats or OPEN will be used. For processing the second type of data type, a specifically designed matrix will be used.
Thanks to the survey the families that would need to be resettled were identified. The social and economic features of these families will be described. The results are presented following the guidelines of the World Bank.

III.1.4.4 Project road section assessment

The description of the environment and the entire project is presented for the entire project. Only the cost-benefit analysis and environmental management program are separated into these two sections, for purposes of a better assessment and subsequent execution of the project at the time of its construction. The sections are:

1. SECTION 1: From the beginning of the project to highway CAÍ (a La Unión)
2. SECTION 2: From highway CAÍ (to La Unión) to RN17 (El Delirio Street)

III. 1.5 *Fieldwork period*

Fieldwork in general took place between 30 July 2011 and 23 September of the same year, according to the project´s planned schedule. For specific studies see the details below:

TABLE No. III.2. PERIODS IN WHICH THE FIELD WORK WAS PERFORMED, SMBP 2011

TOPIC	STARTING	ENDING
Physical aspects		
Climate, air quality and noise	August 23, 2011	November 28
Geology and soils	July 30, 2011	August 27, 2011
Hydrology and water quality	August 11, 2011	November 15
Biological Aspects		
Sampling of wildlife	July 30, 2011	August 8, 2011
Arboreal Census	July 30, 2011	November 10
Social aspects		
Census	July 30, 2011	September 3, 2011
Survey	July 30, 2011	August 20, 2011
Interviews	August 15, 2011	September 14, 2011

Source: Eco Ingenieros Team

III.2 PURPOSE AND NEED

The downtown area of the city of San Miguel, due to its dense urban population, is developing a crises in its internal road system, generating a high level of congestion to its current network. The traffic running along the Panamerican Highway towards the East, on Roosevelt Avenue that stretches across the city, is dramatically affected by this, causing delays, traffic jams and higher transportation costs to users. The project aims to reduce travel time for users of the Pan American Highway, bypassing the downtown area of San Miguel. It is estimated that the project will benefit the entire population of the city of San Miguel, which currently amounts to approximately 299.817 inhabitants.

The Pan American Highway (CA: 1) is one of the main routes of the transportation grid in our country and in Central America, as it is one of the corridors that cuts through its entire length, making it a major artery with a high vehicular movement. It has a direct influence on all departments, since the public and private transportation develops from here to benefit all economic sectors.

Due to its characteristics, this highway connects dense population centers in its contours, as is the case of San Miguel city in the department of the same name. Their level of service is affected directly by the daily traffic flow moving in the downtown area of that city, increasingly diminishing the effectiveness of transporting users to other departments.

Because of this situation, the proposal is to build a 4-lane road surrounding the city of San Miguel, from km 131.91 going through the Township of El Sitio, Hato Nuevo, crossing the Military Road, arriving at the Pan American Highway and ending on the road to the coast, with a total length of 21.36 km.

The Project is important due to the following:

III.2.1 *Regional Importance: Puebla-Panamá Plan*

The national priority is to promote the physical integration of the Mesoamerican region, given the geographical position of El Salvador, it has the potential to emerge as a hub for products, not only for the Central American area but regionally, accentuating the need for mobilization through an adequate road infrastructure support.

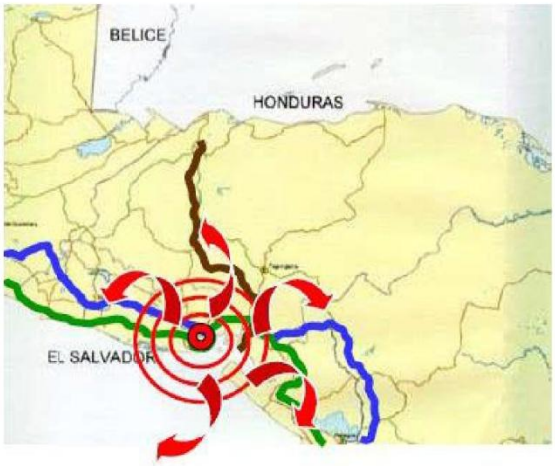
As of 2001, a Central America integration initiative was established, called Puebla Panama Plan. The initiative includes the physical integration of the region through the development of the regional road network, called RICAM (International Network of Mesoamerican Highways). In 2006, a meeting was held with the presence of the ministers of Public Works and Transport of the region and some more road sections were added to the RICAM, being the San Miguel bypass one of them. (The memorandum of understanding is attached in Annex III-1).

The map below shows the current status of the Ramales corridor and additional connections, considered under the road inventory of El Salvador as essential roads to channel trade and industrial development opportunities in our country.

Panamerican Highway. (San Miguel Bypass Road), MOP.

Figure No. III.2. Road Corridors in El Salvador

The project will help improve traffic flow in the sector, namely through the reactivation of the port of La Union, allowing for the fast and safe movement of trailer trucks. Also, allowing for traffic and cargp flow from the north to the south of Central America, aiding in the connection of the Pacific and interoceanic logistics corridors, and enabling the connection of the port of La Union with Puerto Cortez, in Honduras.



Source: Study Profile: "Construction of Section CA:1 - El Papalón - Hato Nuevo – Panamerican Highway. (Bypass San Miguel) ", of the MOP.

Figure No. III.3. Diagram illustrating Project regional connectivity

111.2.2 *Five-year Government Plan*

"The Five Year Development Plan 2010-2014" prioritizes economic recovery that should include the improvement of roads in the eastern region, especially where this project site is located. Economic recovery is a priority for the current government (2009-2014) due to the high level of poverty in the country. The Bypass is one of the major projects that will contribute to economic recovery of the country.

III.2.3 *The National Plan for Land Use and Development (PNODT)*The PNODT raised the Territorial Development policy and strategy, although with no legal force, it is currently used as a reference. The Bypass of San Miguel is considered as one of the priority projects to ensure the transportation capacity along the CA-1 (Carretera Panamericana) since it is one of the three main roads leading to the development of the country. The city of San Miguel is the fourth largest city in the country and it is located in the center of the eastern region with 220 000 inhabitants. The main economic activities are trade and services. The Department of San Miguel, whose provincial capital is the city of San Miguel, has over 430,000 inhabitants (7.6% of the total population) and is responsible for 5% of the gross domestic product (GDP). The economic activation and population growth both in the city of San Miguel and the adjacent cities has caused a permanent gridlock that has become a serious problem, especially in the section of the CA-1 through the center of the city, which mixes urban transport and pass through transportation. The Territorial Development Plan of the San Miguel Subregion (2010-2024) developed in 2010, indicates the need to build a bypass passing through the suburbs of San Miguel, to solve the economic and environmental problems due to the permanent gridlock situation. Currently, heavy transport represents more than 20%. From a logistical standpoint for Central America, the relief of the bottleneck around San Miguel is important and the bypass can be a base infrastructural that will
contribute to sustainable economic development.

III.2.4 *Traffic Study*

It is worth mentioning that according to the traffic study, referred to later in the document, the need for the project is evident to clear the streets of the city. Crossing the city, especially during rush hours, can take more than thirty minutes.

III.2.5 *Objectives*

III.2.5.1 Project General Goal

Contribute to the economic, social, commercial, tourist, industrial development of the country, through increased traffic flow in the eastern part of our country, giving users a better alternative for a more efficient mobilization and integration for moving within the metropolitan area of San Miguel.

III.2.5.2 Project Specific Objectives

- Build a By-pass to provide vehicular flow continuity between the departments of San Miguel, La Union and Morazán.
- Solve the Internal traffic congestion in the City of San Miguel reducing internal passage of users with departmental destinations.
- Contribute to the National Highway Program, this project being part of the measures to improve the national network
- Integrate this work to existing environment in the development zone.

III.2.6 *Project Benefits*

The benefits arising from the construction of a road as the Project San Miguel Bypass can be grouped into different categories, each of which requires a particular methodology for calculation. In particular, the benefits expected from the implementation of this project are:

- Build a main lane with geometric features that will allow for vehicular mobility and fluidity. The emphasis will be concentrated on offering a way with sufficient road capacity to meet current and future demand.
- Provide the project of a road surface that ensures durability and walkability.
- Provide the road with the vertical and horizontal signaling necessary, as well as all basics to provide a level of safety.
- Contribute to the economic growth of the area, to provide the beneficiary population with

a sound highway, which will encourage them to harvest a larger area for the crops characteristic of the area.
- Savings in the operating costs of vehicles.
- Savings in time for passengers. Project implementation brings a decrease in travel time due to increased velocity.
- Savings in time of loading. This is an important analysis when transporting perishable materials and travel time presents many delays. It is also very relevant when moving high value products to the market.
- Cost savings in accidents, since there is a substantial improvement in highway geometry.
- Substantial increase in freight vehicle trips.
- Savings in road maintenance costs.
- Reduced congestion on the main roads of the city, that is in the Ruta Militar (RN18) and Roosevelt Ave.

The current commute along 16 kilometer long Roosevelt Ave (San Miguel) takes almost 30 minutes at a speed of 40 km / h, since it goes through a high-traffic commercial area and intersects different intersections with traffic lights. With the implementation of the project, commute distance increases to 21.87 Km, offset by the decrease in travel time, at a speeds over 80 kmh, completed in just 17 minutes.

III.3 BACKGROUND

The project is in the feasibility and design phase, which includes this EIS, to reach this stage there were several previous studies among which we can mention:
- Initial report: project profile, with a first assessment and project approach.
- Interim Report. Analysis of the socioeconomic and natural characteristics of the project area and conduction of the traffic study and preliminary economic evaluation and the verification of the relevance of the project in conformance to national and regional plans. This economic evaluation indicated that the project has an internal Rate of Return (IRR) of 12.1%, and a Net Present Value (NPV) of 26.95million, discounting future costs and benefits, at an updated rate of 8.5%, representing the country´s estimated opportunity capital cost.
- Preliminary sketch and analysis of alternatives: different routes that were evaluated on technical, social and environmental aspects.
- Conducting first public consultations. There have been three project public consultations.
- Presentation of the environmental form and TOR reception.

Parallel to this EIS, the following studies were also performed as detailed:
- Detailed Survey
- Soil studies
- Feasibility Study: includes preliminary design, implementation plan
- Hydrological study

III.3.1 *Traffic Study*

The traffic study was conducted as part of the evaluation of the project, it is presented for the interim report in Annex III.2. The main objective of the study was to understand the current situation of the traffic in the area under study, to estimate the matrix of Origin - Destination that will be used to forecast traffic demand.

To perform the traffic study, three types of studies were carried out in ten stations: traffic counts, which included: manual traffic count classified by vehicle type and an automated categorized count and an interview regarding source and destination.

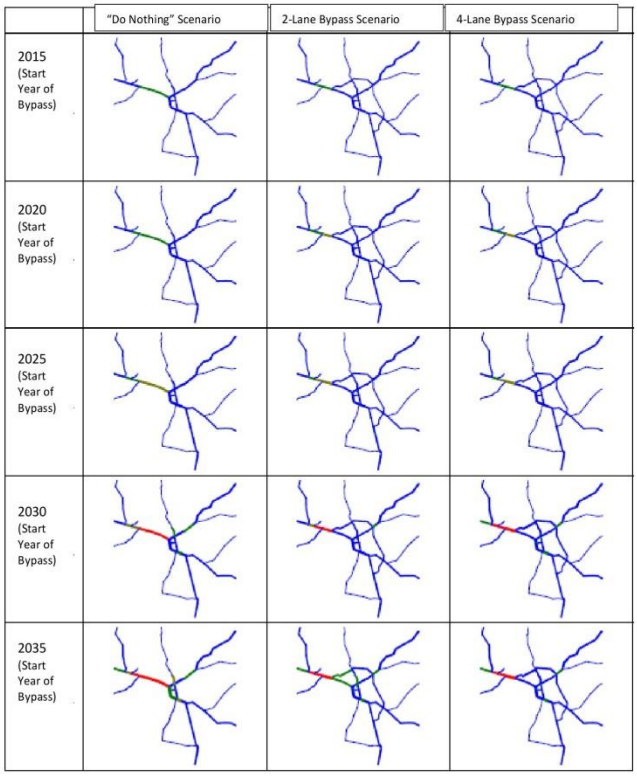
Based on the results of the study, a demand forecast on future traffic demand was performed for the design and economic analysis. The forecasting method is the one used by the MOP. The current flow of traffic was modeled.

For the San Miguel Bypass demand forecast, we propose the following three alternatives:

- Do-Nothing Case: No bypass construction
- 2 lane Bypass Case: Construct a 2-lane bypass
- 4 lane Bypass Case: Construct a 4-lane bypass

Two scenarios were drafted for the future demand forecast, one with a growth of 3.5% for all vehicles and one with a growth of 5% for private vehicles and 2% for commercial vehicles. The future demand of the La Union Port was also considered. We analyzed the option of doing nothing, the two-lane and the four-lane options.

The color given to each connection road shows the volume capacity ratio (VCR) if less than 1.00 it is shown in blue; less than 1.20 in green; less than 1.50 in yellow, red and higher, respectively, the thickness of each connection, shows the volume by PCU. The following graphs display the analysis results.



Source: JICA Survey Team

Figure No. III.4. Traffic Demand

The roads connecting with the western part of San Miguel become the bottleneck to traffic flow at any stage and in any case. In Scenario I, the capacity of the 2-lane bypass (2-lane bypass scenario) is expected to be insufficient by 2035, while the 4-lane Bypass (4-lane by-pass scenario), will still be sufficient. In Scenario II, in which a larger traffic generation is estimated, the ability of the 2-lane bypass (2-lane bypass scenario), is expected to be insufficient by 2030.

Based on future traffic demand by 2035, as set out in Chapter 5, it was determined that the construction of a four-lane bypass is recommended. As shown in Figure III.4, the stretch between Moncagua and the Bypass is the busiest one of all the scenarios analyzed.