17.3. SITUATION OF THE PRESERVATION OF RUINS AND CULTURAL ASSETS

17.3.1. ADMINISTRATION OF THE PRESERVATION OF RUINS AND CULTURAL ASSETS

(1) National Institute of Culture

The National Institute of Culture (INC) is the highest organization of cultural wealth administration, whose competition is the designation, protection, investigation and study of the cultural wealth of the nation. Designation is done by this unitary national institute, there is no cultural wealth designated by department or by province. The institute elaborates and manages a national inventory list of cultural wealth; its regional branch manages it at each regional level. Callao has the INC Regional Directive Office of Callao. The National Council of Cultural Heritage is an organization that approves and determines important matters in cultural wealth administration, like bills of regulation about protection and rehabilitation of cultural heritage, projects of acquisition and appropriation of cultural wealth, and so on.

(2) General Direction Office of Education and Culture of Lima

The Metropolitan Municipality of Lima has a Directive Office of Historic Monumental Heritage and Tourism under the umbrella of the General Directive Office of Education and Culture, whose competition is the promotion of tourism making good use of the historic heritage. The General Directive Office of Urban Development administrates center city rehabilitation projects. For the protection and recuperation of city center there is the PROLIMA (Lima Historic Center Municipal Recuperation Program) office, which is a trans-sectional organization of the Metropolitan Municipality of Lima.

(3) Directive Office of Education and Culture of Callao

The provincial government of Callao has a Directive Office of Education and Culture under the umbrella of the General Directive Office of Social and Cultural Services, which administrates cultural wealth.

17.3.2. RUINS OF FORMER INHABITANTS

Lima, located in the pacific coastal zone, was rich in marine products brought by ocean currents, and had prosperity in agriculture in the oases along the Rivers of Chillón, Rímac and Lurín, though located in the desert where there is almost no precipitation. In these areas there were inhabitants from ancient times, who had built up human cultures. After Christ, the native Lima Culture (0 - 700) was developed in the area of Lima, the Maranga Culture (400 - 1200) constructed prosperous settlements near the cost. the Waris came down from the Andes Mountains escaping from conflicts with the Chancas, bringing Andean crops and domestic animals like vicuñas to the area, and they built the Wari Culture (700 - 1400). The Ishmay Culture (1400 - 1440), excelling in constructions like pyramids with ramps, had prosperity in the area just before the Inca Empire accomplished the unification of the whole country in 1440. The area of Lima was incorporated into the territory of the empire. The Inca Empire was tragically destroyed by the Spaniard Francisco Pizarro in 1532.

In the study area there are a lot of archeological ruins such as human settlements, shrines, pyramids and graves of different ages and cultures. However, these ruins before the Inca age are very fragile to wind erosion, as they are made of so-called adobe or sun-dried clay. Most of the once existed ruins have already been destroyed by wind erosion, Spanish colonization and modern urbanization.

Amongst them, the ruins worth noticing are: the regional ceremonial complex of Pachacámac located on a hill near the mouth of the Lurín River (Pachacámac District); the city ruins of the local kingdom of Maranga (San Miguel District); the Aramburú Pyramid in the campus of San Marcos University (Lima District); the Huaca Pucllana Pyramid (Miraflores District); the Huaca Huallamarca Pyramid (San Isidro District); the Cajamarquilla Ruins (Lurigancho District), and so on.

In the city center of Lima there were shrines, buildings, roads and irrigation networks of the Inca Age before the Spanish constructed a city of grid plan and colonial style. Nowadays, most of the ruins have disappeared only showing traces of the Inca road in Quilca Street, for example, which runs across the grid system. The principal archeological Ruins of Lima are presented in Table 17.3-1 and the locations are shown in Figure 17.3-1.

Table 17.3-1 Chronology and Archaeological Sites in the Lima Area

Years	Eras	Periods	Chillón Valley	Rímac Valley	Lurín Valley
1532	Inca Empire	Late Horizon	- Tambo Inca - Fortaleza de Collique	- Armatambo - Mateo Salado - Huallamarca	- Pachacámac (Temple of the Sun)
1400	Regional States	Late Intrermediate	- Collique	- Huallamarca - Puruchuco - Huaycan, Jicamarca - Limatambo, San Borja - Santa Catalina	- Pachacámac
1000	Wari Empire	Middle Horizon	- Socos	- Huallamarca - Cajamarquilla	- Pachacámac
600 A.D.100	Regional Developments	Early Intermediate	- Culebras - Media Luna	- Huallamarca - Catalina-Huanca - Huaca Juliana - Maranga	- Pachacámac
B.C.200	Formative	Early Horizon		- Jicamarca - Huallamarca - Garagay	- Tablada de Lurín - Cardal - Mina Pérdida
3,000 10,000 20,000	Archaic Litic	Preceramic	- Paraiso - Chivateros II - Oquendo - Zona Roja	- Chira-Villa	

Source: Huallamarca Site Museum

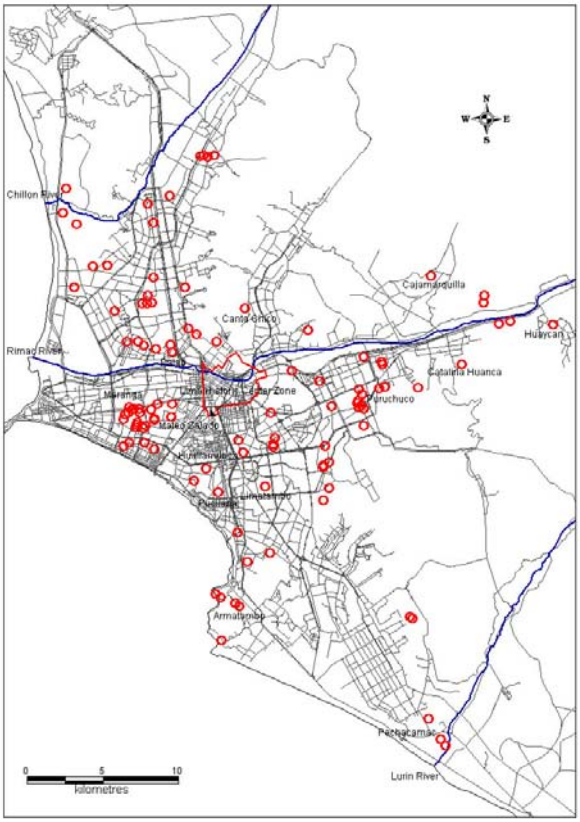


Figure 17.3-1 Main Archaeological Ruins in the Lima Area

Temple of the Sun in the Pachacámac Ruins (Pachacámac District)

Pyramid with Ramp in the Pachacámac Ruins

Figure 17.3-2 Pachacámac's Ruins

Aramburú Pyramid of the Maranga Ruins and Av. Venezuela (Lima District)

Mateo Salado of the Maranga Ruins (Lima District)

Figure 17.3-3 Maranga's Ruins

Pucllana Pyramid, (Miraflores District)

Huallamarca Pyramid (San Isidro District)

Figure 17.3-4 Pucllana and Huallamarca's Pyramid

17.3.3. LIMA HISTORICAL CENTER ZONE

The central shrine, constructed by Francisco Pizarro in 1535 after conquering the Incas, was the first step of the colonization of Lima. At that time the Rímac River was navigable, and the left bank was selected to construct the colonial city. Lima enjoyed prosperity as capital of the vice-king territory and base of colonial development. For protection against buccaneer attacks, the construction of an 11.7 km long fort wall began in 1683 and was finished in 1713. However, in 1746 it was destroyed severely by a large earthquake, which produced 1,141 victims in Lima out of 60,000 inhabitants at that time. In the process of enlargement of the city the fort became an obstacle for development, it was demolished by the city authority in 1870. Nowadays just slight parts of the ruins can be seen in the Muralla Park at the Rímac riverside and in Rivera y Dávalos Street near El Cercado Plaza. See Figure 17.3-5.

Muralla (City Wall) Park at Rimac riverside (Lima District)

City Wall Watch Tower (El Agustino District.)

Figure 17.3-5 City Wall

Earthquakes often attacked the city. In the 20th century two major earthquakes, in 1940 and 1950, destroyed almost all of the buildings made of adobe, thus, adobe construction was later prohibited in the city.

In the center city Lima there are 680 pieces of cultural wealth registered by the government. They include temples, old government buildings, mansions and other historical buildings, though some of them were rebuilt after disasters, including works of neo-renaissance architecture built in the end of the 19th century influenced by France and Italy.

In the center of Lima the San Francisco Church and Convent (the 1st designation, 1988) and the Historic Zone of Lima (the 2nd designation, 1991) are registered by the UNESCO as world cultural heritage sites of humanity (See Figure 17.3-6). Besides these, other historical city centers registered by the UNESCO in Latin America include La Habana of Cuba, San Juan of Puerto Rico, Cartagena of Colombia, Santo Domingo of Dominican Republic and others. In the center of Lima various programs have been executed for recuperation and rehabilitation. At this moment the historic city center is administrated according to Ordinance No.62, and the Lima Historic Center Municipal Recuperation Program (PROLIMA) is promoted by the provincial government on the basis of the Master Plan of the Center of Lima determined by Ordinance No.201.

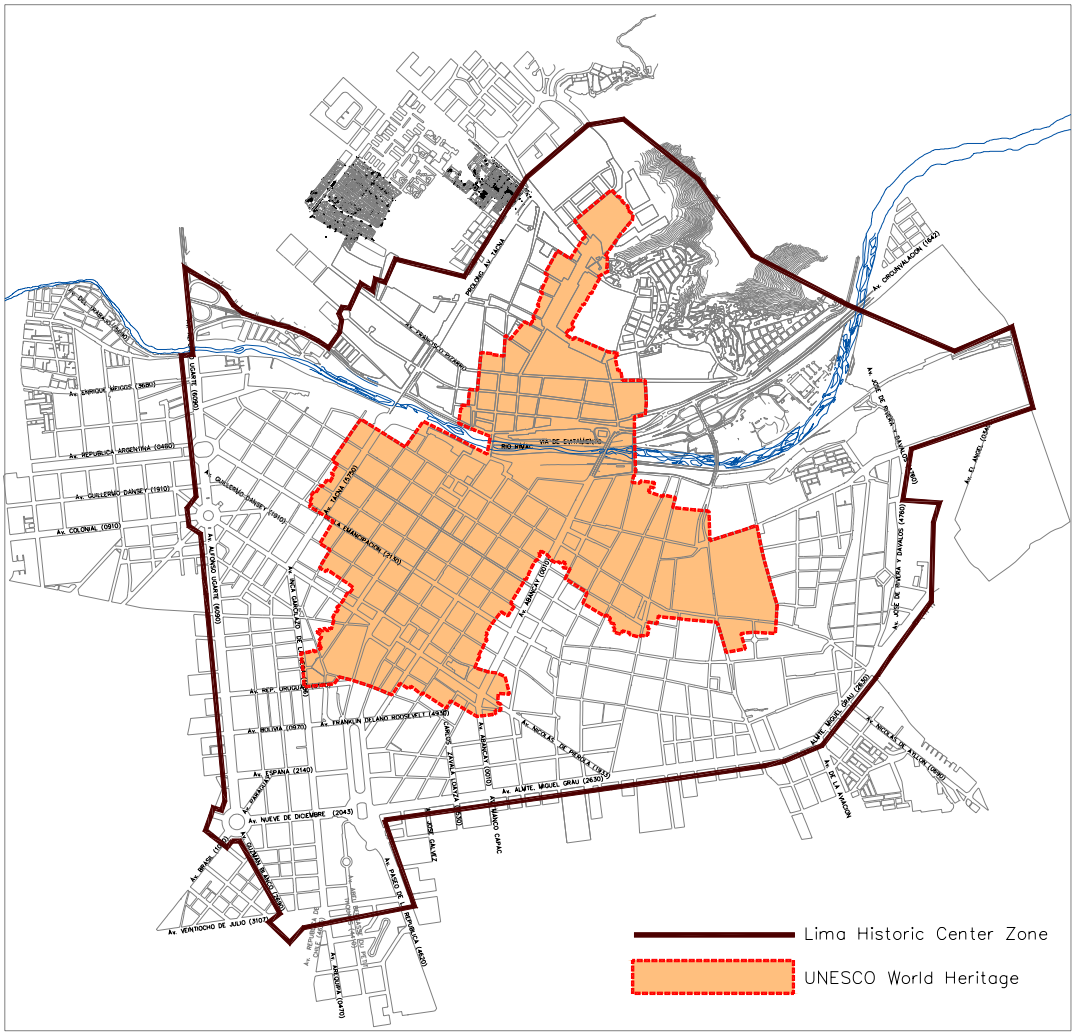


Figure 17.3-6 Lima Historic Center Zone and UNESCO World Heritage

Plaza Mayor and Cathedral (Lima District)

Archbishop Palace at Plaza Mayor

Figure 17.3-7 Plaza Mayor

Mayor's House at Plaza Mayor

Figure 17.3-8 Mayor's House at Plaza Mayor

San Francisco Temple (Lima District)

Figure 17.3-9 San Francisco Temple

Balta Bridge at Rimac River (Lima District)

Figure 17.3-10 Balta Bridge

Eastside City Wall (El Agustino District)

Figure 17.3-11 Eastside City Wall

17.3.4. OLD BUILDINGS AND URBAN MONUMENTS

Not only in the Lima Historical Center Zone, but also outside of it, there are lot of old buildings and urban monuments shown in Figure 17.3-12, which have also been declared as national cultural patrimony.

8-forked crossing of Plaza 2 de Mayo (Lima District)

Plaza Bolognesi (Lima District)

9 de Diciembre Av. (Lima District)

Neoclasical Building in Paseo de la República Av. (Lima District)

Military History Museum (Lima District)

Justice Palace (Lima District)

Figure 17.3-12 Old Buildings and Cultural Monuments

17.3.5. CULTURAL ASSETS OF CALLAO

Callao has been an important port city developed from the colonial age as early as Lima. Callao is unique constitutional province in Peru given special autonomy by constitution in 1857.

The old town was constructed in La Punta Peninsula. The town was destroyed several times by the attack of buccaneers. Ramparts were constructed in the 16th and 17th centuries, however almost of the ramparts and rows of buildings were destroyed at one time by a tsunami in 1746, 4,800 people were killed and only 200 survived. There are almost no ruins left of that age.

In La Punta Peninsula there is the Real Felipe Fort, which was constructed for protection against buccaneer attacks. The construction began one year after the tsunami disaster and it was finished after 29 years. The fort is registered as a national heritage site and used by the national army as its base and military political museum. See Figure 17.3-13.

There are about 40 old buildings with balconies in the city center. Recuperation projects are being prepared for them. The La Punta Cape area has been developed for many years as a place of seaside villas. There are old mansions built from the 19th century to early 20th century, which are registered as cultural wealth (Figure 17.3-15).

Real Felipe Fortress (Callao District)

Figure 17.3-13 Real Felipe Fortress

Plaza Grau (Callao District)

Figure 17.3-14 Plaza Grau

Mansion in La Punta Peninsula

Mansion in La Punta Peninsula

Villa in La Punta Peninsula

Villa in La Punta Peninsula

Figure 17.3-15 Old Mansions

17.3.6. CONSTRUCTION IN REGISTERED CULTURAL ASSETS

Any construction of new buildings, modification, enlargement, restoration which is related to declared cultural wealth property requires, in advance, the authorization of the National Institute of Culture (INC) for its starting. Municipal licenses without authorization of the INC are invalid. In this case, penal responsibility shall be applied to public officials, owners of the property and constructors (Article 1, Law No.27580, Law of Protection Measures applied to Construction in Cultural Properties by the National Institute of Culture).

Construction related to cultural heritage should be executed under technical specifications authorized by the INC. For the cases of aggression, modification or destruction of property violating this provision the INC will charge it to public prosecution (Article 2, ditto). The INC can stop and/or demolish the construction related to cultural heritage in the case that it is done without previous authorization of the INC, that it is done violating technical specifications of the INC or changing the specifications without authorization, overlooking the specifications (Article 3, ditto). Stop orders and demolishment orders from the INC are given in a compulsive way, and all the costs should be assumed by the responsible persons (Article 4, ditto).

17.3.7. MANAGEMENT OF BURIED CULTURAL ASSETS

In the study area a lot of archeological ruins from pre-Columbian age have already been destroyed by wind erosion, Spanish colonization and modern urbanization. However, there is possibility of discovering underground ruins in case of excavation by road construction, for example, in the center of Lima ruins of building foundation and drainage of colonial age might be discovered. When an archeological ruin is discovered in a construction spot the constructor is obliged to inform the INC of the discovery immediately. The INC can order the necessary measures, including a halt of the construction, considering the circumstances (Art.18, Supreme Resolution 004-2000-ED). In this case, the INC can order the constructor to conduct an archeological evaluation investigation. The constructor can not continue the construction until the determination of measures concluded according to the investigation.

In the case that some buried cultural assets are expected to be discovered in advance, the INC can order one of the following measures: 1) The INC orders the constructor to conduct an investigation of archeological evaluation (Art.8 and Art.21, ditto) by way of excavating trench, within the area that is investigated, and is authorized a certification of inexistence of archeological remains (Art.65, ditto) and the construction can be practiced. 2) The INC orders the constructor to conduct an Archeological Rescuing Monitor with a permanent archeological supervisor on the spot to practice the construction.

17.3.8. PRINCIPAL REGULATIONS ON CULTURAL ASSETS MANAGEMENT

Table 17.3-2 presents the principal regulations on Cultural Assets Management:

Table 17.3-2 Principal Regulations on Cultural Assets Managements

Regulated Matter	Regulation Name (in Spanish)
General Law of National Cultural Heritage Protection	Ley 24047 de 1984, Ley General de Amparo al Patrimonio Cultural de la Nación
Law of Protection Measures applied to Construction in Cultural Properties by the National Institute of Culture.	Ley 27580 de 2001, Ley que dispone medidas de protección que debe aplicar el Instituto Nacional de Cultura para la ejecución de Obras en Bienes Culturales Inmuebles
Regulation regarding Archeological Investigation	Resolución Suprema 004-2000-ED, Reglamento de Investigaciones Arqueológicas
Administrative Procedure Guide of the General Direction of Archeological Heritage of the National Institute of Culture	Texto Único de Procedimiento Administrativo (TUPA) 2002, Dirección General de Patrimonio Arqueológico
Lima City Ordinance for the Administration of the Historic Center for Execution of Construction in Public Spaces	Ordenanza 203-1998, MML, Reglamento para la Ejecución de Obras en las Áreas de Dominio Público
Lima City Ordinance for the Administration of the Historic Center	Ordenanza 062-1994, MML, Reglamento de la Administración del Centro Histórico de Lima
Lima City Ordinance for Master Plan of the City Center	Ordenanza 201-1998, MML, Plan Maestro del Centro de Lima
Lima City Ordinance for Vehicle Transit Control in the City Center	Ordenanza 132-1997, MML, Marco de Tránsito en la Provincia de Lima
Callao City Ordinance for Technical Verification of Public Construction in City Heritage	Ordenanza Municipal del Callao 007-2002, Reglamentan el Procedimiento de Verificación Físico-técnica de Obras Públicas a incorporarse al Patrimonio Municipal

17.4. ENVIRONMENTAL REGULATIONS AND PROCEDURES

17.4.1. ENVIRONMENT AND NATURAL RESOURCES CODE

The Code of Environment and Natural Resources (Legislative Decree No. 613 of 1990) is a basic regulation of environmental administration of Peru, which was promulgated just before the United Nations Conference on Environmental and Development providing the following principal matters:

Chap. 1 Environmental Policy, Chap. 2 Environmental Planning, Chap. 4 Measures of Security, Chap. 5 Evaluation, Guard and Control, Chap. 6 Science and Technology, Chap. 7 Educative Actions, Communication Measures and Participation of Citizens, Chap. 8 Natural Heritage, Chap. 9 Genetic Diversity and Ecosystems, Chap. 10 Natural Protection Areas, Chap. 11 Natural Cultural Heritage, Chap. 12 Mineral Resources, Chap. 13 Energetic Resources, Chap. 14 Population and Environment, Chap. 15 Prevention of Natural Disasters, Chap. 16 Economic and Service Infrastructure, Chap. 17 Public Health, Chap. 18 Public Sanitation, Chap. 19 Water and Sewage, Chap. 20 Administrative Sanctions.

It is worth noticing that this code provides, for the first time, the participation of citizens' communities in defining the environmental policy and execution and application of environmental policy (Art. 34, Legislative Decree No. 613) and that any person can have access to information regarding the necessary deeds carried out by the competent authority for environmental protection (Art. 35, ditto).

17.4.2. ENVIRONMENTAL IMPACT EVALUATION SYSTEM

In April of 2001 the Law of the National System of Environmental Impact Evaluation (EIA Law, Law No.27446) was issued prescribing fundamental matters about methods of Environmental Impact Evaluation (or Assessment). This Law obliges responsible persons to conduct Environmental Impact Evaluation for any public and private construction and other activities of investment projects that might produce environmental impact. In the process of evaluation citizens' participation is guaranteed.

Environmental Impact Evaluations are classified into the following 3 categories according to environmental risk (Art. 4, Law 27446):

a) Category I: An Environmental Impact Declaration is necessary for projects that might not produce negative environmental impacts in a significant way.
b) Category II: Semi-detailed Study of Environmental Impact (EIA-sd) is necessary for projects that might produce negative environmental impacts moderately, whose negative effects could be eliminated or minimized by way of easy application of environmental measures.
c) Category III: Detailed Study of Environmental Impact (EIA-d) is necessary for projects that might produce significant negative environmental impacts quantitatively or qualitatively, which require profound analysis for examining impacts and to propose strategies of environmental management.

Environmental Impact Evaluations and their categorization are managed and administrated by each environmental section of each ministry concerned.

For example, environmental impact evaluations of transport and roads projects are managed and administrated by the Directive Office of Socio-Environmental Evaluation under the umbrella of the General Directive Office of Socio-Environmental Matters of the Ministry of Transport and Communication.

In the case that two or more than two different competent activities are included in a project the competent authority will be only one ministry which sector has the most income of them (No. 18-3, Art. 18, ditto). When it is not possible to determine one sector the Directive Board of the National Council of the Environment (CONAM) will be the competent authority (No. 18-4, Art. 18, ditto). The CONAM is the highest authority in the practice of environmental impact evaluations.

The Terms of Reference of the environmental impact studies are determined by each environmental authority (Art. 9, ditto). Environmental Impact Studies shall be disposed to the public and public hearings shall be held to present the studies. The National System of Environmental Impact Evaluation (SEIA) promotes citizens' participation in the procedures of Environmental Impact Study (Art. 13 and Art. 14, ditto).

After examining the Environmental Impact Study the competent authority will emit a Resolution for approval or disapproval of the study. In the case of approval, Environmental Certification will be constituted and by way of the certification the project or action will be authorized (Art. 12, ditto).

The competent authority is responsible in conducting pursuit, supervision and control of the environmental impact evaluation with sanction when necessary. The authority can conduct pursuit, supervision and control by way of a qualified organization or company of the third party (Art. 15, ditto).

17.4.3. ENVIRONMENTAL IMPACT EVALUATION ON ROAD AND TRANSPORT PROJECTS IN LIMA AND CALLAO

According to the Environmental Impact Evaluation Law the competent authority of environmental evaluation of road and transport projects is the Ministry of Transport and Communication, which administrates national roads, but not projects of the Regional and Local Governments. The law above mentioned does not determine the competence of Regional and Local Governments. Regulations related to the Regional and Local EIA authorities have not yet been established.

Therefore, at the moment of this study (December of 2004), there is no authorized organization that administrates and evaluates the EIA Studies of road and transport projects of Lima and Callao.

In this connection, the Metropolitan Municipality of Lima does not have any specialized section of environmental administration but some professionals in charge of environmental matters that are distributed in some sections; on the other hand the Provincial Government of Callao has a General Directive Office of Environment.

Nevertheless, the EIA Study itself for road and transport projects of Lima and Callao is considered an obligation to be conducted in the stage of the Detailed Design, but not in the stage of the Master Plan or Feasibility Study. For a better continuation of environmental studies the CONAM is recommending project promoters to conduct EIA Studies before the stage of the Detailed Design.

In the case of the Lima Urban Transport Program (PTUL) and the High Capacity Segregated Corridor (COSAC) Project the Strategic Environmental Assessment Study and the Technical Environmental Study were conducted by PROTRANSPORTE of Lima according to the specifications of the World Bank and the Inter-American Development Bank, as the introduction of financing of the two banks is planned to realize the projects. These studies are equivalent to the category III of the Environmental Impact Evaluation Law. It goes without saying that these banks are not environmental organizations. However, approval of environmental studies is fundamental for the acquisition of financing.

17.4.4. ENVIRONMENTAL CONTROL STANDARDS AND EMISSION LIMITS

The Environmental Quality Standard of the Atmosphere and the Permissible Emission Limits of Automobile Exhaust Gases were determined for the first time in Peru in 2001 by decree. The Environmental Quality Standard of Noise was also determined in 2003.

(1) Environmental Quality Standard of the Atmosphere

The Environmental Quality Standard of the Atmosphere was determined by Supreme Decree No.74, which annexes No.1, No.2 and No.3 are presented in Table 17.4-1 to Table 17.4-3 respectively.

Table 17.4-1 National Environmental Quality Standard of the Atmosphere

Contaminants	Period	Standard Form		Method of Analysis
		Value (μg/m³)	Format	
Sulfur Dioxide	Annual	80	Annual arithmetic mean	UV fluorescence (automatic method)
	24 hours	365	Not exceeding more than once a year	
PM-10	Annual	50	Annual arithmetic mean	inertial separation / filtration (gravimetry)
	24 hours	150	Not exceeding more than 3 times a year	
Carbon Monoxide	8 hours	10,000	Mobile average	no disperse infrared (NDIR) (automatic method)
	1 hour	30,000	Not exceeding more than once a year	
Nitrogen Dioxide	Annual	100	Annual arithmetic mean	chemiluminescence (automatic method)
	1 hour	200	Not exceeding more than 24 times a year	
Ozone	8 hours	120	Not exceeding more than 24 times a year	UV photometry (automatic method)
Lead	Annual	The standard will be determined according to article 5 of the present regulation.		method for PM-10 (spectrophotometry of atomic absorption)
	Monthly	1.5	Not exceeding more than 4 times a year	
Hydrogen Sulfide	24 hours	The standard will be determined according to article 5 of the present regulation.		UV fluorescence (automatic method)

PM-10 : Suspended Particulate Matter smaller than 10μ

Table 17.4-2 Values of Transition

Contaminants	Period	Standard Form		Method of Analysis
		Value (μg/m³)	Format	
Sulfur Dioxide	Annual	100	Annual arithmetic mean	UV fluorescence (automatic method)
PM-10	Annual	80	Annual arithmetic mean	inertial separation / filtration (gravimetry)
	24 hours	200	Not exceeding more than 3 times a year	
Nitrogen Dioxide	1 hour	250	Not exceeding more than 24 times a year	chemiluminescence (automatic method)
Ozone	8 hours	160	Not exceeding more than 24 times a year	UV photometry (automatic method)

PM-10 : Suspended Particulate Matter smaller than 10μ

Table 17.4-3 Referential Values

Contaminants	Period	Standard Form (μg/m³)	Method of Analysis
PM-2.5	Annual	15	inertial separation / filtration (gravimetry)
	24 hours	65	

PM-2.5 : Particulate Matter smaller than 2.5 μ

(2) Permissible Emission Limits of Automobile Exhaust Gases

The Permissible Emission Limits of Automobile Exhaust Gases are determined by Supreme Decree No. 47, which annexes present Emission Limits of 1) Automobiles in Circulation in Peru, 2) New Automobiles Fabricated in Peru or Imported to Peru and 3) Used Automobiles Imported to Peru. The Permissible Emission Limits of Vehicles with Motors of Gasoline, Liquefied Petroleum Gas and Natural Gas of fabrication year of 2003 and after are presented as follows (See the collected information for the cases of different year of fabrication):

Table 17.4-4 Limit for Vehicles with Motors of Gasoline, Liquefied Petroleum Gas and Natural Gas (light, medium, heavy vehicles) (Year of fabrication: 2003 and after)

CO % of Volume	HC (ppm)	$CO+CO_2$ % (minimum)
0.5	100	12

Table 17.4-5 Limit for Vehicles with Motor of Diesel (light, medium, heavy vehicles) (Year of fabrication: 2003 and after)

Opacity: k(m^{-1})	Opacity in %
2.1	60

(3) Environmental Quality Standard of Noise

The Environmental Quality Standard of Noise, as shown in Table 17.4-6, is determined by Supreme Decree No. 85 of 2003.

Table 17.4-6 National Environmental Quality Standard of Noise

Applicable Zones	Values Expressed by LAeqT	
	Day Time (07:01-22:00)	Night Time (22:01-07:00)
Special Protection Zone	50	40
Residential Zone	60	50
Commercial Zone	70	60
Industrial Zone	80	70

Note: LAeqT means continuous Sound Pressure Level equivalent to that with adjustment A.

17.4.5. ANTI-POLLUTION REGULATIONS OF CALLAO

The Provincial Government of Callao has advanced in coping with environmental management more than Lima or the national government, as Callao has been confronting pollution problems as a city of international marine port, airport and industry.

(1) Provincial Ordinance for Operation Licenses

Callao has a regulation system to watch, control, sanction and authorize industrial activities, for example, Functional Licenses and Functional Authorizations (Provincial Ordinance for Functional Licenses and Functional Authorizations). Whereas the obligation of conduction of environmental impact studies by the Law of the National System of Environmental Impact Evaluation is applied only to new investment projects but not to existing industrial activities.

The objects for Functional Licenses and Functional Authorizations of the Callao Ordinance are mainly industries as well as commercial and service activities. Callao is the only city in Peru that has environmental control systems against commercial and service activities. In

Callao, all of the factories and industrial facilities that produce exhaust gases and other pollutants are inventoried and their emission limits are determined one by one. All of the factories and industrial facilities have to declare, on a yearly basis, the planned amount of emission to ask for permission. If not permitted, they cannot operate industrial activities. If permitted, Functional Licenses and Functional Authorizations are granted for operation and the activities will be controlled by the environmental authority. These environmental authorizations should be renewed every year.

(2) Provincial Ordinance for Lead Dust Control

In Callao, lead dust rose in the air when unloading and loading of lead ore had contaminated the air and the soil of the port area and had produced lead poisoned patients. The Provincial Decree for Control of Storage, Manipulation and Transport of Lead Ore and the Provincial Decree for Reduction of Lead Dust Contamination and Marine Terminal oblige mineral transporters to construct huge transshipment facilities into which mineral trains and trucks must enter, and where the unloading and loading of the mineral should be done in completely closed conditions. The facilities were constructed in 2003 and the problem is almost resolved.

(3) Bill of Provincial Ordinance for Airplane Noise Control

The Provincial Government of Callao is preparing a Bill of Provincial Ordinance for Airplane Noise Control. The ordinance will oblige airline companies to adopt low-noise taking-off methods recommended by the ICAO (International Civil Aviation Organization), and will sanction the airline companies if violated. The ordinance will apply Functional Licenses and Functional Authorizations to commercial air transport services.

17.4.6. OTHER ENVIRONMENTAL REGULATIONS

There are important regulations related to this project as shown in Table 17.4-7 to Table 17.4-9 respectively.

Table 17.4-7 National Environmental Regulations

Regulated Matter	Regulation Name (in Spanish)
Code of Environment and Natural Resources	Código del Medio Ambiente, Decreto Legislativo 613
Law of Environmental Impact Evaluation System	Ley 27446 del 2001, CONAM, Ley del Sistema Nacional de Evaluación del Impacto Ambiental
Decree for Environmental Quality Standard and Permissible Emission Limits	Decreto Supremo 044-1998-PCM, Reglamento Nacional para la Aprobación de Estándares de Calidad Ambiental y Límites Máximos Permisibles
Environmental Quality Standard Program 2001	Resolución Presidencial 054-2001-CONAM/PCD, Programa Anual 2001 para Estándares de Calidad Ambiental (ECAs)
Guideline for the Elaboration of "Air Cleanup Plan"	Resolución Presidencial 022-2002-CONAM/PCD, Directrices para la Elaboración del Plan "A Limpiar el Aire"
Environmental Quality Standard of the Atmosphere	Decreto Supremo 074-2001-PCM, Reglamento de Estándares Nacionales de Calidad Ambiental del Aire
Decree of Air Contaminants Alert	Decreto Supremo 009-2003-SA, Aprobación del Reglamento de los Niveles de Estados de Alerta Nacionales para Contaminantes del Aire
Bill of Decree of Environmental Quality Standard of Lead in the Atmosphere	Resolución Presidencial 011-2003-CONAM/PCD, Anteproyecto del Decreto Supremo, Estándares Nacionales de la Calidad Ambiental de Aire para Plomo
Decree of Removal and Reduction of Lead Contained Gasoline in the Market	Decreto Supremo 019-1998-MTC, Disponen eliminar del mercado la oferta de Gasolina 95 RON con Plomo y reducir el Límite Máximo de contenido de Plomo en la Gasolina 84 RON
Decree of Deadline Postponement of Lead Reduction in Gasoline	Decreto Supremo 034-2003-MTC, Decreto Supremo que suspende obligación contenida en el Decreto Supremo 019-1998-MTC
Permissible Emission Limits of Automobile Exhaust Gases	Decreto Supremo 047-2001-MTC, Límites Máximos Permisibles de Emisiones Contaminantes para Vehículos Automotores que circulan en la Red Vial
Regulation of Standardization of Control Equipment for Automobile Exhaust Gases	Resolución Directorial 008-2002-MTC/15.23, Aprobación de Homologación de Equipos para el Control de Límites Máximos Permisibles de Emisiones Contaminantes de Vehículos
Procedure Regulation of Standardization of Control Equipment for Automobile Exhaust Gases	Decreto Supremo 007-2002-MTC, Establecen Procedimiento para Homologación y Autorización de Equipos a utilizarse en el Control Oficial de Límites Máximos Permisibles de Emisiones Contaminantes para Vehículos Automotores
Environmental Quality Standard of Noise	Decreto Supremo 085-2003-PCM, Aprueban el Reglamento de Estándares Nacionales de Calidad Ambiental para Ruido

Table 17.4-8 Environmental Regulations of Lima

Regulated Matter	Regulation Name (in Spanish)
Provincial Ordinance for Obligatory Technical Revision of Automobiles	Ordenanza 506 del 2003, MML, Disposición que Vehículos Automotores que circulan en la Provincia de Lima deberán aprobar Revisión Técnica

Table 17.4-9 Environmental Regulations of Callao

Regulated Matter	Regulation Name (in Spanish)
Provincial Ordinance for Functional Licenses and Functional Authorizations	Ordenanza Municipal 007-2001, Aprueban Reglamento de Licencias y Autorizaciones Municipales de Funcionamiento
Provincial Decree for Transit Control of Heavy Transporters of Minerals	Decreto de Alcaldía 021-2001, Establecen vías autorizadas para circulación de las unidades de transporte pesado de carga de concentrados de minerales en la Provincia Constitucional del Callao
Provincial Decree for Control of Storage, Manipulation and Transport of Lead Ore.	Decreto de Alcaldía 016-2001, Establecen disposiciones relativas al almacenamiento, manipulación y transporte de concentrado de mineral de Plomo en el Callao
Provincial Decree for Reduction of Lead Dust Contamination and Marine Terminal	Decreto de Alcaldía 025-1999, Aprueban Directiva sobre medidas de Mitigación de Contaminación Ambiental que deben observar depósitos de concentrados de minerales y el Terminal Marítimo de ENAPU.
Provincial Ordinance for Atmosphere Contamination by Automobiles	Ordenanza Municipal 009-2002, Aprueban Ordenanza que regula el Control de la Contaminación Atmosférica producida por el Parque Automotor
Cooperation Convent between Callao and CONAM about Humanized Transport	Convenio Marco de Cooperación Interinstitucional entre la Municipalidad Provincial del Callao y el FONAM, 2003 (1. Humanizando el Transporte: Lima y Callao con Calidad de Vida, 2. COSAC)
Provincial Decree for Mitigation of Contamination by Tobacco	Decreto de Alcaldía 001-2001 y Directiva sobre Medidas de Mitigación de la Contaminación Producida por el Tabaco, Reglamentando la Ordenanza Municipal 002-1993-MPC
Provincial Ordinance for Prohibit, sanction and Control of Bothersome Noises	Ordenanza Municipal 005-1994, Prohibición, Sanciones y Control de Ruidos Molestos
Bill of Provincial Ordinance for Airplane Noise Control	Proyecto de Ordenanza para mitigar la Contaminación Sonora producida por las Aeronaves Comerciales en la Provincia Constitucional del Callao
Cooperation Convent between Callao and GTZ about Project of Purifying Waste Water and Its Utilization	Convenio de Cooperación Técnica (Proyecto “Agua de Riego Higienizada para la Producción Agrícola Local y el Cuidado de las Zonas Verdes”, GTZ)

17.5. PROCEDURE OF INHABITANTS RELOCATION AND PROJECT CASES

17.5.1. PROCEDURE OF LAND ACQUISITION

(1) Land Purchase

In road construction projects when the plan is determined a Supreme Resolution will be promulgated by the governmental office to announce to the public the determined axis and width of the road. Governmental offices are authorized to have priority in purchasing determined road land for public welfare.

When acquiring the land the governmental office initially conducts a study of landownership and by way of consigning to the National Council of Appraisal (CONATA) land value study. Secondly, the governmental office sends proprietors notary notification documents informing of the purchase intention. When there is reply of accordance from the proprietor in 15 days the purchase contract will be concluded immediately, and the payment will be done after 45 days from the contract signing (direct treatment acquisition, Supreme Decree No. 313). By the way, in the cases of road projects, 10% surplus will be added to the CONATA value for promoting smooth procedures of purchase land by Law No. 27628.

(2) Compensation for Residence Right and Commercial Right

There is no compensation system in Peru for the right of residence and the right of commerce related to property purchase to whoever is the owner or tenant of the property.

17.5.2. PROCEDURE OF EXPROPRIATION

After sending proprietors' notary notification documents if there is no reply of accordance or there is refusal, the governmental office will adopt procedures of compulsory expropriation treatment. The expropriation procedure will be consigned to the power of justice. The execution of expropriation will be decided by the power of justice. The land value applied to expropriation is the same as the commercial value by the CONATA, though there is no promoting surplus in this case. When the procedure takes considerable time after CONATA's appraisal the acquisition price will be adjusted on the basis of the price change indicator given by the National Institute of Statistics and Information (INEI).

17.5.3. ACQUISITION OF ILLEGALLY OCCUPIED LAND

(1) Cases with Possession Right

In Peru, a person who has occupied a land and lived there for more than 10 years will have the right of possession of the land and will have possibility to obtain the proprietorship by way of registration. When governmental offices purchase such land in a process of registration the government has to wait for the termination of the registration to proceed with the land purchase.

(2) Cases without Possession Right

There is no compensation of land acquisition for the occupants not possessing the land more than 10 years as they do not have possession right.

17.5.4. PROJECT CASES OF INHABITANTS RELOCATION

(1) Lima International Airport Enlargement Project

The relocation of occupying inhabitants from the project site was needed for the enlargement project of the Lima International Airport promoted by the Peruvian Corporation of Airports and Aviation (CORPAC). The organization in charge of execution was CORDELICA (Development Corporation of Lima and Callao). An Urban Expansion Zone of the Ventanilla District was selected for the relocation adjusting to the future land use plan. 420 families were relocated supplying each family with 140 m^2 of land and 24 m^2 of prefabricated residence with the minimum standards. The project cost was 3,600 Soles per family contributed by way of CORPAC and CORDELICA from the national expenditure.

The procedure was done by way of direct treatment acquisition on the basis of Supreme Decree No. 313 (the Expropriation Law). For the acquisition of the project site CORPAC and CONATA conducted the landownership study and socio-economic study followed by the environmental impact study. In the procedure of the relocation, coordination was done by way of community assemblies and consultation by families.

(2) Callao-Canta National Road Project

The relocation of 78 families from the project site of the National Road Callao-Canta was executed by the National Institute of Civil Defense (INDECI). The institute constructed the urbanization of Pachacutec in the Ventanilla District and supplied each family with 120 m^2 of land and 11 m^2 of residence at a cost of 3,600 Soles each. The Social countermeasures were done by INDECI utilizing the expenditure of PRONAA (National Program of Nourishment Assistance). However, the registration of the property of the relocated residences has been left untouched for now.

(3) Rímac River Disaster Inhabitants Relocation Project

The relocation of inhabitants of the disaster danger zones along the Rímac River in the middle and lower areas was executed by the National Institute of Civil Defense (INDECI). During 1995 and 1996 as many as 3,000 families were relocated to the San Juan de Lurigancho District and the Villa El Salvador District. The institute supplied each family with 120 m^2 of land at US$1,500 and 11 m^2 of residence made from the so-called triplay at US$250. The project cost was paid by way of INDECI from the national expenditure.

In this project the institute transferred neither possession rights nor ownership to the relocated families because of the idea of temporal relocation by disaster. There were some defects in the project caused by the lack of inter-institutional cooperation, for example, there was no water supply in the relocated sites.

(4) Displaced People Return Support Program

The Displaced People Return Support Program (PAR) is a program to support displaced people that have escaped from rural regions of guerrilla conflict so they can return to their home region, which has been supported by the Ministries of Agriculture, Industry, Woman, Defense and the Interior together with NGOs under the umbrella of the Ministry of the Presidency. Many of the displaced people had lived in the urban fringe of the metropolitan area of Lima. About 1,000 of these families were able to return to their home regions through the collaboration of the Ministry of Defense and the National Army and some other 300 families were returned by the Ministry of the Interior. The costs were assumed by each ministry.

However, there were a lot of difficulties as the circumstances had changed, in some cases, for more than 10 years since the displacement, it is difficult for once displaced people to get jobs in their home regions, for children to have school teachers, and so on. The program was not significantly successful with regards to the real meaning of returning home.

(5) Swamp Inhabitants Relocation Project in Callao

There were inhabitants occupying swamp areas with miserable living conditions in Callao. The Provincial Government of Callao carried out a relocation project making good reuse of containers abolished in the port. The government transformed the containers into living facilities and brought them to the relocation site for these people.

17.6. PROCEDURE OF INHABITANTS PARTICIPATION AND PROJECT CASES

17.6.1. DEMOCRACY IN PERU

Peru was under military government administration and democracy had been controlled until 1979. Since that time, and until now, civil governments have been continued all the time. The exertion of the right to vote is obligatory in Peru since the 1980s. Every Peruvian adult is obliged to possess a National Identification Document (DNI). The DNI is needed to vote, and when voting a silvery stamp will be stuck on the DNI as a certification of discharge of duty. If you do not have this stamp on your DNI, your DNI will be invalid for signing contracts, consigning checks in banks, applying for a passport and other procedures that require identification. You have to pay a penalty of approximately US$30 to get a yellow stamp for activating your DNI.

Voting is promoted in a very unique way that is not seen in other countries. However, people have a feeling of distrust of politics and governmental authorities, reflected from political corruptions and traditionally unstable administration changes. Citizens' Participation in administration has just started in Peru since 1990 and the related

regulations have also been developed just recently, a common tendency in other countries in Latin America.

In 2003 a Citizens' Participation System was created for municipality budget compilation and development plans.

17.6.2. CITIZENS' PARTICIPATION SYSTEM

(1) Organic Law of Municipalities

In Peru there is an Organic Law of Municipalities (Law 27972, May 2003) that provides for neighbor citizens' participation in local administration. This law says that local governments should promote citizens' participation in formulation, debate and agreement of development plans, budget and execution. And for this achievement the local government must guarantee all the neighbors the access to the information (Art. 112, Law 27972). The law also says that a neighbor can exert the right of participation in a municipal administration of a province or district by means of the following mechanism: 1) voting right of municipal officials, 2) initiative in the formation of dispositions, 3) referendum right, 4) right of accusing infraction and right of being informed, 5) open council meeting, 6) participation in neighbor assemblies, neighbor committees, neighbor associations, common organizations, social or other similar means of neighbor character, 7) committee of execution (Art. 113, ditto).

The citizens' participation forms part of a Planning System of the local government and municipalities regulate neighbors' participation in the formulation of participative budgets (Art. 53, ditto).

Municipal Councils constitute Neighbors' Councils by way of election of public convocation. Neighbors' Councils are engaged in supervising local public services, observance of municipality norms and execution of public works. Credited Representatives of Neighbors' Councils have the right to speak in the sessions of Municipal Council Assemblies (Art.116, ditto).

The representatives of neighbors have to co-participate in Operation Committees, established by municipal resolution, in the execution of works and the operation of economic development (Art.117, ditto).

(2) Framework Law of the Participative Budget

The Framework Law of the Participative Budget (Law 28056) was proclaimed in November of 2003. One of the objectives of this law is to reinforce the relationship between the state and society by formally introducing, in the ambit of public operation, a new form to comprehend and exercise citizenship in the framework of creative and complementary exercise of direct and representative democracy that generates shared compromises and responsibilities (Art.3, Law 28056)

The law determined Participant Agents as persons who have the right to speak and vote in discussion and decision making in the process of participative budget procedures. Participant Agents are integrated by members of the Local Coordination Council, members of the Local Council and representatives of the Civil Societies identified by regulation. Civil Societies are social organizations with territorial or thematic base, like private organizations or institutes within the local ambit (Art.1, ditto).

Workshops, or Participant Agent Meetings, will be convoked by mayors so as to identify the problems from the thematic and territorial viewpoints and the potentiality of the province or district, as well as to propose actions to operate(Art.1, ditto).

17.6.3. INHABITANTS' ADMINISTRATION IN LIMA

The Metropolitan Municipality of Lima has the General Office of Neighbors' Participation, which contains the Sections of Special Projects, Incubating Neighbors' Organizations and Lima Cercado Affairs. Each district municipality has its own office of Neighbors' Participation to cope with the inhabitants' administration. The Lima General Office coordinates 42 District Municipality Offices and at the same time directly administrates the Lima Cercado District, which does not have its proper district municipality.

The 43 offices of Inhabitants' Administration are different in name and structure from each other, possibly according to the fiscal condition and administration policy of each district. The majority are Neighbors' Participation offices or Citizens' Participation offices. Many of them belong to the Planning and Budget section, as the operation of the participative budget is the main task of inhabitants' administration after the Organic Law of Municipalities was proclaimed. Others belong to the Social Welfare section, Community Service section, Development Plan section, and so on. See Table 17.6-1.

Table 17.6-1 Districts Offices of Neighbors' Participation in Lima

No.	District Municipality	Name of Section
1	Ancón	Municipality Office
2	Ate /Vitarte	Directive Office of Citizens' Participation
3	Barranco	Planning and Budget office
4	Breña	Planning and Budget office
5	Carabayllo	Planning and Budget office, Division of Neighbors' Participation of DEMUNA and OMAPE
6	Chaclacayo	Municipality Office
7	Chorrillos	Division of Neighbors' Participation and Social Promotion
8	Cieneguilla	Office of Social Welfare and Neighbors' Councils
9	Comas	Directive Office of Neighbors' Participation and Citizens' Security
10	El Agustino	Neighbors' Participation Office
11	Independencia	Office of Planning, Budget and Rationalization
12	Jesús María	Neighbors' Participation Office
13	La Molina	Directive Office of Citizens' Participation, Subdirective Office of Neighbors' Organizations
14	La Victoria	Directive Office of Neighbors' Participation
15	Lima /Cercado	General Office of Neighbors' Participation, Cercado Office
16	Lince	Social Promotion Office
17	Los Olivos	Citizens' Participation Office
18	Lurigancho /Chosica	Directive Office of Planning and Budget, Subdirective Office of Citizens' Participation
19	Lurín	Subdirective Office of Planning and Budget
20	Magdalena del Mar	Directive Office of Neighbors' Participation and Budget
21	Miraflores	Directive Office of Neighbors' Participation
22	Pachacámac	Directive Office of Budget
23	Pucusana	Municipality Office
24	Pueblo Libre	Neighbors' Participation Office
25	Puente Piedra	Neighbors' Participation Office
26	Punta Hermosa	Promotion and Development Office
27	Punta Negra	Directive Office of Community Services
28	Rímac	Neighbors' Participation Office
29	San Bartolo	Municipality Office
30	San Borja	Directive Office of Neighbors' Participation
31	San Isidro	Directive Office of Communication, Neighbors' Participation and Special Projects, Subdirective Office of Neighbors' Participation
32	San Juan de Lurigancho	Citizens' Participation Office
33	San Juan de Miraflores	Integral Development Plan Office, Subdirective Office of Neighbors' Participation
34	San Luis	Directive Office of City Services, Neighbors' Participation Division
35	San Martín de Porras	Directive Office of Social Welfare and Human Development, Subdirective Office of Social and Community Service
36	San Miguel	Directive Office of Citizens' Participation and Social Development
37	Santa Anita	Directive Office of Planning and Budget, Subdirective Office of Neighbours' Participation
38	Santa María del Mar	Directive Office of Municipality
39	Santa Rosa	Municipality Office
40	Santiago de Surco	Subdirective Office of Neighbors' Participation
41	Surquillo	Directive Office of Budget, Subdirective Office of Neighbors' Participation
42	Villa El Salvador	Directive Office of Promotion and Social Welfare
43	Villa María del Triunfo	Neighbors' Participation Office

(1) San Juan de Lurigancho District

The San Juan de Lurigancho District is said to have 1,000,000 inhabitants, though there is no up-dated statistic data. The district area is divided into 8 zones (zonas) by the municipality office, made up of 27 common areas (comunas) and 685 local units (locales) approximately. Each zone has 3 or 4 common areas; each common area has 15 to 20 local units.

Each local unit has its own leader elected by democratic way and registered in the Citizens' Participation Office (made up of 12 officials).

The main task of the office is to operate the Participative Budget compilation. About 30 participative budget meetings were held from June to October in 2004 in the budget compilation processes on a local level. The representatives of the Local Coordinative Councils are elected in a democratic way. The 6 elected representatives participated in the Municipality Council Assemblies together with the 15 city councilors, and presented their opinions and voted for the budget.

The Participative Budget is now in the process of its development, as it has just started in 2003, the district office is holding workshops for leader education. Public halls are used for participative events.

Branch Office of Municipality of San Juan de Lurigancho

A Public Hall (UGEL) in San Juan de Lurigancho

Figure 17.6-1 San Juan de Lurigancho

(2) Cercado District

In the Cercado District, other than participative budget activities, some special projects are promoted so as to incubate and foster community activities and organizations.

a) Beautiful Lima Project:
In the historic center of Lima there are a lot of aged buildings of old styles, some of which were not well maintained by the owners, showing dirty walls with graffiti and posted bills left abandoned. The colors of the wall paint were selected inadequately without harmony in neighbor buildings, and this caused an ugly and disorganized image of the old city landscape.
The General Office established the "Beautiful Lima Project", which was planned to renovate the painting of the walls of old buildings by the participation of neighbors concentrating their opinions to create more beautiful urban landscapes. The neighbors had many discussions regarding the selection of the most suitable colors for the old city being advised by some specialists, and they finally selected out some harmonized colors. The General Office purchased a large quantity of paint

materials at one time by cheaper price and offered it to the community. The project was executed successfully under the collaboration of the community. Many of the neighbors offered their labor and painted the walls themselves to carry out the so-called "Beautiful Lima".

b) Clean Roof Project:
Some of the historical buildings in the city center were not maintained very well because of economical difficulties of the owners showing that bulky refuse like old furniture, for example, were abandoned and left on the roofs. The bulky refuse affected the roofs because of the weight and threatened the durability of the buildings. The refuse was left as there was no public cleaning service that dealt with large size refuse after the privatization. The neighbors asked the city office if they could hire a truck together with other neighbors to pick up the refuse at one time, as it would be expensive to hire a truck one by one only for small amounts of refuse. Then the General Office established the "Clean Roof Project" to solve the problem. The project was executed successfully under the collaboration of the community. The main objective of the inhabitants' administration is to incubate the creation of community organizations by way of realizing grass-root movements like above-mentioned participative projects that are executed when budget is available.

However, there are not a lot of examples of participative discussion regarding study, planning and execution of urban development plans or road construction projects realized by way of the neighbors' participation office.

17.6.4. INHABITANTS' ADMINISTRATION IN CALLAO

The Provincial Government of Callao has the General Office of Neighbors' Participation, which contains the Divisions of Special Projects and Neighbors' Organizations to cope with inhabitants' affairs (Table 17.6-2).

The Callao General Office coordinates 5 District Municipality Offices and at the same time directly administrates the Callao District, which does not have its proper district municipality.

Table 17.6-2 Districts Offices of Neighbors' Participation in Callao

No.	District Municipality	Name of the Section
1	Bellavista	Directive Office of Neighbors' Participation
2	Callao	Directive Office of Neighbors' Participation, Neighbors' Organization Office
3	Carmen de la Legua	Neighbors' Participation Office
4	La Perla	Neighbors' Participation Office
5	La Punta	Neighbors' Participation Office
6	Ventanilla	Directive Office of Neighbors' Participation

(1) Ventanilla District

The Ventanilla District has 336,216 inhabitants according to the survey of the Directive Office of Neighbors' Participation in 2004. The district area is divided into 5 zones (zonas) by the municipality office, made up of 257 habitat nuclei (núcleos habitacionales). There are several types of habitat nuclei as follow: Recognized Invaded Inhabitance (asentamientos humanos reconocidos), Not Recognized Invaded Inhabitance (asentamientos humanos no reconocidos), Formalized Amplification (ampliaciones formalizadas), Urbanization (urbanizaciones), Cooperative (cooperativos), Association (asociaciones), Habitat Grouping (agrupaciones habitacionales), Residential Group (grupos residenciales) and Neighbor Council (juntas vecinales), as shown in Table 17.6-3. The Directive Office of Neighbors' Participation (made up of 14 officials) has a data base of the 257 habitat nuclei.

Table 17.6-3 Habitat nuclei and inhabitants in Ventanilla

(unit: persons)

Zone / Habitat nuclei	North	South	East	West	Center	Total
Recognized Invaded Inhabitance	19	31	21	15	16	102
Not Recognized Invaded Inhabitance	2	8	3	40	-	53
Formalized Amplification	-	-	-	-	7	7
Urbanization	-	-	-	-	6	6
Cooperative	-	7	-	6	-	13
Association	1	6	-	23	6	36
Habitat Grouping	-	-	18	-	-	18
Residential Group	-	-	-	21	-	21
Neighbour Council	-	-	1	-	-	1
Total habitat nuclei	22	52	43	105	35	257
Total Lots	10,886	16,242	9,847	18,839	11,429	67,243
Total Inhabitants	54,430	81,210	49,235	94,195	57,145	336,215

Source: Directive Office of Neighbors' Participation of Ventanilla

Each habitat nucleus has its own leader elected by democratic way and registered in the Neighbors' Participation Office.

The main task of the office is to operate the Participative Budget compilation. More than 10 participative budget meetings were held from June to October in 2004 in the processes of budget compilation an a local level. The representatives of civil societies are elected in a democratic way. The 5 elected representatives participated in the Municipality Council Assemblies together with city councilors, and presented their opinions and voted for the budget.

The Participative Budget is now in the process of its development, the directive office is promoting municipal school of leader formation.

17.6.5. INHABITANTS' PARTICIPATION IN ENVIRONMENTAL AFFAIRS

The Code of Environment and Natural Resources (Legislative Decree No. 613 of 1990), which is a basic regulation of environmental administration of Peru, says that direct and indirect participation of community shall be promoted for the definition of environmental policy, execution and application of environmental policy (Art. 34, Legislative Decree No. 613).

On the other hand, the Law of the National System of Environmental Impact Evaluation (Law 27446, SEIA Law) provides for the establishment of mechanisms to guarantee citizens' participation in the process of environmental impact evaluation as objective of the law (Art. 1, Law 27446). According to the law, citizens' participation plans should be presented in an environmental impact study (Art. 10, ditto). The National System of Environmental Impact Evaluation (SEIA) guarantees the petition of diffusion and participation of the community and stakeholders in the procedure of transaction of

environmental impact studies and related affairs (Art. 13, ditto). The SEIA contemplates the community participation in public dispositions and public hearings of environmental impact studies (Art. 14, ditto).

Examination and judging of environmental impact studies are conducted by each ministry concerned, in the case of transport and roads projects they are administrated by the Ministry of Transport and Communication. The ministry has a Directive Office of Socio-Environmental Evaluation under the umbrella of the General Directive Office of Socio-Environmental Matters. The General Directive Office prepared the Regulation of Citizens' Consultation and Participation in the Process of Socio-Environmental Evaluation in the Transport Section (Directorial Resolution 006-2004-MTC).

17.6.6. INHABITANTS MANAGEMENT IN PROTRANSPORTE PROJECT

In the case of projects that plan to introduce financing of the World Bank and the Inter-American Development Bank consultation studies of stakeholders are conducted in the process of planning according to the specifications of the banks. For example, in the case of the Lima Urban Transport Program (PTUL), a consultation study of stakeholders was conducted by the project promoter PROTRANSPORTE, forming a part of the Strategic Environmental Evaluation Study and the Technical Environmental Study.

In this study, hearing meetings were held with the participation of transport users of 3 districts and bus service supplier groups, and hearing studies were also conducted by interviewing specialists and intellectual persons. In these studies no officials of PROTRANSPORTE attended the meetings or interviews, but neutral social consultants presided and managed all of the study. The following meetings and interviews were realized in the study:

1) Meetings with the people living along the project routes:

    a) Inhabitants of the Independencia District.
    b) Inhabitants of the Chorrillos District.
    c) Inhabitants of the San Juan de Lurigancho District.

2) Meetings with the Bus Service Supplying Organizations:

    d) General Confederation of Transport (CGT).
    e) Metropolitan Association of Urban Transport Enterprises (AMETUR).
    f) Association of Peruvian Transport Enterprises (ASETRAP).

3) Interviews with Specialists and Intellectual Persons:

    a. Study and Development Promotion Center (DESCO).
    b. Social Investigation and Popular Education Center.
    c. Investigation and Advisory Center of Terrestrial Transport (CIDATT).
    d. Lima College of Economy.
    e. Peruvian Association of Consumers and Users (ASPEC).

The three main subjects of discussion and inquiry in the meetings with transport users and bus service suppliers are the following:

    a) Perception of the current public transport system.
    b) Perception of the future public transport system in ten years.
    c) Perception regarding transport culture and urban identification.

The three main subjects of discussion and inquiry in the interviews with specialists and intellectual persons are the following:

    a) Image concerning the current public transport system.
    b) Knowledge regarding the proposal of the PTUL and accordance or

discordance with the PTUL - COSAC I (High Capacity Segregated Corridor Phase I) project.

c) Socio-environmental management of the PTUL and role of PROTRANSPORTE for the viability.

The results of these meetings and interviews were analyzed from the points of benefits, impacts and risks and were arranged into synthesis tables according to each theme. These results were integrated with socio-environmental consideration studies to elaborate the Socio-environmental Management System.

A consultant of the mentioned study said, "In Peru people have a deep-rooted feeling of distrust of politics and governmental authorities. On the other hand, people speak actively once given an opportunity as they have a feeling of frustration for not having the opportunity of presenting their opinions. It is difficult to understand the tendencies of participants in a stereotypical manner".

17.6.7. INHABITANTS' MANAGEMENT IN OTHER PROJECT CASES

(1) Natural Gas Pipeline Project

The pipeline construction of natural gas from the Camisea gas fields (Cusco Department) to Callao was finished in 1993. In Callao various public hearings were held in the process of environmental impact evaluations regarding the section between the Chillón River and Callao.

It is noted that the project was criticized in other sites for the lack of social and environmental considerations: no operation of effective mechanisms of consulting with civil societies in the process of treating social and environmental impacts, methodological insufficiency in the environmental monitoring plan and contingency plan for the fractionation plant and marine terminal of LNG located in Lobería Beach near the Paracas National Reserve (Ica Department), insufficient guarantee for the lives and health of native indigenous inhabitants (Nantis, etc.) in the Kugapakori-Nahua Reserve (Cusco Department).

(2) Modification Affair of Territorial Reconditioning Plan

In the Province of Callao the modification of the Government Territorial Re-conditioning Plan has been studied since 2003. Various public hearings were held in the process of examination of the study.

17.7. ROADSIDE NOISE SURVEY

17.7.1. OUTLINE OF FIELD SURVEY

In order to investigate the current roadside noise condition of the Lima and Callao Metropolitan Area, the preliminary roadside noise survey was conducted by the Study Team. Within this measurement, the noise parameter, Leq, is of concern.

Basically, this roadside noise survey program is established based on the Japanese Industrial Standard, JIS Z 8731 that is also ratified by ISO. Based on the current traffic condition of the Lima and Callao Metropolitan Area, five points are chosen for this measurement. Figure 17.7-1 shows the location of all selected survey points for this measurement. Amongst them, four points are used for the 12-hours continuous (i.e., 6:00 - 18:00) roadside noise measurement while the remaining one is used for the measurement of the background noise, which has less influence of surrounding traffic conditions. A weekend survey is also carried out at one point for comparison. Table 17.7-1 and Table 17.7-2 summarize the outline of this noise measurement

Table 17.7-1 Noise Measurement

Total number of survey points = 5 Measuring period: Nov/03/04 - Nov/11/04	
Parameter	Instrument
Leq	RION NL-04 (approved by JIS C 1502)

Table 17.7-2 Field Survey Schedule (Noise)

	Locations	Survey Campaign	
		Weekday	Weekend
1	Av. La Marina Cdra. 26, San Miguel	Nov/03 (Wed)	Nov/06 (Sat)
2	Av. Globo Terraqueo Cdra. 73 Urb. Sol de Oro - Los Olivos	Nov/04 (Th)	**
3	Av Alfonso Ugarte Cdra. 12	Nov/09 (Tue)	**
4	Calle 29, Parque Barnesoni	Nov/10 (Wed)	**
5	Panamericana Sur, Av. Morro Solar y Av. Andres Tinóco	Nov/11 (Th)	**

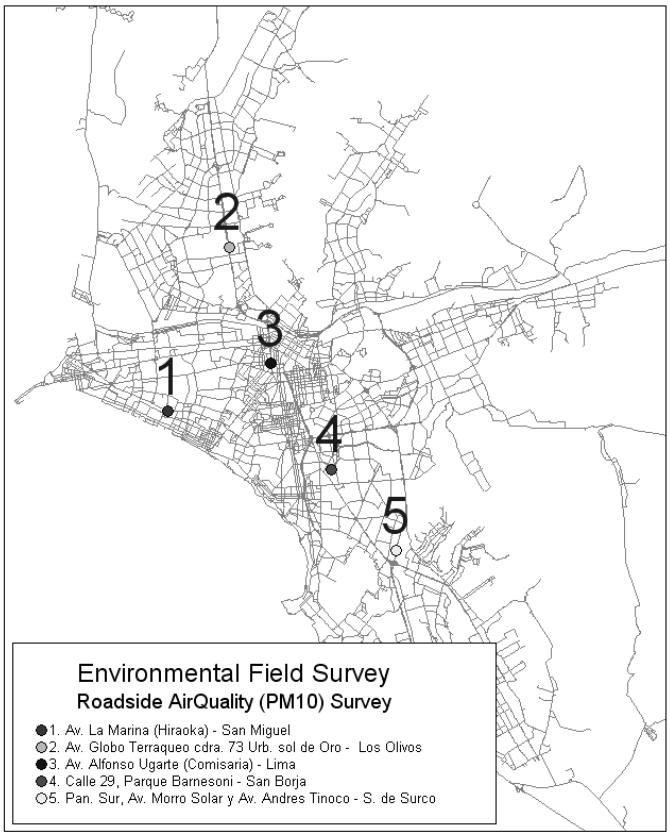


Figure 17.7-1 Site Location map (Preliminary Roadside Noise Survey)

17.7.2. RESULTS AND DISCUSSIONS

Figure 17.7-2 shows the time variation of the Leq values at four points, excluding the San Borja Site to be used for the measurement of the "background noise condition". From this figure, it can be seen that Leq values measured at all roadside points are varied between 70 and 80 dBA. Leq value measured at San Borja, where there is no severe noise impact from the surrounding traffic conditions, is always around 50 dBA (see Figure

17.7-3), although several peaks that sometimes reach 60 dBA are recognized. Upon considering the surrounding environment of the San Borja site, these peaks do not seem to be originated by traffic but caused by community activities within and/or around this park.

The difference in measured Leq values between all roadside points and San Borja may be caused by both the roadside human activities and the traffic conditions around all roadside measurement points. Also, a strong daily fluctuation pattern that would correspond to the traffic flow pattern is recognized within the survey results of all roadside points. Mainly, most of the roadside Leq variation patterns seem to have three peaks that would correspond to traffic peaks (i.e., morning, noon and evening).

The weekend noise survey is carried out at La Marina (see the survey result curve labeled "Marina-2" in Figure 17.7-2 and Figure 17.7-3). From these figures, it can be seen that no significant differences in the order of the magnitude of the noise levels observed between weekday and weekend surveys exist, although the patterns of the time variations such as the occurrence of the morning noise peak seem to be slightly different each other. For example, the morning peak is observed at around 8 a.m. in the weekday survey whereas it is observed at 10 a.m. in the weekend survey. Several large shopping malls exist along Av. La Marina and the shopping activities tend to become active during the weekend. So these survey results may reflect the tendency of those shopping activities around Av. La Marina. Thus, it can be said that a strong correlation exists between the obtained noise survey results and the surrounding environment within this survey.

In Peru, the daytime noise standards (7:00 – 22:00) for the residential and commercial zones are of 60 and 70 dBA, respectively, and most of the Leq values measured at all roadside points exceed those standards. So it can be said that the current daytime roadside environment is noisy and might cause some disruptions in human health such as hearing changes, losses, interference with speech communication and/or annoyance.

The nighttime roadside survey was not carried out within this preliminary roadside noise survey, and it is highly recommended to carry out a 24-hour continuous survey in order to grasp the comprehensive time variation of the hourly noise fluctuation and evaluate the quantitative impact of the roadside noise on human health.

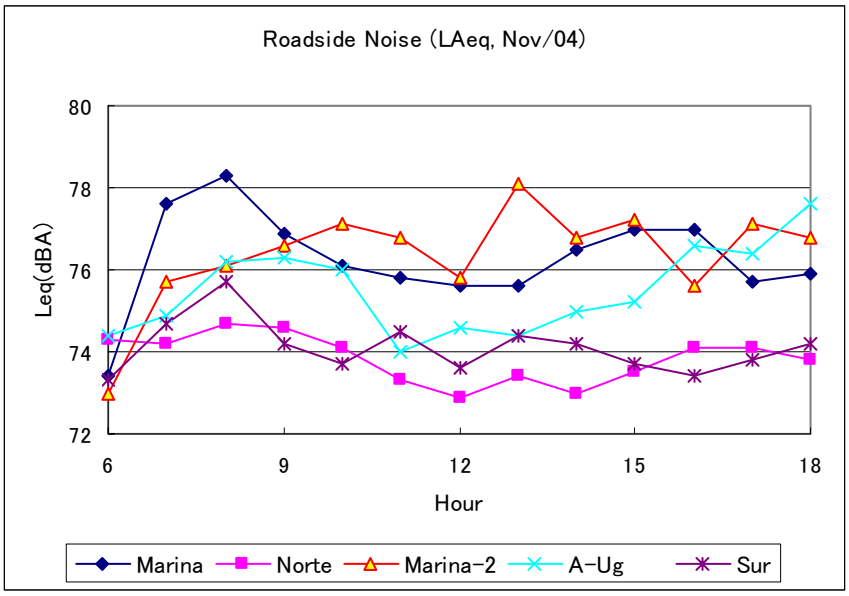


Figure 17.7-2 Noise Measurement Results (Nov/04)

Note: Survey results measured at San Borja were not included. "Marina-2" indicates the weekend survey result obtained at Av. La Marina.

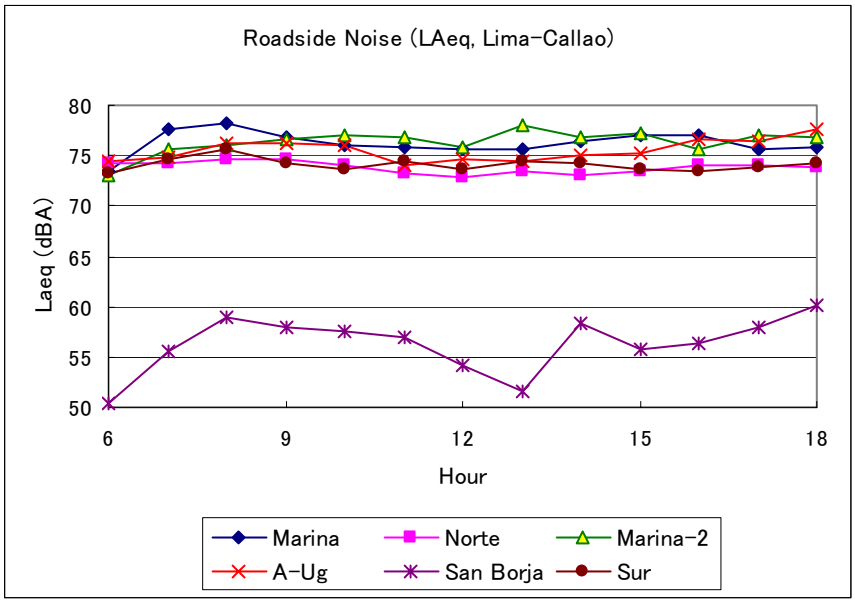


Figure 17.7-3 Noise Measurement Results (Nov/04)

Note: All survey results measured at five points are shown. "Marina-2" indicates the weekend survey result obtained at Av. La Marina.

17.8. ROADSIDE AIR QUALITY SURVEY

17.8.1. OUTLINE OF THE FIELD SURVEY

In order to analyze the current air quality conditions in the Lima and Callao Metropolitan Area, the preliminary air quality field measurement was carried out by the Study Team. Within this measurement, one air quality parameter, PM10, is of concern.

Based on the current traffic conditions of the Lima and Callao Metropolitan Area, five points are chosen for this measurement. Figure 17.8-1 shows the location of all selected survey points for this measurement. Amongst them, four points are used for the 12-hour continuous (i.e., 6:00 - 18:00) roadside air quality measurement while the remaining one is used for the measurement of the background concentration, which has less influence of the surrounding traffic condition. A weekend survey was also carried out at one point for comparison. Table 17.8-1 and Table 17.8-2 summarize the outline of this air quality measurement

Table 17.8-1 Air Quality Measurement

Total number of survey points = 5 Measuring period: Nov/04/04 - Nov/11/04	
Parameter	Instrument
PM10	PARTISOL Model 2000H Air Sampler, Rupprecht and Patashnick

Table 17.8-2 Field Survey Schedule (Air Quality)

	Locations	Survey Campaign	
		Weekday	Weekend
1	Av. La Marina (HIRAOKA), San Miguel	Nov/09 (Tue)	Nov/06 (Sat)
2	Av. Globo Terraqueo Cdra. 73 Urb. Sol de Oro - Los Olivos	Nov/04 (Th)	**
3	Av. Alfonso Ugarte (Comisaría)	Nov/09 (Tue)	**
4	Calle 29, Parque Barnesconi	Nov/11 (Th)	**
5	Panamerica Sur, Av. Morro Solar y Av. Andres Tinoóco	Nov/10 (Wed)	**

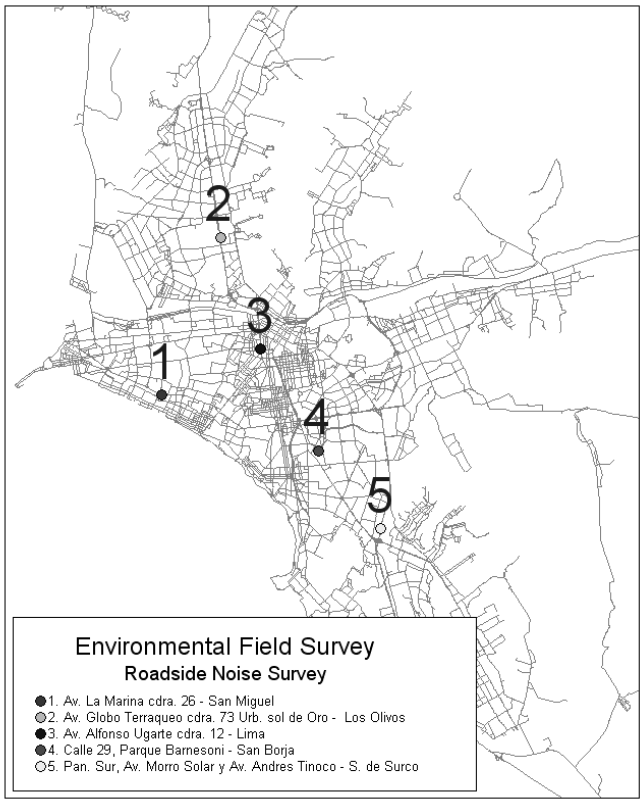


Figure 17.8-1 Location Map (Preliminary Roadside Air Quality Survey)

17.8.2. RESULTS AND DISCUSSIONS

Figure 17.8-2 shows the 12-hour averaged measured PM-10 concentration values at five sampling points. As shown in this figure, relatively larger PM-10 values are detected along heavy traffic roads such as Points 1 of Av. La Marina (weekend survey), 2 of Panamericana Norte, and 3 of Av. Alfonso Ugarte, whereas they are relatively low at the park of San Borja where the influence of surrounding traffic seems to be small. So it can be said there is a strong correlation between the current traffic condition and the spatial variation of PM-10 concentration. Note that a measured weekend value (i.e., labeled as "Marina-2" in Figure 17.8-1) is higher than that of a weekday value (i.e., labeled as "Marina" in Figure 17.8-1). This tendency is also recognized in the roadside noise survey results, described in the previous section, and can be explained by the more active weekend activities around that area.

In Peru, the 1-day average air quality standard of PM10 is 150 μ g/m^3, whereas the results of this preliminary survey are based on an average of 12-hours. So, it is difficult to carry

out a direct discussion of the roadside air quality degradation based on Peruvian air quality standards within this study. It is recommended to carry out a 24-hour continuous roadside air quality survey of PM10 as well as other important air quality parameters such as CO, NOx, SO2, HC and Pb.

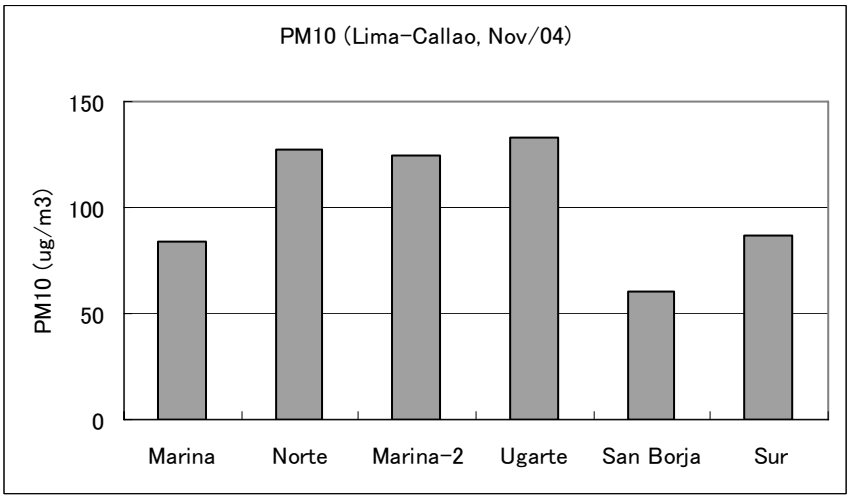


Figure 17.8-2 Roadside A/Q Survey (PM 10, November/04)

All survey results measured at the five points are shown. "Marina-2" indicates the weekend survey result obtained at Av. La Marina

17.9. SCOPING AND SCREENING

17.9.1. INTRODUCTION

The urban mass transit system to be evaluated within this Master Plan study consists of thirty three (33) sub transport projects; i.e., seventeen (17) expressway projects by IMP, sixteen (16) trunk busway projects by PROTRANSPORTE, and five (5) railway projects by AATE, respectively (see Chapter 18 for more detailed information about each project). Some project routes of these expressway, trunk busway and railway projects are geographically overlapped completely or partially, and the structural integrity among those projects is to be established through the inter-agency coordination process later. Table 17.9-1 summarizes the current situation of the project development process for the entire urban transport system across the Lima and Callao Metropolitan Area.

Here, the preliminary environmental examination is carried out for twenty five (25) major project routes that are key components for the entire public transport system, separately, and potential environmental issues associated with each major route are summarized.

Table 17.9-1 Expressway, Trunk Busway and Railroad Project

	Project Name	Descriptions
Only Expressway Project (IMP)		
1	Peripheral Road of Lima Section	L1 = 36.1 km (Faucett - Naranjal - Canta Callao - Panamericana Norte - S. J. Lurig – Santa Anita - Via de Evitamiento)
2	Extension of Autopista Ramiro Prialé	L1 = 19 km (Lurigancho, Chaclacayo and Ate Vitarte)
3	Urban Peripheral Road	L1 = 111.1 km (Puente Piedra - Carabayllo - San Juan de Lurig -Lurig - Ate Vitarte - Cieneguilla - Pachacámac - Lurín - Puenta Hermosa - Punta Negra - San Bartolo)
4	La Costa Verde Expressway Lima Section**	L1 = 11.5 km (Chorrillos - Barranco - Miraflores - San Isidro - Magdalena del Mar San Miguel)
5	La Costa Verde Expressway Callao Section	L1 = 8.0 km (Extension of La Costa Verde Lima Section to Callao Port)
6	Extension of Paseo De La República of South	L1 = 5.0 km (Barranco, Santiago de Surco and San Juan de Miraflores)
7	Bridges over the Rímac River	Rio Banba and Delgado de la Flor Bridges are to be constructed at San Martin de Porres, Lima
8	Road Tunnel	Three Tunnels, L1 = 200 (Santa Rosa), 300 (Rímac) and 270 m (San Francisco), respectively.
Only Trunk Busway Project (PROTRANSPORTE)		
1	Av. Venezuela	L2 = 9.05 km (Paseo de la República - Grau)
2	Av. Brazil	L2 = 4.84 km (Paseo de la República - Angamos)
3	Av. Angamos	L2 = 15.96 km (La Marina - Javier Prado)
4	Av. Grau	L2 = 2.27 km (Paseo de la República - Próceres de la Independencia)
5	Carretera Central	L2 = 8.36 km (Grau - Haya de la Torre)
6	Av. La Molina	L2 = 6.54 km (Carretera Central)
Railway Project (AATE)		
1	Ferrocaril Central Del Peru	L3 = 29.0 km
Both Expressway and Trunk Busway Projects		
1	Peripheral Road of Callao Section	L1 = 12.4 km (Manco Capac - Canta Callao - Airport) Trunk bus project is planned for the section between Canta Callao - Airport. Refer to Elmer Faucet Expressway project described below.
2	Av. Canta-Callao**	L1 = 9.7 km (Carabayllo, Comas, Los Olivos and San Martín de Porres). L2 = 9.13 km (Elmer Faucett - Panamerica Norte) A Trunk busway is planned at southern portion of this route plan.
3	Paseo de la República	L1 = 3.8 km (Paseo Colon - Alfonso Ugarte Cecado de Lima) L2 = 29.02 km (Panamericana Sur - Universitaria Norte). Note: Trunk busway is to mainly run through Av. Tupac Amaru, Alfonso Ugarte, Paseo de la República and Av. Huaylas.
4	Nestor Gambetta Expressway**	L1 = 19.0 km (Ventanilla, Callao) L2 = 22.55 km (Argentina - Panamericana Norte)
5	Elmer Faucet Expressway**	L1 = 5.6 km (Callao, Carmen de la Legua, Bellavista, San Miguel) and thr remaining part of this section is included in the "Outer Ring Road Callao Section". L2 = 8.81 km (La Marina - Néstor Gambetta)
Both Railway & Trunk Busway Projects		
1	Av. Universitaria Norte	L2 = 7.27 km (Metropolitana - Manuel Prado) L3 = 24.6 km The project route of the railway system is to be located in parallel with that of the trunk busway project, crossing the Panamericana Norte and connecting to Av. Universitaria, mentioned below.
2	Av. Tomas Valle	L2 = 2.84 km (Nester Gambetta - Universitaria) L3 = 24.6 km The project route of the railway system is to be located in parallel with that of the trunk busway project, and is to connect to Av. Elmer Faucett, mentioned below.
3	Elmer Faucett	L2 = 8.81 km (La Marina - Néstor Gambetta). L3 = 24.6 km The project route of the railway system that is to connect Comas and San Miguel, is to be located in parallel with that of the trunk busway partially and is to connect to Av. La Marina, San Miguel (no geographical overlapping with the expressway project, mentioned earlier).

Mass Transit System (Expressway, Trunk Busway and Railway) Project		
1	Próceres de la Independencia	L1 = 3.3 km (El Agustino, San Juan de Lurigancho) L2 = 11.23 km (Grau - Bayovar) L3 = 24.7 km (San Juan de Lurigancho - Villa El Salvador)
2	Carretera Panamericana Norte **	L1 = 33.0 km (Puente Piedra, Comas, Los Olivos and Independencia) L2 = 23.9 km (Caqueta - Ancon) L3 = 26.6 km (Puenta Piedra - Lima Centro)
3	Javier Prado Expressway, Sanchez Carrion and La Marina **	L1 = 22.3 km (Ate Vitarte, La Marina, Surco, San Borja, La Victoria, San Isidro, Magdalena, Jesús María, Pueblo Libre and San Miguel) L2 = 21.07 km (Elmer Faucett - Carretera Central) L3 = 28.1 km (Callao - Ate)
4	Av. Universitaria**	L1 = 2.7 km (Colonial - Venezuela de Lima) and other expressway project exists at the northern section of this route plan. L2 = 12.66 km (La Marina - Panamericana Norte) L3 = 24.6 km (Comas - San Miguel) The project route of the railway system is to be located in parallel with that of the trunk busway and is to turn to Av. Tomas Valle (no geographical overlapping with the route of the expressway project). The origin of the proposed railway system is at Manuel Prado, Comas.

Note: "**" indicates the road improvement project is planned.
L1: Total distance of the proposed expressway project, L2: Total distance of the proposed trunk busway system, L3: Total distance of the proposed railway project.

17.9.2. ENVIRONMENTAL SCOPING

(1) Peripheral Road of Lima Section

The main purpose of this project is to enhance the connection between the city of Callao and the northern and eastern parts of the city of Lima. The project route is to run through the following eight districts of San Martin de Porras, Los Olivos, Independencia, San Juan de Lurigancho, Lurigancho, Ate, Santa Anita and La Molina. A large-scale land-take is expected to occur for this mountainous road construction. The existence of many illegal squatter's communities is reported. No rare flora/fauna exists along this project route. Occurrences of landslide events are reported. The project route is to cross the Rímac River, which is prone to floods during the El Niño event. Table 17.9-2 summarizes the preliminary environmental evaluation of the Project of the Section of the Peripheral Road of Lima.

(2) Extension of Autopista Ramiro Prialé

A part of the project route is located at the bottom of the steep cliff. The existence of illegal squatter's communities is reported. No rare flora/fauna exists along this project route. Ruins exist within 500 meters of both sides of the project route. The water intake point from the Rímac River, operated by the Water Supply Authority (i.e., SEDAPAL) of the Municipality of Lima, exists around El Valle. Another water supply plant facility exists at Pariachi, ATE. During El Niño, severe floods occur along the Rímac River and sometime cause severe property damages. When El Niño causes heavy rainfall at the upstream site of the river severe run-off is induced therein, consequently most of the area adjacent to the Rímac River is inundated for about one month, and sometime the outbreak of water borne diseases occurs. Also, regional traffic conditions are sometimes jeopardized during this high water season. From a topographical point of view, the site around this project route is regarded as a bottleneck area that connects both the upstream site of the Rímac River upstream basin and the Lima Metropolitan Area, and it is prone to floods. Table 17.9-3 summarizes the preliminary environmental evaluation of the Extension of the Autopista Ramiro Priale Project.

(3) Urban Peripheral Road

This mountainous ring road is to be located at the outermost bound of the Lima and Callao Metropolitan Area and it will connect the following eleven districts of Puente Piedra, Carabayllo, San Juan de Lurigancho, Lurigancho, Ate, Cieneguilla, Pachacamac, Lurin, Punta Hermosa, Punta Negra and San Bartolo. The existence of many illegal squatter's communities is reported. No rare flora/fauna exists along this project route. Occurrences of landslide events are reported. The project route is to cross both the Rímac and Chillón Rivers, which are prone to floods during the El Niño event. Table 17.9-4 summarizes the preliminary environmental evaluation of the Urban Peripheral Road Project.

(4) La Costa Verde Expressway of Lima

In general, the major part of the existing road, Cicuito De Playas, that is to be widened within this project, is located at the bottom of the steep cliff. Several traces of small-scale landslide events are recognized. Waste disposal sites also exist along this road. Road bank protection measures against wave-induced erosion will be necessary. Also, the establishment of a contingency plan for the tsunami event would be desirable. No rare flora/fauna exists along this project route. Table 17.9-5 summarizes the preliminary environmental evaluation of the Project of La Costa Verde Expressway of Lima.

(5) La Costa Verde Expressway of Callao

This coastal road is to extend the La Costa Verde Expressway, mentioned earlier, to the Callao Port. Most of the project route is to be located at the bottom of the steep cliff, and the reclamation work is carried out partially. Road bank protection measures against wave-induced erosion will be necessary. Also, the establishment of a contingency plan for a tsunami would be desirable. No rare flora/fauna exists along this project route. Table 17.9-6 summarizes the preliminary environmental evaluation of the Project of La Costa Verde Expressway of Callao.

(6) Extension of Paseo de la República to the South

The main purpose of this project is to extend the existing Paseo de la República to the Panamericana Sur as well as La Costa Verde Expressway. Large-scale land-take is expected to occur for this road extension project. Some portions of the project route run through the military base. No rare flora/fauna exists along this project route Table 17.9-7 summarizes the preliminary environmental evaluation of the Extension Project of Paseo de la República to the South.

(7) Construction of Two Bridges over the Rímac River

The main purpose of this new bridge construction is to improve the road network system of the downtown area by adding two more new bridges over the Rímac River and alleviate the traffic congestion around the downtown area. Several land-takes are expected to occur. No rare flora/fauna exists along this project route. During El Niño, severe floods occur along the Rímac River and cause severe property damages. When El Niño causes heavy rainfall, most areas adjacent to the Rímac River, in particular, lowland areas around Callao, are inundated for about one month, and sometime, the outbreak of water borne diseases occurs. Generally, the river bank of the Rímac River is not well constructed and most of the areas adjacent to the Rímac River (except several gorge sections) are prone to floods every January or February. Table 17.9-8 summarizes the preliminary environmental evaluation of the construction of two bridges over the Rímac River project.

(8) Construction of Three Road Tunnels

The Main purpose of this new tunnel construction is to improve the road network system of the downtown area by creating three new tunnels and alleviate the traffic congestion around the downtown area. Several land-takes are expected to occur at the site connecting the proposed tunnel routes and currently existing roads for this tunnel construction project. The existence of illegal squatter's communities is reported. Ruins exist within 500 meters of both sides of the project route. Some portions of the project site intrude the inside of the military shooting range. No rare flora/fauna exists along this project route. Table 17.9-9 summarizes the preliminary environmental evaluation of the construction project of three new tunnels.

(9) Av. Universitaria Norte

This road runs through the residential area. Parks that would require a calm environment exist. No rare flora/fauna exists along this project route. Table 17.9-10 summarizes the preliminary environmental evaluation of Av. Universitaria Norte.

(10) Av. Tomas Valle

This road runs through the industrial area and connects both the Panamericana Norte and the Airport. A central bike-lane has been partially constructed. No rare flora/fauna exists along this road. Table 17.9-11 summarizes the preliminary environmental evaluation of Av. Tomas Valle.

(11) Av. Venezuela

Originally, Av. Venezuela was constructed as the first inter-city road connecting both the Center of Lima and the City of Callao. Several schools and hospitals that would require a calm environment exist. Several factories exist along the Callao side of this road. Ruins exist within 500 meters of both sides of the road. No rare flora/fauna exists along this project route. Table 17.9-12 summarizes the preliminary environmental evaluation of Av. Venezuela.

(12) Av. Brazil

This road runs through the residential area and connects both the Center of Lima and Magdalena, a coastal residential area. Several schools, churches and hospitals that would require a calm environment exist. No rare flora/fauna exists along this project route. Table 17.9-13 summarizes the preliminary environmental evaluation of Av. Brazil.

(13) Av. Angamos

This road runs through the residential area. Several schools, hospitals and church that would require a calm environment exist. There are also several shopping malls. Ruins exist within 500 meters of both sides of the road. No rare flora/fauna exists along this project route. Table 17.9-14 summarizes the preliminary environmental evaluation of Av. Angamos.

(14) Av. Grau

Several schools and hospitals that would require a calm environment exist. Some portion of this road runs through the perimeter of the Historical Center. Damages of some historical facilities due to the current roadside vibration were reported around the Historical Center region. Wholesale stores and markets are easily accessible from this road. No rare flora/fauna exists along this project route. Table 17.9-15 summarizes the preliminary environmental evaluation of Av. Grau.

(15) Carretera Central and Av. N Ayllón

Several hospitals and churches that would require a calm environment exist. The Fruit Market is easily accessible from this road. Ruins exist within 500 meters of both sides of the road. Some portion of Av. Carretera Central runs through the archaeological conservation zone, located around the area of Ate and La Molina. No rare flora/fauna exists along this project route. Table 17.9-16 summarizes the preliminary environmental evaluation of Carretera Central and Av. N Ayllón.

(16) Av. La Molina

This road runs through the residential area. Schools that would require a calm environment exist. Ruins exist within 500 meters of both sides of the road. No rare flora/fauna exists along this project route. Table 17.9-17 summarizes the preliminary environmental evaluation of Av. La Molina.

(17) Section of the Peripheral Road of Callao

The main purpose of this peripheral road is to extend the Section of the Peripheral Road of Lima, mentioned earlier, and improve the accessibility to both the Airport and the Callao Port. The project route is to run through the industrial zone. It is reported that some sites around the Callao Port were severely contaminated with Lead in the past. No rare flora/fauna exists along this project route. The project route is to cross the Rímac River, which is prone to the floods during El Niño. Table 17.9-18 summarizes the preliminary environmental evaluation of the Project of the Section of the Peripheral Road of Callao.

(18) Carretera Panamericana Norte

Central partition walls are constructed in order to prevent the free cross-walking of this highway. Several small-scale markets exist along this road. Ruins exist within 500 meters of both sides of this road. No rare flora/fauna exists along this road. This road crosses the Chillón River, which is prone to floods during El Niño. Table 17.9-19 summarizes the preliminary environmental evaluation of the Carretera Panamericana Norte.

(19) Av. Canta-Callao

The main goal of this road construction is to connect both the Panamericana Norte and the Airport. Some portions of this road are not constructed, yet (e.g., the expropriation process of the section between Panamericana Norte and Av. Naranjal is not completed, yet), while the remaining section between Av. Naranjal and Av. Faucett runs through the industrial zone. No rare flora/fauna exists along this project route. Table 17.9-20 summarizes the preliminary environmental evaluation of Av. Canta Callao.

(20) Av. Huaylas, Paseo de la República, Av. 9 de Diciembre, Av. Alfonso Ugarte, Av. Caqueta and Av. Tupac Amaru

Several schools, hospital and parks that would require a calm environment exist along the entire section. Some portion of the project route runs through the perimeter of the Historical Center, and several important monuments and statues exist at plazas constructed inside of the roundabouts of Avs. Alfonso Ugarte and 9 de Diciembre. Central bus lanes are constructed along both Av. Alfonso Ugarte and Paseo de la República. The air quality at open-cut sections of Av. Alfonso Ugarte and Paseo de la República is deteriorated due to the stagnant air circulation (i.e., poor ventilation) and heavy vehicular emission loading. Damages to some historical facilities due to the current roadside vibration were reported around the Historical Center region.

Mainly, Av. Huaylas runs through the residential area. Some portions of the project route of the trunk busway (i.e., Av. Huaylas, ex-Panamericana Sur) may run through the environmental reserve, Villa wetland area. Table 17.9-21 summarizes the preliminary environmental evaluation of Av. Huaylas, Paseo de la República and Avs. Alfonso Ugarte, 9 de Diciembre, Caqueta and Tupac Amaru.

(21) Av. Nestor Gambetta

Several factories, warehouses and storehouses exist along the southern part of this road while several communities exist along the remaining section of this road. No rare flora/fauna exists along this project route. Ruins exist within 500 meters of both sides of the road. This road crosses the Chillón River, which is prone to floods during El Niño. Table 17.9-22 summarizes the preliminary environmental evaluation of Av. Nestor Gambetta.

(22) Av. Elmer Faucet

Mainly, the northern part of this road runs through the perimeter of the airport, and several factories exist along this road. The southern part (i.e., the section between the Rímac River and La Marina) runs through the residential area, and one hospital that would require a calm environment exists. No rare flora/fauna exists along this project route. This road crosses the Rímac River, which is prone to floods during El Niño. Table 17.9-23 summarizes the preliminary environmental evaluation of Av. Elmer Faucet.

(23) Av. Javier Prado, Sánchez Carrión and La Marina

Most of Javier Prado runs through the residential area and some portions of this expressway are open-cut road structures. Several schools and hospitals that would require a calm environment exist. Terminals of several private bus companies also exist. The air quality at open-cut sections of Av. Javier Prado is deteriorated due to the stagnant air circulation (i.e., poor ventilation) and heavy vehicular emission loading. Both Avs. Sanchez Carrion and La Marina run through one of the active commercial zones in the Lima and Callao Metropolitan Area. Ruins exist within 500 meters of both sides of these roads. Some portion of Av. Javier Prado runs through the archaeological conservation zone, located around the area of Ate and La Molina. No rare flora/fauna exists along this project route. Table 17.9-24 summarizes the preliminary environmental evaluation of Av. Javier Prado, Sanchez Carrion and La Marina.

(24) Av. Universitaria

This road runs through several residential areas, and a large-scale land-take is expected to occur for this road improvement project. Several schools and parks that would require a calm environment exist. Ruins exist within 500 meters of both sides of the road. No rare flora/fauna exists along this project route. This road crosses the Rímac River, which is prone to floods during El Niño. Table 17.9-25 summarizes the preliminary environmental evaluation of Av. Universitaria.

(25) Próceres de la Independencia

This road runs through the residential area and connects both San Juan de Lurigancho and the Center. A park that would require a calm environment exists. Large-scale land-take is expected to occur for this road construction. No rare flora/fauna exists along this project route. Table 17.9-26 summarizes the preliminary environmental evaluation of Próceres de la Independencia.

Table 17.9-2 Environmental Scope (Section of the Peripheral Road of Lima)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	B
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	B
3	Soils	Potential for soil erosion during/after construction.	B
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	B
7	River flow	Risk of pollution of major tributaries during construction.	B
		Risk of rapid sedimentation to nearby tributary system.	B
8	Groundwater	Groundwater quality degradation during construction.	C
		Disturbance of regional groundwater flow.	C
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	A
		Demolition of roadside houses.	A
		Demolition of illegal squatters' lots.	A
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	U
13	Landscape	Visual conflict with surrounding community.	D
		Cutting of hill/use of embankment.	A
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-3 Environmental Scope (Extension of Autopista Ramiro Priale)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	B
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	B
3	Soils	Potential for soil erosion during/after construction.	U
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	B
7	River flow	Risk of pollution of major tributaries during construction.	B
		Risk of rapid sedimentation to nearby tributary system.	B
8	Groundwater	Groundwater quality degradation during construction.	C
		Disturbance of regional groundwater flow.	C
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	B
		Demolition of roadside houses.	A
		Demolition of illegal squatters' lots.	B
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	B
13	Landscape	Visual conflict with surrounding community.	D
		Cutting of hill/use of embankment.	C
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-4 Environmental Scope (Urban Peripheral Road)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	B
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	B
3	Soils	Potential for soil erosion during/after construction.	B
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	B
7	River flow	Risk of pollution of major tributaries during construction.	B
		Risk of rapid sedimentation to nearby tributary system.	B
8	Groundwater	Groundwater quality degradation during construction.	C
		Disturbance of regional groundwater flow.	C
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	A
		Demolition of roadside houses.	U
		Demolition of illegal squatters' lots.	B
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	U
13	Landscape	Visual conflict with surrounding community.	D
		Cutting of hill/use of embankment.	A
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-5 Environmental Scope (La Costa Verde Expressway of Lima)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	A
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	A
3	Soils	Potential for soil erosion during/after construction.	B
		Disturbance of contaminated soil site.	B
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	A
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	D
		Cutting of hill/use of embankment.	A
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-6 Environmental Scope (La Costa Verde Expressway of Callao)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	A
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	A
3	Soils	Potential for soil erosion during/after construction.	B
		Disturbance of contaminated soil site.	B
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	A
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	D
		Cutting of hill/use of embankment.	A
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-7 Environmental Scope (Extension of Paseo de la República to the South)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	C
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	C
		Demolition of roadside houses.	C
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	A
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	C
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-8 Environmental Scope (Construction of New Bridges over the Rímac River)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	C
3	Soils	Potential for soil erosion during/after construction.	U
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	B
7	River flow	Risk of pollution of major tributaries during construction.	B
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	B
		Demolition of roadside houses.	B
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	C
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-9 Environmental Scope (Road Tunnel Construction)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	B
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	B
3	Soils	Potential for soil erosion during/after construction.	B
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	A
		Demolition of roadside houses.	A
		Demolition of illegal squatters' lots.	A
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	A
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	B
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-10 Environmental Scope (Av. Universitaria Norte: Railway & Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	C
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	D
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-11 Environmental Scope (Av. Tomas Valle: Railway & Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	C
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	D
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	C
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-12 Environmental Scope (Av. Venezuela: Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	C
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	D
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	C
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-13 Environmental Scope (Av. Brazil: Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	C
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	D
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-14 Environmental Scope (Av. Angamos: Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	C
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	D
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	B
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-15 Environmental Scope (Av. Grau: Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	D
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	B
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-16 Environmental Scope (Carretera Central and Av. N. Ayllón: Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	D
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	B
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-17 Environmental Scope (Av. La Molina: Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	D
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	B
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-18 Environmental Scope (Peripheral Road of Callao: Expressway and Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	B
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	B
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	B
7	River flow	Risk of pollution of major tributaries during construction.	B
		Risk of rapid sedimentation to nearby tributary system.	B
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	D
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	C
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-19 Environmental Scope (Carretera Panamericana Norte: Expressway, Trunk Busway and Railway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	B
7	River flow	Risk of pollution of major tributaries during construction.	B
		Risk of rapid sedimentation to nearby tributary system.	B
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	C
		Demolition of roadside houses.	B
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	C
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-20 Environmental Scope (Av. Canta Callao: Expressway and Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	C
		Demolition of roadside houses.	C
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	D
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	D

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-21 Environmental Scope (Av. Huaylas, Paseo de la República, Av. 9 de Diciembre, Av. Alfonso Ugarte, Av. Caquetá and Av. Tupac Amaru: Expressway and Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	B
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	B
5	Fauna	Disturbance of bird habitats during construction.	B
		Potential risk of habitat separation during/after construction.	B
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	B
		Disturbance of regional groundwater flow.	B
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	C
		Demolition of roadside houses.	C
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	B
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-22 Environmental Scope (Av. Nestor Gambetta: Expressway and Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	B
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	B
		Risk of rapid sedimentation to nearby tributary system.	B
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	C
		Demolition of roadside houses.	C
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	D
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	B
13	Landscape	Visual conflict with surrounding community.	C
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-23 Environmental Scope (Av. Elmer Faucet: Expressway and Trunk Busway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	B
		Risk of rapid sedimentation to nearby tributary system.	B
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	C
		Demolition of roadside houses.	C
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	C
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	C

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-24 Environmental Scope (Av. Javier Prado, Sanchez Carrion and La Marina : Expressway, Trunk Busway and Railway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	C
		Demolition of roadside houses.	C
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	B
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-25 Environmental Scope (Av. Universitaria : Expressway, Trunk Busway and Railway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	D
		Risk of rapid sedimentation to nearby tributary system.	D
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	D
		Demolition of roadside houses.	D
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	B
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

Table 17.9-26 Environmental Scope (Próceres de la Independencia : Expressway, Trunk Busway and Railway)

Element		Impact	Importance
Natural Environment			
1	Topography	Steep Cliff, Landslide.	D
2	Seismisty	Risk of earthquake damage (e.g., landslide, tsunami)	D
3	Soils	Potential for soil erosion during/after construction.	D
		Disturbance of contaminated soil site.	U
4	Vegetation	Destruction of wetland.	D
5	Fauna	Disturbance of bird habitats during construction.	D
		Potential risk of habitat separation during/after construction.	D
6	Run-off/ Drainage	Risk of roadside inundation during El Niño.	D
7	River flow	Risk of pollution of major tributaries during construction.	B
		Risk of rapid sedimentation to nearby tributary system.	B
8	Groundwater	Groundwater quality degradation during construction.	D
		Disturbance of regional groundwater flow.	D
Socio-Economic Factors			
9	Land expropriation	Land expropriation due to road alignment.	C
		Demolition of roadside houses.	C
		Demolition of illegal squatters' lots.	D
10	School/Church/ Hospital	Disruption of school/church/hospital during construction.	B
11	Military Base	Direct interference with facilities of military base/airport.	D
12	Archaeological, historical, cultural and monumental sites	Conflict with the setting of historical, cultural or monumental sites.	D
13	Landscape	Visual conflict with surrounding community.	B
		Cutting of hill/use of embankment.	D
		Loss of visual continuity of townscape.	B

Note: A: significant, B: major, C: minor, D: less significant, U: unknown and needs further study.

17.10. DISCUSSIONS ON ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

17.10.1. ENVIRONMENTAL CONSIDERATION (BIO-PHYSICAL ENVIRONMENT)

Lima is located in the center of the coastal desert region of Peru and its climate is highly arid throughout the year. Its coastal plain area is relatively narrow, and the surrounding high mountainous area is rapidly rising up from the coastline within a relatively short distance. Several landslide sites exist around the surrounding mountainous areas as well as the coastal cliff. It is reported that several active fault lines exist around the study area and some epicenters of the past severe earthquakes are located around those fault lines. So, it can be said that most of the study area is prone to the earthquake, and the possibility to have severe future earthquake is not negligible.

It is reported that some sites around the Callao Port were severely contaminated with lead due to the shipping of lead without the appropriate environmental protection measures in the past. Some portions of the project route of the expressway construction projects may run through these contaminated sites, and it is recommended to carry out a series of soil analysis around these sites as well as to implement the anti-spreading and/or treatment program of the contaminated soil.

In general, no rare flora/fauna exists around the Lima-Callao Metropolitan Area except for one environmental reserve, the Villa wetland area, located around Chorillos. This wetland is one of the final destinations of the confined groundwater flow recharged at the highland area of Andes Mountain Range, and several springs exist around this reserve. Also, this reserve is one of the important resting points for the bird migration across the South America Region and it is famous for its bird watching activity. It is recommended to carry

out the biological environmental study if any construction activities related to the proposed transport project are planned within the direct influence zone of this environmental reserve.

Also, some project routes are to cross the Rímac and Chillon Rivers, which are prone to floods during the rainy season, in particular, El Niño. During every rain season, a relatively heavy rainfall occurs at the highland area, and the run-off water collected within the upstream basins of each river sometime causes severe flood at the downstream side such as the Lima-Callao Metropolitan Area, where the river banks of those rivers are not well constructed. During El Niño, this situation worsens and most of areas adjacent to the Rímac River, in particular, lowland areas around Calla,o are inundated for about one month, and the outbreak of water borne diseases is sometimes induced. Also, from the topographical point of view, the site along Autopista Ramiro Prialé is regarded as the bottlenecked area that connects both the upstream basin of the Rímac River and the Lima Metropolitan Area, and it is also highly prone to floods. It is recommended to carry out the comprehensive hydrological study for all of the basins of the Rímac and Chillon Rivers, and appropriate flood and/or inundation mitigation measures shall be taken.

The air quality of the Lima and Callao Metropolitan Area is not in good condition, mainly due to following four factors: i.e., (1) the heavy traffic conditions, (2) the poorly maintained vehicle conditions, (3) the chemical character of the fuel currently available in Peru, and (4) the regional atmospheric condition (i.e., the thermal inversion that frequently occurs throughout the year). The most prevalent wind directions are SE, S and SW (i.e., the wind blows from the sea toward the land), and the regional air quality around the coastline is in relatively good condition whereas this is not the case around the mountainous areas such as Independencia and San Juan de Lurigancho, where the majority of pollutants tend to be trapped due to the thermal inversion phenomenon.

Several air quality-related environmental management and/or mitigation measures were implemented by different governmental bodies. For instance, DIGESA started a city-wide air quality monitoring program, and several air quality parameters such as the particulate matters, NO_X, SO_X are monitored at five fixed stations across the metropolitan area. However, due to its budget problem and the man power limitation, it has become highly difficult to carry out the periodical monitoring soon after the initiation of the monitoring program, and eventually, those results became sporadic and disorganized. By the same token, the monitoring equipment to be used for this program has not been well-maintained from the beginning. Based on those facts, it is difficult to conclude that those monitoring results are reliable and that they can be used directly for further relevant air quality modeling and/or management studies. Recently, IDB decided to finance a new city-wide air quality monitoring program to be operated and maintained by PROTRANSPORTE, in which several fixed air quality stations are to be installed across the metropolitan area.

In Peru, a comprehensive vehicle inspection and maintenance program has not been established yet, and the majority of vehicles circulating across the metropolitan area are imported used vehicles. In general, the exhaustion systems of those vehicles are not well-maintained, so, as mentioned earlier, the amount of the pollutants emitted from those poorly maintained vehicles are abundant and worsen the current roadside air quality environment. Besides, the clean fuel policy that bans the use of leaded gasoline is not completely fulfilled, and that also contributes to the city-wide air quality deterioration problem to some extents.

Several ad-hoc working committees for the air quality management were established and the import of used vehicles with a vehicle age of more than five years has been prohibited recently. Also, preliminary vehicular emission studies were initiated under the commands of the Lima-Callao Clean Air Committee in 2002, although a comprehensive verification of its study results has not been completed yet, thus special attention shall be paid to the application of those results in further relevant studies (e.g., air quality modeling study).

Within this study, preliminary roadside noise and air quality surveys were carried out, and it was found that most of the Leq values measured at all roadside points exceed current Peruvian noise standards. So it can be said that the current daytime roadside environment is noisy and might cause some disruptions in human health such as hearing changes, losses, interference with speech communication and/or annoyance. Many parks, schools, churches and hospitals that require a calm environment exist within 500 meters of both sides of the majority of the urban expressway project routes. It is also reported that there have been damages to some historical facilities due to the nearby roadside vibration around the Historical Center region. It is highly recommended to carry out a 24-hour continuous noise and vibration survey in order to grasp the comprehensive time variation of the hourly noise/vibration fluctuation pattern and to evaluate the impact of the roadside noise/vibration on the human health quantitatively.

Some people, such as transit police officers and street vendors, work at the roadside and stay there for relatively long periods everyday. In other words, they are directly exposed to vehicular emissions throughout their daily work, and thus, their risk of health deterioration caused by inhaling the pollutants originated from the vehicular emissions seems to be high compared with other people. Within this preliminary survey, it was also found that relatively high PM-10 values were detected along heavy traffic roads such as Av. La Marina, Panamericana Norte, and Av. Alfonso Ugarte whereas relatively low values were detected at the park of San Borja, where the influence of surrounding traffic conditions seems to be small. It is highly recommended to carry out a 24-hour continuous roadside air quality survey of PM10 as well as other important air quality parameters such as PM2.5, CO, NOx, SO2, HC and Pb.

Based on the computational results of the preliminary vehicular emission loading study (CO_2), carried out within this study, it was found that the amounts of the vehicular emission-reduction of CO_2 to be caused by the operation of the proposed transport project in the Year 2025 vary between 22,526 ton/day (59 %-reduction: Alt-M) and 16,900 ton/day (44 %- reduction: Alt-D). So it can be said that a large amount of the regional CO_2 vehicular emission loading (i.e., environmental benefit) can be achieved and the roadside air quality environment around the Lima-Callao Metropolitan Area is expected to be partially improved.

17.10.2. SOCIAL CONSIDERATION (SOCIO-CULTURAL ENVIRONMENT)

According to the latest national census of 1993 the total population of the Provinces of Lima and Callao is 6,434 thousand, occupying 28% of the national total. The yearly increase from 1988 to 1993 is 2.3% in Lima and 3.5% in Callao. The cause of the increase is mostly due to the social population movement, that is, the influx of people into the cities. Examining the population movement between departments, in 5 years from 1988 to 1993, 647 thousand people immigrated to the Province of Callao and the Department of Lima from other departments where they were born. As many as 2,392 thousand people, or 34% of the total population of the Province of Callao and the Department of Lima (7,127 thousand), are from other departments. It is assumed that the influx of people into the Lima metropolitan area is still advancing after 1993.

The principal cause of the population inflow is the impoverishment of the rural economy. Secondly are the displacements due to guerrilla conflicts, border strives, natural disasters, development projects of mining, dams, and so on. In the case of guerrilla conflicts 25,000 victims were produced in 13 years until 1998 and 60,000 families were obliged to emigrate.

The majority of these people are poor and without jobs and tend to move to urban areas for survival and settle themselves in newly expanded urban areas or not consolidated areas, for example, in the mountainsides in the Lima metropolitan area. In most cases they live in

self-constructed shelters on land without proprietorship, which are the so-called human settlements (*asentamiento humano*) or invasion. It is estimated that there are more than 2 million people living in such shelters, although there are no reliable statistics.

In the urban fringe of the metropolitan area, above all in the invaded areas of the mountainsides, public services are insufficient, not only water and electricity but public transportation access as well.

The geographical distribution of the poor population is particularly concentrated in the Districts of Lima and Callao. Puente Piedra, Villa El Salvador, Pachacámac, Lurín, Ventanilla, Cieneguilla and other 10 Districts have more than 50% of Stratum E population, which is the poorest of the 5 socio-economic categories. On the other hand, Jesús María, Lince, La Punta, San Isidro, Miraflores and other 10 Districts have less than 5% of Stratum E population.

Special socio-economic considerations should be necessary for the poor people in the elaboration of the Urban Transportation Project Plans. It is recommended to create a transportation tariff policy taking into account the low income population and social vulnerability.

The Relocation of Houses and Resettlement of Inhabitants will be needed for some road projects and tunnel projects. In the case of the Section of the Peripheral Express Road of Lima, for example, the relocation of 2,300 houses and 12,000 inhabitants might be necessary, although the numbers have been roughly estimated. In the Urban Railroad Projects it is estimated that approximately 57 houses, 96 families and 384 inhabitants may be required to Line No.1 and 60 houses, 60 families and 240 inhabitants in Line No.2.

Project plans should be designed on the basis of minimizing relocation and resettlement. In the case of relocation, the community structure should be conserved as well as possible.

The relocation of informal settlements will be conducted according to the related regulations. Relocation should be suspended for people in the process of titling until the appropriate moment. For people without titles, the relocation should be executed on the basis of humanitarianism. Collaboration with governmental relocation programs should be studied on a conjoint basis.

Ambulant trading has been a socio-cultural tradition for a long time before the beginning of motorization when vehicles started to occupy human space. The evacuation of street vendors from transportation projects should be treated in a prudent manner, as the majority of such people are poor and socially fragile.

The Master Plan shall be designed considering cooperation with the future plan of urban expansion as well as the restructuring plan of traffic concentrating facilities such as markets, circulation bases, terminals, shopping centers, and so on. Project plans should be designed considering socially delicate and vulnerable land use and facilities such as hospitals, kindergartens, homes for the aged and homes of handicapped, though at this moment the number and distribution of them are not yet estimated in detail.

The number of public transportation drivers and collectors of omnibuses, microbuses and colectivos is roughly estimated to be 126,000 persons, which occupy 3.5% of total employment in the metropolitan area and 4.4% of that of the tertiary industries in the same area. New transportation projects may inevitably produce a structural change in employment. So as to cope with the difficulties, soft-landing measures should be taken for the workers who might lose jobs. The job motives of the public transport operators are different amongst each other. For example, 51% of colectivo drivers are temporarily working and looking for other jobs, and the remaining 49% are working as a favor. It is recommended to continue and develop socio-economic studies about labor motivation and

employment structure of transportation operators in order to establish adequate strategies for soft-landing.

Lima, located in the Pacific coastal zone, was rich in marine products brought by the Ocean, and had glory in agriculture in the oases along the Rivers of Chillón, Rímac and Lurín, though located in the desert. This enabled this region to prosper the lives of numerous inhabitants dating back to ancient times. This is why there are a number of archaeological ruins everywhere in the metropolitan area. However, the archaeological information of the area is not sufficient, as the National Institute of the Culture (INC) does not possess any map information of potential buried ruins nor an adequate cadastre inventory of discovered ruins because of undeveloped excavation studies and the lack of base maps not catching-up to rapid urban expansion, which have caused loss or destruction of countless human heritages. So, it is very difficult to predict the existence or potentiality of existence of buried ruins in the area. Archaeological monuments and underground ruins should be respected in the transportation projects according to the related regulations. Precautious examination will be needed for road construction projects accompanied by excavations for open-cut or underpass, for example Javier Prado Av., and so on.

Lima is a city of distinctive appearance, rich in urban monuments beautifully oriented to aesthetic focal points and scenic vista, worthy of the capital of the Spanish Vice-king's territory and an important base for new world development. New transportation projects and their facilities should respect the harmony with urban landscape, historic facades, monuments and other cultural heritages.

Unfortunately, the existing separated bus-lane facilities in Lima failed to earn a positive reputation in terms of human respect. The public transportation facilities should be designed in a humanity oriented manner so that every user may feel pleased and they should create a proud sense of ownership. Landscaping can be introduced to transportation facilities to create a comfortable space for users.

According to the PT surveys carried out by the JICA team, 26% of the inquired families possess one or more bicycles, however bicycles are used in as little as 0.5% of the total person trips, whereas 25.5% are trips on foot. Lima is promoting a Non Motorized Transport Plan and Callao is developing a Humanized Transportation Plan. These plans are worth executing with integration to the Master Plan.

In the stage of construction Reclaiming Sites of Construction Waste should be prepared systematically for socio-environmentally adequate treatment.

In excavation sites a suitable protection for landslides is necessary for the prevention of human disasters that might be caused by ground sinking affected by the excessive pumping up of underground water.

17.10.3. STUDY PLAN OF ENVIRONMENTAL IMPACT ASSESSMENT

(1) Introduction

Considering the outline of the proposed project and the current environmental features of the study area, it is highly likely to carry out a full-scale Environmental Impact Assessment (i.e., EIA) study within the feasibility study of the proposed project to be followed (note: as of January 2005, it is not officially determined yet if the feasibility study of the proposed project is carried out). This EIA study shall be prepared and carried out based on both the Peruvian EIA Law (Law # 27446 of 2001, CONAM) and the New JICA Guideline for Environmental and Social Considerations [JICA, 2004; hereinafter referred to as the New JICA Guideline].

According to the Peruvian EIA Law, it is not mandatory to carry out any EIA-related environmental study during the planning stage of the development project (i.e., Master

Plan or Feasibility Studies). However, the project owner has to carry out an EIA study and its relevant environmental studies or investigations based on the Peruvian EIA Law and must obtain the environmental license/permit approved by the competent environmental agencies just after the initiation of the detailed design study (CONAM, personal communication, 2004). Without this permit, construction activities can not be initiated.

Under this situation, the project owner has to get involved in two separate EIA processes (i.e., one is based on the New JICA Guideline and the other is based on the Peruvian EIA Law) and prepare for two separate EIA documents while keeping the consistency between both EIA studies and minimizing any discrepancies that might be caused during the transition of the project development phase from F/S to D/D.

Within the EIA process based on the Peruvian EIA Law, the outline of the whole EIA process, such as the study period and the governmental environmental organization/agency mainly responsible for EIA examination, is determined through consultation with the CONAM.

(2) New JICA Guideline for Environmental and Social Considerations

The New JICA Guideline for Environmental and Social Considerations was implemented in April 2004, and several new ideas and concepts were incorporated into this new guideline in order to make any development project environmentally sound and to achieve a broad consensus on both needs and the validity of the development project among various stakeholders promptly. Some of the new ideas incorporated in this new guideline are i) the establishment of the stakeholder meeting, and ii) timely information disclosures. The requirements of those meeting and disclosure processes depend on the environmental categorization of the proposed development project, described below.

In principle, this project categorization is carried out based on the significance of the possible negative impacts to be caused by the proposed project. Within this new guideline, the project is classified into the Categories A, B and C, and the project that may cause a significant negative environmental impact is classified as a Category A project. Figure 17.10-1 shows the flowchart of the EIA study to be required for the Category A project classified within this new guideline. According to this new guideline, it is recommended to hold at least seven or eight stakeholder meetings throughout the master plan and feasibility studies of the Category-A project.

Participants of those stakeholder meetings shall be fairy-selected among competent environmental agencies, organizations, institutes, universities, NGOs, communities, and socially-vulnerable people. Also, prompt information disclosure shall be encouraged in order to share the same study information and/or findings among various stakeholders and to deepen the understanding of the proposed project, which is one of the essential parts for the smooth achievement of a broad consensus.

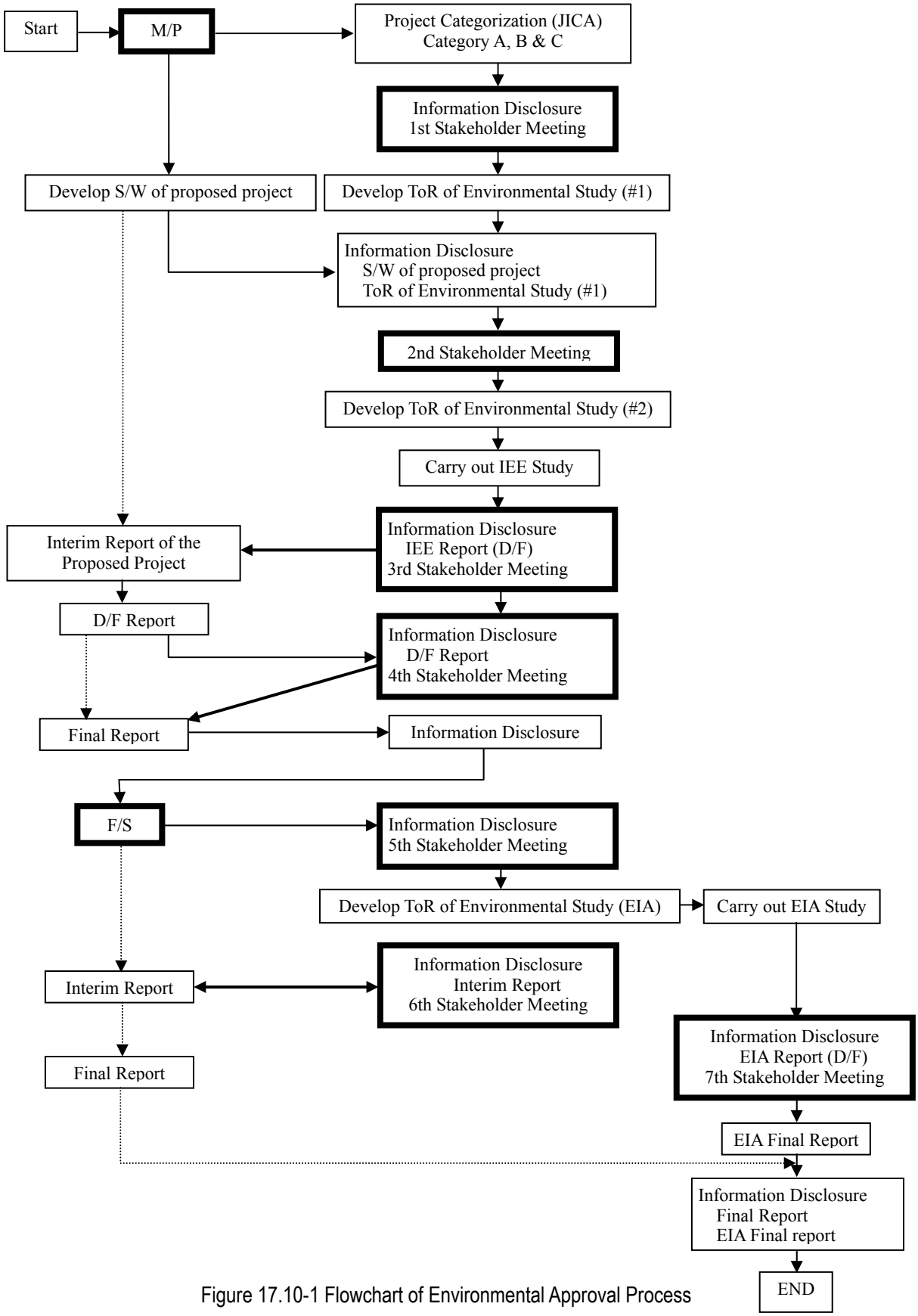


Figure 17.10-1 Flowchart of Environmental Approval Process

Note that this process is applicable for Category A Projects classified within the New JICA Guidelines

Source: New JICA Guidelines for Environmental and Social Considerations [JICA, 2004]

(3) EIA Working Frame

Throughout a series of discussions with the CONAM and other competent environmental agencies, conducted within this M/P Study, it is found that the entire EIA study shall be prepared and carried out based on both the Peruvian EIA Law and the New JICA Guideline. As described earlier, the EIA study for the feasibility study is to be carried out mainly based on the New JICA Guideline while the EIA study for the detailed design study is based on the Peruvian EIA Law. According to the current Peruvian EIA Law, the environmental license/permit issued by the competent environmental agency shall be obtained during the detailed design study. And, it is likely that the environmental license application process for the proposed project is to be carried out under the supervision of the environmental section of the Ministry of Transport and Communication [CONAM, personal communication, 2004].

Usually, JICA-based EIA studies take about ten (10) months (note: this is a rough time estimate since both the final project route and the EIA-ToR to be employed within the F/S are not determined yet). After both the feasibility and New JICA Guideline-based EIA studies are completed, the project owner is to shift into the next project cycle and prepare for the tender session for the construction phase, which includes the detailed design study. Throughout this tender process, the contractor to be in charge of the construction activity will be selected, and then, the selected contractor will chose EIA consultants to be in charge of the Peruvian EIA Law-based EIA study for the detailed design study. Based on the ToR of the EIA, the selected EIA consultants shall carry out relevant environmental studies, prepare for the EIA reports and establish a series of public participation programs based on the Peruvian EIA Law. For the smooth environmental license application process, it is preferable to assign qualified EIA consultants to be selected among the EIA consultants or consulting firms registered at each environmental section of ministries throughout the Peruvian EIA process.

Usually, this EIA process during the detailed design study period takes nine (9) to ten (10) months [CONAM, personal communication, 2004]. Thus, it would take more than twenty (20) months for the entire EIA study and the environmental license approval process. It is noted that the time to be required for the tender session for the construction phase is not accounted in this rough time estimation.

Currently, the environmental section of the MTC is revising its own EIA guideline for the transport development project and this should be terminated by October, 2005 [MTC, personal communication, 2005]. It is recommended to incorporate up-to-date information of the revised MTC's road-sector EIA guideline into the ToR of the EIA studies to be used during both feasibility and detailed design studies as much as possible.

Again, it shall be stressed out that it is quite essential to establish the study integrity between both EIA studies while keeping the same ToR of the relevant environmental studies and working/supporting staff to be comprised of Peruvian C/P and JICA Study Team throughout the whole EIA study.

Figure 17.10-2 shows the outline of the working frame for the entire EIA study. Mainly, Peruvian C/P (i.e., the project owner) shall be responsible for the entire EIA process, in conjunction with technical support of the JICA Study Team. Both Peruvian C/P and the JICA Study Team shall supervise all EIA-related activities such as relevant environmental studies/surveys, public involvement and consultations with both CONAM and competent environmental agency/organization responsible for the Peruvian EIA Law-based EIA evaluation process. Major undertakings of Peruvian C/P are summarized as follows:

1) Preparation for the required stakeholder meetings based on the New JICA Guideline (F/S)
2) Preparation for the Information Disclosure based on the New JICA Guideline (F/S)

3) Official application for the EIA evaluation based on the Peruvian EIA Law (D/D)
4) Preparation for the tender of the EIA studies to be required for D/D.

Major Undertakings of the JICA Study Team are summarized as follows,

Support the stakeholder meetings based on the New JICA Guideline (F/S)
Support the Information Disclosure based on the New JICA Guideline (F/S)
Support and supervise the EIA studies (F/S and D/D).

(4) Suggested ToR for the EIA Study

The EIA study to be required for the feasibility study of the proposed project shall be carried out based on both the Peruvian EIA Law and the New JICA Guideline. Here, tentative drafts of ToR to be required for the whole EIA study are summarized in Table 17.10-1 to Table 17.10-5. These ToR development work were carried out based on the New JICA Guideline, the MTC Road-Sector Guideline (almost equivalent to that of the World Bank), several EIA reports currently available in Peru and remarks obtained from consultations with several environmental sections of governmental organizations such as PROTRANSPORTE. Table 17.10-1 summarizes the key component tasks to be required for the entire EIA study. Table 17.10-2 summarizes the key environmental factors for the baseline environmental information collection activity. The contents of the bio-physical and socio-cultural environmental field surveys are described in Table 17.10-3 and Table 17.10-4 respectively. Several impact assessment studies such as impacts on the air quality, the vehicular emission and the noise/vibration are summarized in Table 17.10-5.

At this moment (as of December 2004), specific project routes and/or design plans to be implemented for the feasibility study have not been finalized yet. The final draft of the ToR for all of the EIA studies shall be determined based on the bio-physical and socio-cultural environmental conditions around the final project route or its surrounding study area as well as the engineering features of the proposed project.

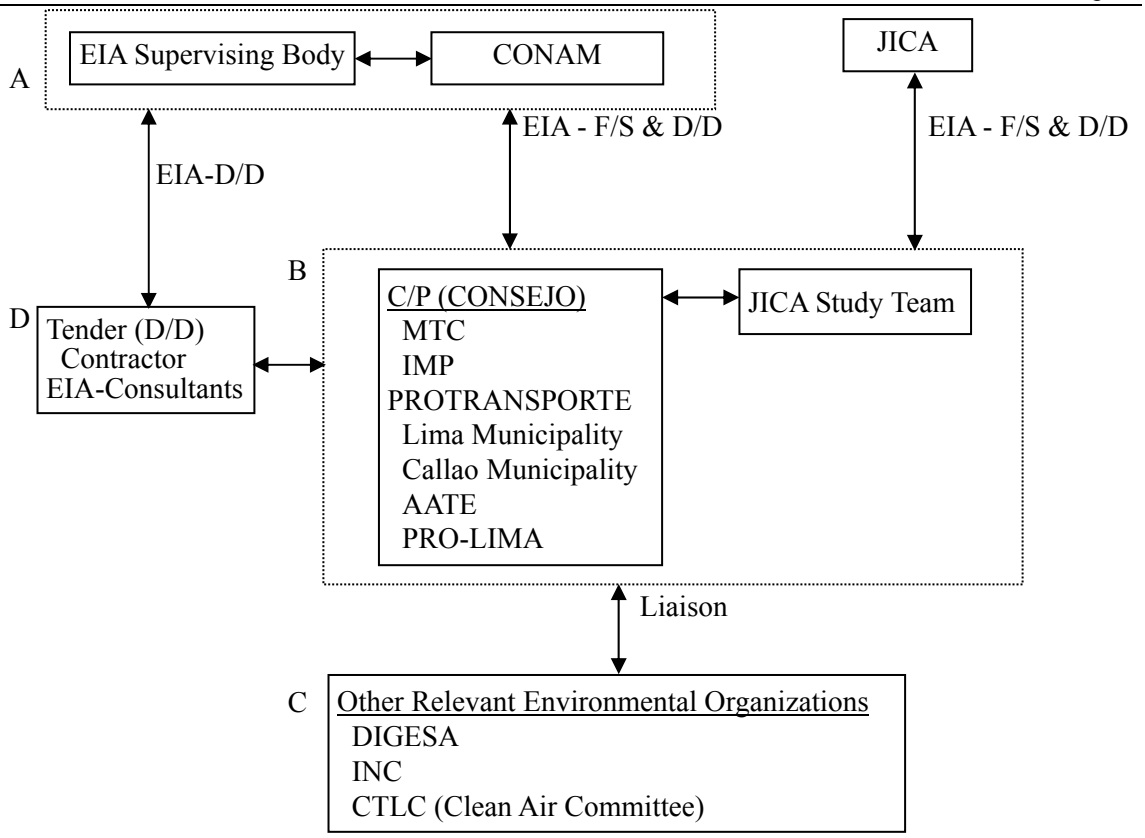


Figure 17.10-2 EIA Working Frame (Tentative)

Note: Box A includes the CONAM and a competent environmental organization that is to be responsible for the D/D-based EIA examination. This EIA-supervising environmental body is nominated by the CONAM. Box B includes the Peruvian C/P composed of several governmental bodies in conjunction with the JICA Study Team. Box C includes other key environmental (bio-physical and socio-cultural) bodies. Box D includes both contractors and EIA consultants to be selected during the tendering of the D/D. The EIA studies for both the F/S and D/D shall be carried out with good coordination and close liaison among each box (i.e., stakeholders).

Table 17.10-1 Major Environmental Tasks to be required for the full-scale EIA Study

	Environmental Tasks
1	**Description of Current Environmental Condition**
	Collect environmental baseline information and describe current environmental condition. 1) Bio-Physical condition 2) Socio-Cultural condition
2	**Field Environmental Survey**
	Carry out the following environmental surveys, 1) Roadside Air Quality 2) Roadside Noise/Vibration 3) Water Quality Survey 4) Soil Survey 5) Biological Survey 6)Groundwater Survey 7) Hydrological Study 8) Preliminary Archaeological and Cultural Surveys 9) Roadside Health Survey
3	**Environmental Impact Assessment**
	Evaluate the potential environmental impacts of three project stages such as 1) pre-construction phase, 2) construction phase, and 3) operational phase. Besides, the following impact assessment studies shall be conducted in order to stress out the advantage/disadvantage of the proposed project quantitatively. 1) Biological Impact Assessment Study (e.g., habitat-based methods or model approaches - HES, HEP) 2) Vehicular Emission Study (CO_2) 3) Air Quality Prediction Study 4) Noise Prediction Study 5) Vibration Prediction Study 6) Run-off (road surface drainage) Study 7) Visual Impact Study 8) Socio-Economic Impact Study
4	**Environmental Mitigation**
	Describe comprehensive, effective measures of mitigation (i.e., avoidance, reduction, and elimination) of negative impacts for the pre-construction, construction and operation phases of the project
5	**Environmental Management**
	Establish an appropriate environmental management plan. Specific objectives of this plan are to 1) define organizational and administrative arrangements for the environmental monitoring, including the definition of responsibilities of the staff, coordination, liaison and reporting procedures, and 2) to discuss procedures for pro-active environmental management, in order to identify potential problems and mitigation measures to be adopted prior to the construction commencement.
6	**Environmental Monitoring**
	Establish an appropriate environmental monitoring program. The scope of the monitoring plan is 1) to identify the monitoring tasks, 2) to identify the nature and the schedule of the monitoring, and 3) to identify samples to be taken for analysis and parameters to be measured.
7	**Preparation of EIA D/F**
	Prepare an EIA D/F Report that documents the results of the impact study. 1) Basic EIA D/F Report 2) Summary of final report written in both Spanish and English (10 – 15 pages in length).
8	**Preparation of Public Involvement**
	Prepare suitable handout or brochure to be used for the public participation process.
9	**Revision of the EIA D/F**
	Based on the following information or results, the revision of the EIA D/F report shall be conducted 1) Feedback loop obtained from the public participation in the EIA process. 2) Comments and advice from relevant environmental agencies. 3) Results of additional and/or supplemental studies.
10	**Preparation of the EIA Final Report**
	Prepare an EIA Final Report that documents the results of the impact study. 1) Basic EIA Final Report 2) Summary of final report written in both Spanish and English (10 – 15 pages in length). 3) Executive summary written in both Spanish and English (3 – 5 pages in length). 4) Abstract from the executive summary or the summary written in both Spanish and English (1 – 2 paragraphs in length)

Table 17.10-2 Description of Current Environment Conditions

1. Bio-Physical condition
1) Regional hydrology (e.g., major tributaries, channels, regional water balance) 2) Water quality of surface/subsurface within the study area. 3) Air quality 4) Regional drainage 5) Roadside noise/vibration/air quality 6) Climate 7) Geology 8) Disaster Records (e.g., past earthquake, landslide, tsunami, inundation or flood events) 9) Soil 10) Biological Environment (e.g., Villa Wetland environmental conservation area)
2. Socio-Cultural condition
1) Cultural (historical and archaeological) resources (e.g., Inca ruins, memorial facilities, historic spots and others) 2) Visual resources (e.g., scenic zones, townscape) 3) Land take/resettlements (e.g., conditions of existing roadside buildings) 4) Illegal squatter 5) Land use 6) Water use (e.g., water supply system, well, oasis) 7) School, hospital, park, library, religious facilities. 8) Waste Disposal Site (location, capacity, treatment method) 9) Vehicle Registration 10) Vehicle Inspection/Maintenance Program 11) Clean Fuel Program 12) Sewage system
3. Pollution
1) Roadside Noise/Vibration 2) Roadside Air Quality 3) Soil Contamination 4) Water Contamination 5) Bad odor

Table 17.10-3 Field Environmental Survey (Bio-Physical)

1. Roadside Air Quality
Carry out a 24-hour continuous survey at ten (10) points across the study area. Parameter: PM10, CO, HC, NO2, SO2, wind data (direction & magnitude) Traffic volume by vehicle type Survey Campaign: Twice (once in summer and once in winter, respectively).
2. Roadside Noise
Carry out a 24-hour continuous survey at ten (10) points across the study area. Parameter: Leq Traffic volume by vehicle type Survey Campaign: Twice (once in summer and once in winter, respectively).
3. Roadside Vibration
Carry out a 24-hour continuous survey at ten (10) points across the study area. Parameter: L_{10} Traffic volume by vehicle type Survey Campaign: Twice (once in summer and once in winter, respectively).
4. Water Quality Survey
Carry out a water quality survey of surface and subsurface waters. Parameters: 1) pH, 2) turbidity, 3) DO, 4) BOD, 5) COD, 6) Grease, 7) Conductivity, 8) Temperature, 9) SS, 10) E-Coli-form, 11) Total Coli-form Sampling Points: 10 points at surface water & 10 for subsurface water Sampling Campaign: Twice (once in summer and once in winter, respectively)
5. Soil Survey
Carry out soil survey of surface layer. Parameter: Heavy Metal and other contaminants Sampling Points: 10 points. Sampling Campaign: Once
6. Biological Survey
Carry out a scientific description of the flora and fauna as well as other natural resources and habitats. 1. Floral components 1) General vegetation patterns of the entire area, 2) Plant species, 3) Tree species, 4) Rare plant species in the entire area, & 5) Others 2. Faunal components 1) Amphibians, 2) Reptiles, 3) Mammals, 4) Fishes, 5) Sport fishes, 6) Birds, 7) Rare faunal species, & 8) Others Prepare vegetation map Prepare impact-identification methods such as 1) Interaction matrices, 2) Networks or 3) Simple and descriptive checklist in order to provide a systematic base for qualitatively outlining potential impacts to be caused by the proposed project.
7. Groundwater Survey
Summarize current groundwater utilization around the study area in order to identify the potential impacts of the proposed project on the groundwater resources. 1) The number of wells (by type, well depth, owner, location) 2) Pumping rate, utilization purpose 3) Confined/unconfined
8. Hydrological Study
Carry out a regional hydrological study, based on the available hydrological and/or meteorological data such as flow rate, rain, groundwater pumping rate, and evapo-transpiration data in order to grasp the regional water balance and regional run-off (e.g., drainage system) characteristics around the study area. (1) Regional Drainage System 1) Major tributaries, channels 2) Demarcation of regional watershed area (2) Regional Water Balance (3) Establish run-off simulation model

Table 17.10-4 Field Environmental Survey (Socio-Cultural)

1. Preliminary Archaeological and Cultural Surveys
Carry out a cultural (historical and archeological) environmental study in order to describe the current existing cultural resources, which include architectural, historical, and archeological sites, as well as areas of unique importance because of their ecological, scientific, or geological information around the study area, and to qualitatively identify the potential impacts of the proposed project on those cultural resources. The cultural environment study consists of the following three steps; Identification of known cultural resources 1) Archaeological resources 2) Cultural resources related to areas of ecological, scientific, or geological importance (e.g., the conservation of mango trees). 3) Local resources of importance to ethnic groups such as burial grounds and cemeteries or areas of unique religious importance 4) Historical properties 5) Others Identification of potential cultural resources A preliminary archaeological reconnaissance shall be conducted in order to identify previously unknown archaeological resources in the study area. Depending of the surrounding environment of the study area, either of following archaeological surveys should be implemented; 1) Controlled-exclusive survey 2) Uncontrolled-exclusive survey 3) Nonexclusive survey 4) Predictive survey Determination of significance of cultural resources Based on the results of the identification processes mentioned above, the significance of those resources must be carefully investigated.
2. Roadside Health Survey
In order to grasp the current health conditions of people working in heavy traffic congestion areas of the cities of Lima and Callao and to study the health damage to be caused by the vehicular emission, the questionnaire-based health damage survey shall be carried out. (1) Transit police officers in charge of traffic control and patrol (2) Street vendors (3) Office workers

Table 17.10-5 Impact Assessment Study

1. Biological Impact Assessment Study (e.g., habitat-based methods or model approaches - HES, HEP)
Discuss the relationship between the land use and habitat change under several project scenarios. The impacts shall be quantified where possible, with qualitative descriptions will be provided for those impacts which can not be quantified.
2. Vehicular Emission Study (CO_2)
Evaluate the amount of vehicular emission to be generated by the regional future traffic and transport conditions around the study area, and carry out a comparative study under the following two scenarios; i.e., **with-** and **without** proposed project. Targeted substance: NOX or CO_2.
3. Air Quality Prediction Study
Evaluate the roadside air quality to be generated by the future traffic and transport conditions along main project routes and find out suitable impact mitigation measures within this project.
4. Noise Prediction Study
Evaluate the sound pressure level to be generated by the future traffic and transport conditions along main project routes and find out suitable impact mitigation measures within this project. Basically, the noise impact prediction study is carried out for daytime and night-time transport conditions, respectively.
5. Vibration Prediction Study
Evaluate the vibration level to be generated by the future traffic and transport conditions along project routes and find out suitable impact mitigation measures within this project. Basically, the vibration impact prediction study is carried out for daytime and night-time transport conditions, respectively.
6 Run-off (road surface drainage) Study
Evaluate the impacts of the proposed project (or activity) on the regional drainage system quantitatively, using computer simulation models.
7. Visual Impact Study
Evaluate the impacts of the proposed project (or activity) on visual resources, using either of (1) descriptive approach, (2) scale model, (3) seasonally-varied photograph, (4) seasonally-varied photomontages, or (5) computer simulations.
8. Socio-Economic and Socio-Cultural Impact Study
Evaluate the impacts of the proposed project (or activity) on several socioeconomic and socio-cultural factors such as (1) regional economy, (2) land use and utilization of local resources, (3) gender, (4) children's rights (e.g., child labors), and (5) resettlement.

17.11. PUBLIC INVOLVEMENT

17.11.1. INVENTORY OF STAKEHOLDERS

The assumptive Stakeholders for public transport projects could be made up of 1) Public Transport Users, 2) Non Public Transport Users, 3) Public Transport Operators, 4) Governmental Offices Concerned, 5) People of Learning and Experience, 6) NGOs and Groups of interest, 7) People who might be affected by the Projects, and others.

(1) Public Transport Users:

Approximately 70 % of the total inhabitants (8,000,000) of the Lima Metropolitan Area are estimated to be Everyday Users of Public Transport, which is equivalent to 5,600,000 persons.

They can be classified as follows.

1) Users of Different Trip Motives:
    a) Commuting Users
    b) Student Users
    c) Users of Other Trip Motives
2) Users Needing Special Consideration
    a) Handicapped People
    b) Sick People
    c) Elderly People

d) Infants
e) Socially Vulnerable People

- Low Income People
- Displaced People
- People of Minority Race

3) User Groups:

a) Organizations of Citizens and Neighbors
b) Companies of Workplace
c) Schools and Educational Institutes
d) Others

(2) Non Public Transport Users:

The rest, 30 % of the total inhabitants, 2,400,000 persons, are Non Everyday Users of Public Transport.

(3) Public Transport Operators:

1) Bus, Microbus, Combi-bus Workers:

a) Drivers
b) Collectors
c) Inspectors and Other Bus Operation Workers

2) Bus, Microbus, Combi-bus Owners
3) Bus, Microbus, Combi-bus Companies
4) Taxi Drivers
5) Taxi Owners
6) Taxi Companies
7) Moto-taxi Drivers
8) Moto-taxi Owners
9) Moto-taxi Companies
10) Public Transport Organizations
11) Labor Unions

The number of public transport workers, drivers and collectors of omnibuses, microbuses and camionetas, are said to be 100,000 in Lima (official data of the DMTU), though there is no statistic data. If three (3.0) persons are working for one (1) vehicle unit (official data of the DMTU), considering relief turns, the number of workers will be 94,782 persons, as shown in Table 17.11-1, though this is on the basis of registered vehicles. Considering non-registered vehicles, the number is estimated to be one third (1/3) more than that, which is 126,000 persons.

The number of total employment in the metropolitan area of Lima is 3,568,000, of which 2,835,000 belonged to tertiary industries in 2004. So, bus transport workers occupy 3.5% of the total employment in the area and 4.4% of that of the tertiary industries.

Table 17.11-1 Registered Number of Vehicles and Estimated Number of Workers

(unit: vehicles)

Items	Lima	Callao
Omnibuses	4,500	2,026
Microbuses	11,000	
Combi-buses (Camionetas)	9,000	5,068
Total	24,500	7,094
Estimated number of workers	73,500	21,282
Total	94,782	

Source: DMTU, DGTU, adjusted by JICA investigator

There are 326 registered bus transport companies with operation in Lima, and 150 registered in Callao.

There are 30,256 registered taxis in Lima and Callao. Additionally, 181,000 taxis without registration are estimated to be in operation. That is to say, more than 211,000 taxi drivers are working in Lima and Callao.

There are 286 taxi companies in Lima.

7 Organizations of Public Transport are known in the area:

Table 17.11-2 Organizations of Public Transport

Abbreviation	Full Name
CGT	Confederación General de Transporte
ASETRAP	Asociación de Empresas de Transporte del Perú
ANETUR	Asociación Metropolitana de Empresas de Transporte Urbano
ASETUO	Asociación de Empresas de Transporte Urbano del Perú
CONATRAP	Confederación Nacional de Empresas de Transporte Público
CEMTU-PERU	Corporación de Empresas de Transportistas Urbanos del Perú
ASETUM	Asociación de Empresas de Transporte Urbano Masivo del Perú

(4) Governmental Offices Concerned:

1) National Government and Related Organizations.
2) Regional Government and Related Organizations
3) Provincial Municipalities and Related Organizations
4) District Municipalities and Related Organizations

Table 17.11-3 Governmental Offices Concerned

National Government	Ministry of Transport and Communications (MTC)
	Ministry of Economy and Finance (MEF): PROINVERSION
	National Corporation for Urban Transport (ENATRU)
	National Road Security Committee (CNSV)
	National Assessment Council for Real Estate (CONATA)
	National Environment Council (CONAM)
	National Environmental Fund (FONAM)
	National Institute of Culture (INC)
	National Superintendence Agency for Public Registration (SUNARP)
	National Police (PNP)
	Peruvian Agency of International Cooperation (APCI)
Regional Government	Department of Lima
Provincial Municipalities	Municipality of Metropolitan Lima (MML): DMTU, DMDU, AATE, PROTRANSPORTE, PETNM, IMP, SETAME, EMAPAE, CEPRI, INVERMET, TRANSMET
	Municipality of the Province of Callao (MPC): DGTU, DGDU, FINVER
District Municipalities	42 District Municipalities and the Municipality of Metropolitan Lima (Lima Cercado District)
	5 District Municipalities and the Municipality of the Province of Callao (Callao District)
Inter-Institutional Organization	Lima Callao Transport Council (CTLC): MTC, MEF, PNP, MML, MPC

(5) People of Learning and Experience:

1) Transport Consultants
2) Other Consultants
3) University Professors
4) Other Specialists
5) Professional Organizations
    a) Civil Engineers
    b) Urban Planners
    c) Architects
    d) Sociologists
    e) Economists
    f) Environmentalists
    g) Others

(6) NGOs and Groups of Interest

1) Transport NGOs
2) Social NGOs
3) Environmental NGOs
4) Other NGOs

(7) People who might be affected by the Transport Projects

1) Residents Needing to be Relocated
2) Business People Needing to be Relocated
3) Vendors of Street Kiosks
4) Street Vendors and Street Vendor Groups

17.11.2. CHARACTERISTICS OF LOW INCOME PEOPLE

(1) Socio-economic Strata

A socio-economic classification is applied to demographic statistics by the National Institute for Statistics and Information (INEI) on the basis of the National Census of Population and Dwelling (CPV) and the National Inquiry of Households (ENAHO). The households are classified statistically into 5 Socio-economic Strata: A (high), B (medium high), C (medium), D (medium low), E (low), by way of synthetic manner made up of 23 items of inquiry results, 11 of which correspond to housing and household, 9 of which correspond to employment and income, and 3 of which correspond to educational background and age of householder.

The predominant characteristics of the profile of Socio-Economic Strata D and E are given in Table 17.11-4 by a study report:

Table 17.11-4 Characteristics of Socio-Economic Strata D and E

Items	Estrato D	Estrato E
Characteristics of Household		
Monthly Household Income	US$ 203	US$ 146
Monthly Expense for Food	US$ 120	US$ 92
Engel's Coefficient	0.59	0.63
% of Household with Debt	43 %	41 %
Characteristics of Residence		
Possession of Fixed Telephone	30 %	4 %
Possession of Refrigerator	56 %	12 %
Possession of Washing Machine	2 %	2 %
Possession of Cable TV	15 %	2 %
Internet Access	0 %	0 %
Possession of Automobile	5 %	1 %

Source: Niveles Socioeconómicos Gran Lima, Apoyo Opinión y Mercado S.A., 2003

The percentage of Stratum E population in Lima, as shown in Table 17.11-5, is 34.2%, in Callao it is 31.6%, and the total of Lima and Callao is 34.0%. There are 10 districts in Lima and Callao with 50% to 60% of Stratum E population, and 6 districts with more than 60%, which are Puente Piedra (83%), Villa El Salvador (73%), Pachacámac (71%), Lurín (70%), Ventanilla (65%) and Cieneguilla (62%).

Table 17.11-5 Percentage of Estrato E Population

District	%	18. Luriganchо /Chosica	58.3	36. San Miguel	2.6
1. Ancón	55.0	19. Lurín	70.2	37. Santa Anita	54.6
2. Ate Vitarte	49.6	20. Magdalena del Mar	0.1	38. Santa Marìa del Mar	32.0
3. Barranco	0.5	21. Miraflores	0.2	39. Santa Rosa	56.3
4. Breña	0.2	22. Pachacámac	70.7	40. Santiago de Surco	6.5
5. Carabayllo	58.1	23. Pucusana	52.4	41. Surquillo	3.7
6. Chaclacayo	47.7	24. Pueblo Libre	0.8	42. Villa El Salvador	73.4
7. Chorrillos	40.8	25. Puente Piedra	82.5	43. Villa María del Triunfo	57.3
8. Cieneguilla	62.0	26. Punta Hermosa	47.9	**TOTAL LIMA**	34.2
9. Comas	39.3	27. Punta Negra	48.8	1. Bellavista	2.1
10. El Agustino	53.5	28. Rímac	18.4	2. Callao	36.1
11. Independencia	36.4	29. San Bartolo	34.4	3. Carmen de la Legua	15.5
12. Jesús María	0.0	30. San Borja	1.6	4. La Perla	1.0
13. La Molina	8.5	31. San Isidro	0.0	5. La Punta	0.0
14. La Victoria	13.5	32. San Juan de Lurigancho	56.2	6. Ventanilla	64.5
15. Lima/Cercado	11.3	33. San Juan de Miraflores	52.0	**TOTAL CALLAO**	31.6
16. Lince	0.0	34. San Luis	4.2	**TOTAL LIMA & CALLAO**	34.0
17. Los Olivos	34.9	35. San Martín de Porras	15.6		

Source: Planos Estratificados de Lima Metroplitana a Nivel de Manzana (INEI 1998)

Table 17.11-6 Districts with more than 50% of Estrato E Population

Puente Piedra	82.5 %
Villa El Salvador	73.4 %
Pachacámac	70.7 %
Lurín	70.2 %
Ventanilla	64.5 %
Cieneguilla	62.0 %
Lurigancho /Chosica	58.3 %
Carabayllo	58.1 %
Villa María del Triunfo	57.3 %
Santa Rosa	56.3 %
San Juan de Lurigancho	56.2 %
Ancón	55.0 %
Santa Anita	54.6 %
El Agustino	53.5 %
Pucusana	52.4 %
San Juan de Miraflores	52.0 %

Source: INEI 1998

(2) Survey of Poverty and Extreme Poverty

The JICA study team carried out inquiry surveys of poverty and extreme poverty households. The inquiry was executed on the 15 points of open air markets, invaded dwellings, health centers, and Popular Dining Room (Comedores Populares) service sites in the 11 districts of San Juan de Lurigancho, Villa El Salvador, San Juan de Miraflores, Ate, La Victoria, San Martín de Porras, Los Olivos, Comas, Callao, Puente Piedra and Ventanilla with 1,085 samples, 117 of which were Extreme Poverty households.

The characteristics of these households are shown in Table 17.11-7.

Table 17.11-7 Characteristics of Poverty and Extreme Poverty Households

Items	Poverty Household	Extreme Poverty Household
Drinkable Water Supply		
Public Service	45 %	1 %
Private Water Truck Service	39 %	64 %
Wells	1 %	1 %
Others	9 %	9 %
No Benefit of Any Service	6 %	25 %
Electricity Supply		
Public Service	90 %	0 %
No Benefit of Public Service	9 %	94 %
Others	1 %	6 %
Types of Dwellings		
Owned Dwellings	48 %	0 %
Rented Dwellings	17 %	0 %
Invaded Dwellings and Others	35 %	100 %
Possession Electrical Appliances		
Television	77 %	32 %
Radio	34 %	12 %
Refrigerator	17 %	2 %
Telephone	2 %	0 %
Computer	2 %	2 %
Situation of Employment		
Stable Labor	56 %	36 %
Temporary Labor	28 %	27 %
Unemployed	16 %	37 %
Type of Stable Labor		
Vendor	74 %	64 %
Construction Worker	3 %	2 %
Guard	2 %	5 %
Others	21 %	29 %
Type of Temporary Labor		
Vendor	42 %	50 %
Construction Worker	15 %	19 %
Guard	4 %	0 %
Others	39 %	31 %

Source: JICA Study Team

(3) Minimum Salary

The Legal Minimum Vital Remuneration (RMV) is 460 Soles (US$130) monthly, which is determined by the Urgent Decree No.022-2003 of September 13, 2003.

(4) Popular Dining Rooms

The Popular Dining Rooms (Comedores Populares) of the National Program of Alimentary Assistance (PRONAA) are a government subsidized service of supplying cheap lunches (from 1.00 Sol to 1.50 Soles each) to the communities of poor people. For the realization of this service it is necessary to organize an autonomous and participative group of beneficence and volunteering. This can also be a manner of establishing an organization for poor people.

In the case of the Ventanilla District of Callao there are 186 Popular Dining Rooms with 6,514 members serving 17,421 rations of lunch per day. The Directive Office of Neighbors' Participation of the municipality has an inventory of the Popular Dining Rooms

with group name, location, president (name, address, Tel, DNI), municipal resolution number, mandate period and infrastructure of the service site.

(5) Glass of Milk Program

The Glass of Milk (Vaso de Leche) Program is a government subsidized service that supplies free breakfasts (250 cc of milk per day and complementary food) to the infants, pregnant women, mothers in lactation, etc. of the most vulnerable social groups. The service is realized by way of the Ministry of Economy and Finance and the Bank of the Nation.

In the case of La Molina District of Lima the beneficiaries are classified into 3 levels of priority:

1) The first priority:
    a) Children of 0 to 6 years of age
    b) Pregnant women
    c) Mothers in lactation
2) The second priority:
    a) Children of 7 to 13 years of age
3) The third priority:
    a) Women more than 55 years of age
    b) Men more than 60 years of age
    c) Tuberculosis patients
    d) Disabled persons

17.11.3. CHARACTERISTICS OF BUS DRIVERS

The public transport operators (drivers, collectors or assistants) of Lima have very bad reputations with regards to their reckless driving, violation of traffic rules and criminal acts. The DMTU and DMSBS (Municipal Direction of Health and Welfare) carried out socio-economic surveys and psychological tests for 4,946 operators in 2003, making good use of the opportunity of registration, as public transport operators are obliged to carry ID cards registered in the DMTU since 2003.

According to the study, the following points can be presented:

(1) Where they live

The operators come mainly from the east, north and south zones of Metropolitan Lima, from which it is possible to define that the predominant social-economic level is D or E, as shown in Table 17.11-8.

More than half of the drivers live in the 5 districts of San Juan de Lurigancho (23%), Comas (11%), Villa María del Triunfo (7%), San Martín Porras (6%) and San Juan de Miraflores (5%), where the percentage of stratum E is more than the average of Lima (except for San Martín de Porras). See Table 17.11-9.

Table 17.11-8 Distribution of Residence by Zones

Zone	Percentage of Operators' Residence
Lima East	35 %
Lima North	29 %
Lima Center	21 %
Lima Southeast	1.5 %
Lima Northwest	1.5 %
Callao	3 %
Others	4 %
Total	100 %

Source: DMTU, INEI

Table 17.11-9 Districts of Drivers Residence and Stratum D and E Population

District	Drivers' Residence	Stratum E Population	Stratum D Population
San Juan de Lurigancho	23 %	56 %	23 %
Comas	11 %	39 %	39 %
Villa María del Triunfo	7 %	57 %	29 %
San Martín Porras	6 %	16 %	24 %
San Juan de Miraflores	5 %	52 %	21 %
Others	46 %	-	-
	Total 100 %	Average Lima 34 %	Average Lima %

Source: DMTU, INEI

(2) Age

The group of service operators of public transport is composed basically by a young population, 75 % of which is under 40 years of age. The population is concentrated in two big groups: the first one is composed by teenagers and young adults between 19 and 25 years old (25 %) and the second group by young adults between 26 and 32 years old (28 %). The first group is mainly composed of collectors and the second one by drivers.

Table 17.11-10 Distribution of Age

Ages	Collectors		Drivers		Collectors and Drivers	
	Percentage	Accumulated	Percentage	Accumulated	Percentage	Accumulated
12 - 18	7 %	7 %	0.04%	0.04%	3.3 %	3.3 %
19 - 25	41 %	48 %	10 %	10 %	25 %	28 %
26 - 32	27 %	75 %	30 %	40 %	28 %	57 %
33 - 39	14 %	89 %	22 %	62 %	18 %	75 %
40 - 46	7 %	96 %	20 %	82 %	14 %	89 %
47 - 53	3 %	99 %	11 %	93 %	7 %	95 %
54 - 60	1 %	99.6%	5 %	97 %	3.0 %	98 %
61 - 67	0.3 %	100.0%	2.3 %	99.7 %	1.4 %	99.8 %
68 - 74	0.04 %	100 %	0.35 %	100%	0.20 %	100%
Total	100 %	-	100 %	-	100 %	-

Source: DMTU

(3) Educational Background

As shown in Table 17.11-11, 86 % of the operators have an Educational Background that goes beyond Primary School. In addition, 12 % of drivers and 10 % of collectors have studied beyond Secondary School.

Table 17.11-11 Educational Background of Drivers and Collectors

Grade of Education	Drivers		Collectors	
	Percentage	Accumulated Percentage	Percentage	Accumulated Percentage
University	2.8 %	2.75%	1.9 %	1.88%
University not Completed	6.0 %	8.2 %	4.8 %	6.7 %
Vocational School	2.1 %	10.9 %	2.1 %	8.8 %
Vocational School not Completed	1.5 %	12.3 %	1.5 %	10.3 %
4 - 5 Grades of Secondary School	56.4 %	68.8 %	57.0 %	67.2 %
1 - 3 Grades of Secondary School	17.7 %	86.5 %	19.1 %	86.4 %
4 - 6 Grades of Primary School	8.2 %	94.7 %	7.4 %	93.8 %
1 - 3 Grades of Primary School	1.4 %	96.1 %	1.5 %	95.2 %
Without Education	0.2 %	96.3 %	0.5 %	95.7 %
No information	3.7 %	100.0%	4.3 %	100.0%
Total	100 %	-	100 %	-

Source: DMTU, adjusted by JICA investigator

(4) Results of Projectional Tests and Psychometric Tests

In order to determine the psychological profile of the public transport operators Projectional and Psychometric Tests were executed.

The Projectional Tests are Drawing Tests of the Human Figure by Karen Machover to examine Emotional Stability, Sociability, Aggressiveness Grade and Observance Grade.

The Psychometric Tests are the CPF Test (Sociability in Workplace Circumstances), NPF Test (Emotional Stability in Workplace Circumstances) and Kent IQ Test (Mental Intelligence Quotient Test, ten oral questions which provide a rapid estimate of the IQ).

As shown in Table 17.11-12, in the results of the Projectional Tests, 55 % of the operators are estimated to have a Low Emotional Stability, 29 % have a Low Sociability, 9 % have a High Aggressiveness Grade and 7 % have a Low Observance Grade.

As shown in Table 17.11-13, in the results of the Psychometric Tests, 39 % of the operators are estimated to have a Low Sociability in Workplace Circumstances and 9 % have a Low Emotional Stability in Workplace Circumstances. As the result of the Kent IQ Test, the average value of Collectors is 23.65, which is below 24.00, equivalent to the mental age of a 14 year old and the minimum required for transport operators.

Table 17.11-12 Results of Projectional Tests

Items	Collectors	Drivers	Total
Emotional Stability			
High	0.0 %	0.0 %	0.0 %
Medium	46 %	44 %	45 %
Low	54 %	54 %	**55 %**
Total	100 %	100 %	100 %
Sociability Level			
High	0.8 %	0.5 %	0.6 %
Medium	72 %	70 %	71 %
Low	28 %	30 %	29 %
Total	100 %	100 %	100 %
Aggressiveness Grade			
High	8 %	10 %	9 %
Medium	81 %	81 %	81 %
Low	11 %	9 %	10 %
Total	100 %	100 %	100 %
Observance Grade			
High	0.3 %	0.3 %	0.3 %
Medium	93 %	92 %	92 %
Low	7 %	8 %	7 %
Total	100 %	100 %	100 %

Source: DMTU

Table 17.11-13 Results of Psychometric Tests

Items	Collectors	Drivers	Total
Sociability in Workplace Circumstances (CPF Test)			
Low	40 %	38 %	39 %
Medium	39 %	37 %	38 %
High	10 %	10 %	10 %
Not Valid	11 %	14 %	13 %
Total	100 %	100 %	100 %
Emotional Stability in Workplace Circumstances (NPF Test)			
Low	10 %	7 %	9 %
Medium	40 %	31 %	35 %
High	30 %	39 %	34 %
Not Valid	20 %	24 %	22 %
Total	100 %	100 %	100 %

Source: DMTU

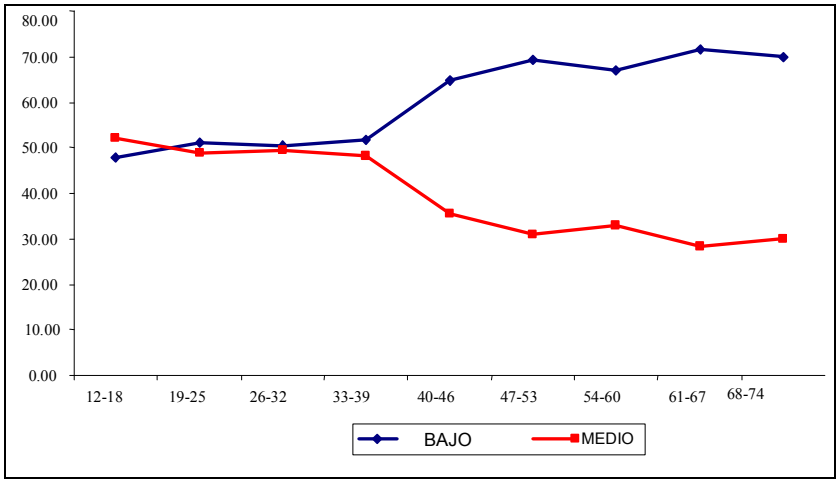
Table 17.11-14 Result of Age - Mental Intelligence Quotient Test (Kent IQ Test)

Items	Average IQ Value
Drivers	24.37
Collectors	23.65
Divers and Collectors	24.02
Required Minimum Value	24.00

Source: DMTU

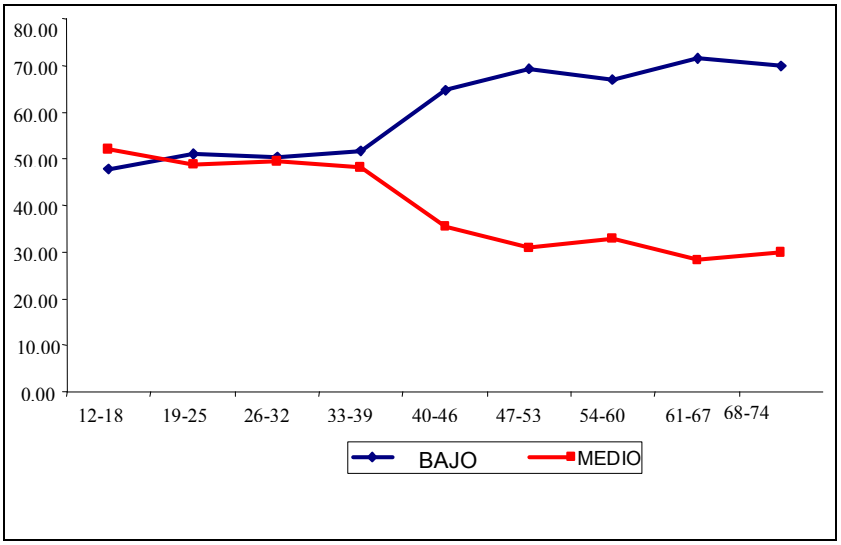
(5) Age versus Emotional and Intellectual Aspects

The age factor directly affects the performance of people both in emotional and intellectual aspects. The results of the evaluations show that in areas considered as keys for the approval of psychological evaluations (aggressiveness, emotional stability and sociality level) there is a clear co-relation allowing us to observe that for old people there are a lot of conflicts in such areas.



Source: DMTU

Figure 17.11-1 Tendency of Emotional Stability by Age



Source: DMTU

Figure 17.11-2 Tendency of Sociality by Age

(6) Relation between Age and Educational Background

There is a marked relation between the age and level of education. This means that young operators have received a higher level of education than the old operators, which especially represent the basic education levels, in other words primary education. In the tables presented it is observed that as the age increases there is a low level of education. For instance, in the group of operators between 26 and 32 years old 5.7% have only primary education, while in the group between 54 and 60 years old this percentage represents 31.5%.

Table 17.11-15 Age and Educational Background of Drivers and Collectors

Range of Age	Without Ed.	1 - 3 Grades Primary	4 - 5 Grades Primary	1 - 3 Grades Secon.	4 - 5 Grades Secon.	Voca-tional School Incom-plete	Voca-tional School	Univ. Incom-plete	Univ.	No Info.	Total
12-18	1.2%	0.0%	6.16%	24.9%	**60.6%**	0.6%	0.6%	1.8%	0.6%	3.6%	100%
19-25	0.3%	1.0%	4.39%	16.7%	62.4%	1.9%	2.6%	4.5%	1.5%	4.9%	100%
26-32	0.1%	0.5%	5.7%	16.6%	60.6%	1.6%	2.1%	**6.6%**	3.0%	3.3%	100%
33-39	0.5%	1.1%	7.2%	18.1%	56.8%	1.9%	2.8%	6.2%	2.6%	2.9%	100%
40-46	0.2%	2.1%	7.5%	22.0%	53.8%	0.9%	0.9%	5.3%	3.1%	4.3%	100%
47-53	0.6%	3.2%	16.38%	22.1%	41.9%	0.3%	2.6%	5.8%	2.0%	5.2%	100%
54-60	0.0%	6.9%	**31.5%**	21.2%	27.4%	1.4%	0.7%	4.1%	1.4%	5.5%	100%
61-67	1.5%	9.0%	**37.3%**	14.9%	28.4%	0.0%	1.5%	0.0%	0.0%	7.5%	100%
68-74	0.0%	10.0%	20.0%	10.0%	60.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
Total	0.3%	1.4%	7.8%	18.4%	56.7%	1.5%	2.1%	5.4%	2.3%	4.0%	100%

Source: DMTU

(7) Sense of Little Valorization of Work

From the previous point it is possible to deduct that there is a lack of valorization for operator jobs, probably due to the lack of demand of minimal education requirements in order to operate. This could mean that the operator produces a feeling of less valorization for his work. So, if no work challenge or progress sensation is generated, the social environment could understand it as something shameful or with little aspiration.

(8) Young Collectors and Low IQ

By making a difference according to the work category, only 11 % of collectors are people older than 40 years old. But in the case of drivers, 38 % exceeds this age. This allows us to provide reasoning according to the IQ results obtained. If a Collector is a young man, it results “natural” that he have a mental age inferior to that obtained by the drivers.

(9) Aggressiveness and Emotional Instability

Regarding psychological aspects, the operator of a public transport service shows a high emotional instability (55 %), that is to say that the operator has an inadequate handling of emotions in front of conflictive situations. Additionally, he presents a medium aggressive personality (81 %). By adding these factors, taken from projective tests, we can propose that it is a neurotic human group that is exposed to a progressive damage, exposing both the physical and mental health and exposing the user of the public transport service.

(10) Circumstances of Work

However, it is believed that inside a better working environment, they could have a better performance by improving their emotional stability, according to the results shown in the psychometric tests of Stability-Instability (34 % with a high score in sub test NPF).

(11) Adequate Social Relation

Regarding the ability to make adequate social relationships, they have shown a great capacity to establish appropriate social relationships (71 %) both with work partners and with the public in general. It gives us the hope to be able to work with this human group in order to improve the service to the public and the user. It is clear that, in order to get this kind of change, it is important to change the labor offers within the companies.

(12) Questions

Although the study is an approximation to the psychological profile of the operator, it is believed that it is necessary to develop further studies allowing a better analysis of the above mentioned social group. There are factors of personality in the operator, such as his expectations in work, motivations, beliefs and style of life among others, that would permit a classification in order to obtain a better performance and consequently to establish better policies of intervention.

(13) Hypothetical Analysis on Motivations

An Inquiry about Motivation and Perspective for Transport Labor was carried out. The result is presented as follows:

Table 17.11-16 Result of Inquiry about Perspective for Transport Labor

Items	Yes	No
Perception of transport as the only possibility of labor	40 %	60 %
Self-perception of performance capacity of other labor	77 %	23 %
Possibility of abandonning transport for another opportunity	94 %	6 %
Actually looking for another labor activity	55 %	45 %
Transport labor for survival	39 %	61 %

Source: DMTU

According to the result, 4 types of operators can be classified hypothetically as follows:

Table 17.11-17 Hypothetical Analysis of Operators on Motivations

Types	Attribute		Present Motivation	Future Perspective
Type 1	Opportunist	Eventual	Resource just for gaining real objective of life.	Obtain proper business outside of transport.
Type 2		Transitory	Looking for possibility in transport.	Aspire to gain successfulness in a position inside or outside of transport.
Type 3	Traditionalist	Aspirant	Establishing life in transport.	Found a transport company. Acquire transport vehicles.
Type 4		Circumscribed	Transport as a vicious circle. Not aspiring.	Survival. Look for realization by way of his family.

Source: DMTU, adjusted by JICA investigator

The Hypothetical Analysis mentioned above requires additional examination in detail for ascertainment; however this analysis and statistic survey will be very helpful to cope with the expecting employment impact of the introduction of new transport systems.

17.11.4. CHARACTERISTICS OF NGOS

The Peruvian Agency of International Cooperation (APCI) has 300 NGOs registerred in Lima and Callao, 6 of which have interest in transport, 14 in natural resources, 54 in the environment, 67 in social development and 93 in Promotion of the Feminine Gender and Human Development (PROMUDEH).

17.11.5. CHARACTERISTICS OF UNIVERSITIES

There are 31 universities and higher educational institutes in Lima and Callao. See Table 17.11-18.

9 universities have faculties related to civil engineering, urban planning and architecture: UAP, UNIFE, UNI, UNFV, PUCP, USMP, UPC, URP and the Military School.

8 universities have faculties related to environmental science, natural geography, biology, forest science and agronomy: UNAC, UNALM, UNMSM, UNE, UNI, UNFV, URP and the Air Force School.

9 universities have faculties related to social and human sciences: UAP, UNMSM, UNE, UPEU, UIGV, UNFV, PUCP, UL and the Navy School.

Table 17.11-18 Universities and Higher Education Institutes

Name (District & Province)	Faculties
Universidad Nacional del Callao - UNAC (Bellavista, Callao)	Economics, Administrative Sciences, Accounting, Natural Sciences, Electronics, Mechanics, Systems, Energy, Fishery, Foods and Chemical Engineering, Environment and Natural Resources Engineering, Health Sciences.
Universidad Privada San Juan Bautista (Chorrillos, Lima)	Human Medicine, Infirmary, Law, Communication Sciences, Computing and System Engineering.
Universidad Alas Peruanas S.A. - UAP (Jesus María, Lima)	Law and Political Sciences, Farming Sciences, Health Sciences, Management, Economy, Accounting and Finance Sciences, Architecture, Education and Humanities, Communication Sciences.
Universidad del Pacífico - UP (Jesus María, Lima)	Management and Accounting, Economy.
Universidad San Ignacio de Loyola - USIL (La Molina, Lima)	Management, Hotel & Tourism Management, Art and Graphic Design, Communication, Law, Education, Economy, Agro-Industrial Engineering, Industrial and Commercial Engineering, Marketing.
Universidad Femenina del Sagrado Corazón - UNIFE (La Molina, Lima)	Architecture, Communication Sciences, Law, Education, System Engineering, Nourishing, Psychology, Translation and Interpretation
Universidad Nacional Agraria de La Molina - UNALM (La Molina, Lima)	Agronomy, Forest Sciences, Economy and Planning, Nourishing Industries, Agricultural Engineering, Fishing, Zoological Technology
Universidad Privada Norbert Wiener S.A. (Lima, Lima)	Engineering, Medical Sciences, Management and International Business, Pharmacy and Biochemistry
Universidad Tecnológica del Perú - UTP (Lima, Lima)	Electronic Engineering, Industrial Engineering, System Engineering, Management, Accounting, Law and Political Sciences
Universidad Nacional Mayor de San Marcos - UNMSM (Lima, Lima)	Medicine, Law and Political Sciences, Literature and Human Sciences, Biochemistry, Dentistry, Education, Chemistry and Chemical Engineering, Veterinary, Medicine, Management, Biological Sciences, Accounting, Economics, Physics, Mathematics, Social Sciences, Geology, Geography, Industrial Engineering, Psychology, Electronics, System Engineering
Universidad Católica Sedes Sapientiae (Los Olivos, Lima)	Management, Accounting, Education.
Universidad Nacional Enrique Guzman y Valle - La Cantuta - UNE (Lurigancho, Lima)	Agriculture and Nourishing Sciences, Management and Tourism, Social Sciences, Humanities, Physical Culture and Pedagogy
Universidad Peruana Unión - UPEU (Lurigancho, Lima)	Accounting and Management Sciences, Education and Human Sciences, Health Sciences, Engineering, Theology
Universidad Marcelino Champagnat (Miraflores, Lima)	Education.
Facultad de Teología Pontificia y Civil de Lima - FTPCL (Pueblo Libre, Lima)	Theology and Philosophy, Education.
Universidad Antonio Ruiz Montoya - UARM (Pueblo Libre, Lima)	Philosophy, Historical Social Sciences, Language and Literature.
Universidad Inca Garcilaso de la Vega - UIGV (Pueblo Libre, Lima)	Dentistry, Psychology and Social Sciences, Pharmacy and Biochemistry, Infirmary, Law and Political Sciences, Communication, Tourism, Education, Management, System and Telecommunication Engineering, Management and Economic Sciences
Universidad Nacional de Ingeniería - UNI (Rímac, Lima)	Architecture, City Planning, Civil Engineering, Economic and Social Sciences, Electric and Electronic Engineering, Industrial and System Engineering, Petrochemical Engineering, Manufacturing and Chemical Engineering, Mechanical Engineering, Geological, Mining and

	Metallurgical Engineering, Environmental Engineering
Universidad Peruana Cayetano Heredia - UPCH (San Martín de Porras, Lima)	Medicine, Dentistry, Education, Public Health and Management, Sciences and Philosophy, Veterinary and Zoological Technology, Infirmary, Psychology.
Universidad Nacional Federico Villareal - UNFV (San Miguel, Lima)	Architecture and City Planning, Management, Social Sciences, Accounting and Finance, Mathematics and Natural Sciences, Economics, Law and Political Sciences, Education, Humanities, Civil Engineering, Geographic and Environmental Engineering, Electronic Engineering, Industrial and System Engineering, Medicine, Dentistry, Oceanography, Fishing and Nourishment Sciences
Pontificia Universidad Católica del Perú - PUCP (San Miguel, Lima)	Management and Accounting, Architecture and City Planning, Arts, Sciences and Engineering, Social Sciences, Arts of Communication, Law, Education, Literature and Human Sciences.
Universidad San Martín de Porras - USMP (Santa Anita, Lima)	Management Sciences and Industrial Relations, Communication Sciences, Tourism and Psychology, Accounting, Economics and Finance, Law and Political Sciences, Education, Engineering and Architecture, Obstetrician and Infirmary, Medicine, Dentistry
Universidad Peruana de Ciencias Aplicadas - UPC (Santiago de Surco, Lima)	Architecture, Communication Sciences, Law, Economics, Study of Enterprise, Engineering
Universidad de Lima (Santiago de Surco, Lima)	Communication, Law, Psychology, Industrial Engineering, System Engineering, Management, Accounting, Law and Political Sciences
Universidad Científica del Sur - UCSUR (Santiago de Surco, Lima)	Veterinarian Medicine, Zoological Technology, Medicine, Nourishment and Dietetics, System Engineering, Informatics Engineering, Economics
Universidad Ricardo Palma - URP (Santiago de Surco, Lima)	Architecture, Biology, Economic and Enterprise Sciences, Engineering, Modern Language, Medicine, Psychology.
Escuela Nacional de Marina Mercante "Miguel Grau" - ENAMM (Chucuito, Callao)	Official of Engineering, Deck Official, Maritime and Harbor Management
Escuela Militar de Chorrillos (Chorrillos, Lima)	Infantry, Mounting and Artillery (Management), Military Engineering, Telecommunication Engineering, Intelligence (Psychology, Law and Social Sciences), War Material (Mechanical Engineering), Intendancy
Escuela de Oficiales Fuerza Aerea Peruana EOFAP (Surco, Lima)	Enterprise Management, Political Science, Geographic Engineering, Industrial Engineering, Electronic Engineering.
Escuela Naval del Peru (La Punta, Callao)	Industrial Engineering, Humanity and Political Sciences, Management and Maritime Security

17.11.6. SEMINARS

(1) The First Seminar (Jan.30, 2004)

The First Seminar had an aspect of a stakeholder meeting with transport specialists in the administration, universities and consultant companies. The number of participants on the first Seminar is shown in Table 17.11-19.

The following 2 lectures were presented in the seminar:

a) The Scopes for the Inception Report of the Study
b) Technology of the Geographic Information System

In the Question and Answer session 23 participants asked questions, and the following opinions were presented:

a) Bicycle Riding should be promoted. Bicycle Riding is good because it is free from air pollution, the topography is flat, and there is no rain in Lima. Short sections for cycling roads of 3 to 4 km are proposed to connect the different modes such as bus, train, car, etc.
b) Landscaping and human design should be considered for transport facilities. The existing bus corridors are not visually attractive and not comfortable for users.
c) Large scale projects should be executed without reducing green space and depreciating the quality of residential areas.

d) The study results should be open to the public.

Table 17.11-19 Number of Participants in the First Seminar (Jan.30, 2004)

(unit: Persons)

Organization	Participants
Counterpart Organizations	33
Ministry of Transport and Communications	3
Ministry of Economy and Finance	1
DMTU, PROTRANSPORTE, AATE, IMP, PETNM and the Municipality of Metropolitan Lima	25
GGTU and the Municipality of the Province of Callao	4
District Municipalities of Lima	25
District Municipalities of Callao	2
University	7
Consultant	8
International Bank	0
Transport Company	0
The Press	14
Total	89

(2) The Second Seminar (Aug.11, 2004)

The Second Seminar had an aspect of a stakeholder meeting with transport specialists in the administration, international banks, universities, consultant companies and transport companies. The number of participants on the second seminar is shown in Table 17.11-20

The following 4 lectures were presented in the seminar:

a) General Explanation about the Objectives of the Studies
b) Socio-economic Framework for Urban Transport Planning
c) The Importance of the Urban Mobility Studies and Analysis of Person Trip Inquiries
d) Interim Report of the Bus Transport Study

In the Question and Answer session 23 participants asked questions, and the following opinions were presented:

a) With regards to the future planning direction, if there is higher frequency of service, a system with a major capacity must not be considered.
b) An exclusive corridor bus system might have high tariffs. It is feared that the majority of the low-income population will not have access to such transport means.

Table 17.11-20 Number of Participants in the Second Seminar (Aug.11, 2004)

(unit: Persons)

Organization	Participants
Counterpart Organizations	41
Ministry of Transport and Communication	5
Ministry of Economy and Finance	2
DMTU, PROTRANSPORTE, AATE, IMP, PETNM, CEPRI and the Municipality of Metropolitan Lima	30
GGTU and the Municipality of the Province of Callao	4
District Municipalities of Lima	17
District Municipalities of Callao	2
University	4
Consultant	9
International Bank	2
Transport Company	7
The Press	0
Total	82

(3) The Third Seminar (February 18th, 2005)

The Third Seminar had an aspect of a stakeholder meeting with transport specialists in administration, international banks, professors of universities, and private consultants. The number of participants in the third seminar is shown in Table 17.11-21.

The following 5 lectures were presented in the seminar based on the Progress Report.

a) General explanation of the contents of the study and study schedule
b) Alternative transport network plans and evaluation of alternative plan
c) Implementation program and project cost
d) Long-Term Transport Master Plan
e) Effectiveness of the Long-Term Transport Master Plan

In the Question and Answer session, mainly the following inquiries were presented.

a) With regards to the investment cost, what kinds of revenues should be considered?
b) Is it possible to introduce the railway system?

Table 17.11-21 Number of Participants in the Third Seminar (February 18th, 2005)

(unit: Persons)

Organization	Participants
Counterpart Organizations	31
Ministry of Transport and Communications	2
Ministry of Economy and Finance	2
CTLC, DMTU, AATE, IMP, CEPRI and PROTRANSPORTE Lima	25
GGTU Callao	2
District Municipalities of Lima	10
District Municipalities of Callao	10
University	5
Consultant	10
International Bank	2
Transport Company	10
The Press	5
Total	83

(4) The Fourth Seminar (May 11th, 2005)

The Fourth Seminar had an aspect of a stakeholder meeting with transport specialists in administration, international banks, professors of universities, and private consultants. The number of participants in the fourth seminar is shown in Table 17.11-22.

The following 8 lectures were presented in the seminar based on the Draft Final Report.

a) General explanation of the contents of the Study and study schedule
b) Socioeconomic framework
c) Land use structure
d) Future traffic and transport projection
e) Long Term Master Plan
f) Short Term Master Plan
g) Evaluation of Master Plan
h) Financial procurement

In the Question and Answer session, mainly the following inquiries were presented.

a) Relationship between the Master Plan and Non motorization Transport
b) Traffic congestion in the future
c) Project cost procurement

Table 17.11-22 Number of Participants in the Fourth Seminar

Organization	Participants
Counterpart Organizations	34
Ministry of Transport and Communications	3
Ministry of Economic and Finance	2
CTLC,DMTU,AATE,IMP,CEPRI, PROTRANSPORTE	23
GGTU Callao	6
District Municipalities of Lima	10
District Municipalities of Callao	5
University	5
Consultant	15
International Bank	1
Transport Company	15
The Press	5
Total	90

17.11.7. SPECIALIST STAKEHOLDER MEETING

(1) The first Stakeholder Meeting (Nov.23, 2004)

The JICA study team and Peruvian counterparts organized a Specialist Stakeholder Meeting with previous discussion and accordance between the two parties. The meeting took place on Nov. 23, 2004 and 46 specialists from universities and consultant companies were invited.

The following 5 presentations were given in the workshop:

a) The Results of Person Trip Inquiries
b) The Results of Supplementary Person Trip Inquiries
c) Interim Report of the Public Transport Study
d) Projection of Future Demand of Transport
e) The Basic Considerations for the Master Plan Study

In the Question and Answer session 14 participants asked questions, and the following opinions were presented:

1) Policy

a) Besides a technical evaluation criterion, an evaluation criterion of the transport policy should be established.
b) A definition of the importance of the different elements should exist, which must be discussed and defined in the advisory committee.
c) Regarding the selection of alternatives, there are other combinations of vehicle restriction, urban tolls and other kinds of measures directed to making other decisions besides the simple proposal of infrastructure.

2) Planning

a) They are currently working based on the urban shell. It is important to introduce the image of urban development in the future.
b) The structure of the city is radial mono-centric, but there is the North Road Peripheral which direction was to change the urban space into radio concentric.

However the M/P does not visualize such possibility.

c) It is necessary to take into account how the city grows to the south in the future.
d) In a few years Lima will grow towards the Huaral Valley to the North, Cañete to the South and Corcona to the East. This must be the framework where the M/P must be proposed.
e) It is known that there is a regionalization project and an interest in metropolitan reorganization, which would affect the future scenarios from the peripheral zone to the center.
f) The Lima Municipality has approved a regulation in which new urban projects are proposed. The idea is to release the city of densification. It is important to make a recomposition of the zoning.
g) It is important to consider the current scenario of Lima to make projections, by observing the development of Lima through new projects under execution and how this demand will have an effect in the future.
h) The plan must formulate alignments of development policies before making specific technical proposals, for instance: the Lima Municipality has a number of projects for reorganizations, new urbanizations and urban equipment in different sectors of the city, so the land use in such areas is going to change.
i) The current offer is chaotic and distorted, and if it is projected based on this tendency, we will make a very weak inference. So, it is important to have the correction and interpretation of factors in accordance with two important equipments: the remodeling of the transport plan and the future organization of the metropolitan region.
j) A plan for 2025 will be discussed, but it will be for 2035. For instance, the Urban Plan of 1968-1990 is being used up to now and will have to imagine what will be the image of Lima in 20 years.
k) Regarding modal partition, private transport must not be limited.
l) About 16 million trips are discussed here, although we have figures of 8, 9 and 10 million. There are some data that will help us to reformulate.
m) The subjective value of trip time in selection pattern has not been considered. The studies developed in the past have a high value of trip time and such value is related to the income level of the people.

3) Roads

It would be good to know about the existing corridors of Av. Alfoso Ugarte, Av. Brasil, Av. Tomás Marsano. as well as projected corridors such as Grau Corridor, that could not be executed since the scope of the electrical train was unknown, as well as San Juan de Lurigancho - Abancay - Manco Capac Corridor, Santa Rosa Bridge - Tacna - Wilson - Arequipa Corridor. All these projects should be in INVERMET or in any other municipal institution.

4) Train

a) The proposal of trains must be observed in the long-term. It is important to have solutions without the train in the short-term.
b) The M/P should have a criterion of selection of transport technology based on demand.
c) It is important to reformulate the basic concepts and propose suitable technologies in order to obtain appropriate demands.
d) The M/P proposes a mass transport system for 25,000 passengers/hour/way, although it is known that such amount has been exceeded by reaching more than 35,000 passengers/hour/way.
e) In order to support this methodology, it is necessary to have a demand of 40,000 to 50,000 passengers/hour/way, except in the north zone, the remaining does not

exceed 23,000 passengers/hour/way.

f) The current Electric Train is not working at all. It would be very difficult to have the entire network by 2025.
g) The proposal should be in agreement with our reality. Almost all train systems in Latin America is subsidized.
h) Struggle between buses and trains should not exist. Lima has a different reality in comparison with other cities.
i) The Electric Train Project has already been implemented with more than 300 million US dollars invested in the Project.
j) It is important to take into account the reality of the economy. The possibility of supporting a train system is considered, however, the demand of main axis transport in the city is completely weak.
k) In order to propose the M/P it must take into account the users and their capacity of payment since all of these investments of the train system are expensive and financing is difficult.
l) The M/P is less ambitious. It only mentions mass transport projects, but what Lima needs is a mass and also rapid transport. It is necessary to take further risks in order to support the optimism for raising the self-respect of Peruvian people and technicians.
m) People think that the train is very expensive and the country can not pay for it. During 40 years we haven't done anything for it, meanwhile, all of the people have lost uncountable time and money in urban trips.

5) Bus

More than 80% of trips make a transfer and it is only noticed in the peripheral areas. It is important to think of the users' impact.

6) Taxi

Some taxi figures are not official. It has been mentioned that approximately 53% of taxis are authorized and 47% are informal. There is a record in Lima of 45,000 taxis and 15,000 in Callao showing a total of 60,000 authorized taxis. However, the total number of unauthorized taxis in the city ranges between 100,000 and 110,000 in the presentation, in the summary chart the number of taxis and colectivos was equal to that of the private vehicles. If Lima has 420,000 cars, we would have between 200,000 and 210,000 taxis and colectivos, which does not match with the first chart where we would have 100,000 taxis. It is necessary to provide further detail.

7) Bicycle

Regarding interconnections with pedestrian networks, the percentage of walking is wide. There is a lack of stimulation for using bicycles. It is important to consider the roads for bicycles.

8) Economic Aspects

The M/P is particularly directed to the construction approach, contrary to the financial approach. It is assumed that the economy will grow 150% in the next twenty years or 4.5% annually. But the economy up to now has increased only 2% annually. This approach is too optimistic.

9) Social Aspects

a) Regarding the projection for 2025, the increase of Socio-economic Strata A (high) and B (medium high) is too optimistic.
b) Regarding institutional matters, the transport legislation has serious deficiencies

regarding legal and socio-cultural aspects. It is important to define the alignments of our society in which more than 50% of the population is under 25 years of age. Thus, how do we design transport for adults if the majority are young people?

The above presented opinions will be examined carefully in further processes of the study to be reflected or rejected in the Master Plan.

Table 17.11-23 Number of Participants in Specialist Stakeholder Meeting (Nov.23, 2004)

(unit: Persons)

Organization	Participants
Counterpart Organizations	27
Ministry of Transport and Communication	4
Ministry of Economy and Finance	0
DMTU, PROTRANSPORTE, AATE, IMP, PETNM, CEPRI and the Municipality of Metropolitan Lima	21
GGTU and Municipality of the Province of Callao	2
District Municipalities of Lima	0
District Municipalities of Callao	0
University	6
Consultant	40
International Bank	1
Transport Company	0
The Press	0
Total	74

(2) The Second Stakeholder Meeting (January12th, 2005)

The JICA Study Team and Peruvian Counterparts organized the Second Stakeholder Meeting with private bus operation companies. The meeting took place on January 12th, 2005 in the meeting room of the CTLC. The number of participants of the Second Stakeholder Meeting is shown in Table 17.11-24.

The following four (4) presentations were discussed:

a) The problems and issues of the existing bus system.
b) Explanation of public transport demand.
c) How to improve the problems and issues.
d) Necessary actions for the improvement of the bus system

The major discussion items were as follows:

a) There are many bus routes on trunk roads.
b) The income of bus drivers is very small.
c) The Municipality has not controlled the bus system.
d) The Municipality has not prepared a future improvement plan for the bus system.

The private bus companies in Lima are considering a new bus system with the COSAC project.

Table 17.11-24 Numbers of Participants in the Second Stakeholder Meeting (January 12th, 2005)

(unit: Persons)

Organization	Participants
Counterpart Organizations	19
Ministry of Transport and Communications	0
Ministry of Economy and Finance	0
CTLC, DMTU, AATE, IMP, CEPRI and PROTRANSPORTE Lima	17
GGTU Callao	2
District Municipalities of Lima	5
District Municipalities of Callao	3
University	0
Consultant	0
International Bank	0
Transport Company in Lima and Callao	23
The press	0
Total	50

(3) The Third Stakeholder Meeting (January 18th, 2005)

The JICA Study Team and Peruvian Counterparts organized the Third Stakeholder Meeting with private bus operation companies. The meeting took place on January 18th, 2005 in the meeting room of the CTLC. The number of participants of the Third Stakeholder Meeting is shown in Table 17.11-25.

The following four (4) presentations were discussed:

a) The problems and issues of the existing bus system.
b) Explanation of public transport demand.
c) How to improve the problems and issues.
d) Necessary actions for the improvement of the bus system.

The major discussion items were as follows:

a) There are many bus routes and a congested bus fleet.
b) The length of bus routes and travel time is very long and the bus fleet is unsafe.
c) The Municipality has not controlled the bus system.
d) The Municipality has not prepared a future improvement plan for the bus system.

Table 17.11-25 Number of Participants in the Third Stakeholder Meeting (January 18th, 2005)

(unit: Persons)

Organization	Participants
Counterpart Organizations	17
Ministry of Transport and Communications	0
Ministry of Economy and Finance	0
CTLC, DMTU, AATE, IMP, CEPRI and PROTRANSPORTE Lima	2
GGTU Callao	15
District Municipalities of Lima	0
District Municipalities of Callao	2
University	0
Consultant	0
International Bank	0
Transport Company in Callao	13
The press	0
Total	32

(4) The Fourth Stakeholder Meeting (January 24th, 2005)

The JICA Study Team and Peruvian Counterparts organized the Fourth Stakeholder Meeting with private bus operation companies. The meeting took place on January 24th, 2005 in the meeting room of the CTLC. The number of participants of the Fourth Stakeholder meeting is shown in Table 17.11-26.

The following four (4) presentations were discussed:

a) The problems and issues of the existing bus system.
b) Explanation of public transport demand.
c) How to improve the problems and issues.
d) Necessary actions for the improvement of the bus system.

The major discussion items were as follows:

a) There are many bus routes and a congested bus fleet.
b) The length of bus routes and travel time is very long and the bus fleet is unsafe.
c) Drivers working hours are very long´.
d) Improper driving manners.
e) The Municipality has not controlled the bus system.
f) The Municipality has not prepared a future improvement plan for the bus system.

Table 17.11-26 Numbers of Participants in the Fourth Stakeholder Meeting (January 24th, 2005)

(unit: Persons)

Organization	Participants
Counterpart Organizations	4
Ministry of Transport and Communications	0
Ministry of Economy and Finance	0
CTLC, DMTU, AATE, IMP, CEPRI and PROTRANSPORTE Lima	4
GGTU Callao	0
District Municipalities of Lima (Villa El Salvador District)	5
District Municipalities of Callao	0
University	0
Consultant	0
International Bank	0
Transport Company in Lima (Villa El Salvador District)	6
The press	0
Total	15

17.11.8. INFORMATION DISCLOSURE

The information of the Master Plan Study was disclosed, on a professional level, on the occasions of the First Seminar (Jan. 2004), the Second Seminar (Aug. 2004) and the Specialist Stakeholder Meeting (Nov. 2004).

During the execution of the Person Trip Surveys, 2,000 posters were printed and posted inside the buses, and mass media propagandas were given in June 2004, for 75 times in radio stations and 11 times in newspapers. See Figure 17.11-3.

Radio propaganda says in 20 seconds:

- Presenter: The Municipality of Lima and Callao will carry out the great survey of urban transport from June 14th to August 14th in order to improve the urban transport and environmental conditions. Thanks to the cooperation of the Japanese Government and the work of the Urban Transport Council the Transport Master Plan is under execution.
- A Man: An identified person will knock on your door, please cooperate with him/her.
- Presenter: Your opinion is very important so that the improvement becomes a reality.

Figure 17.11-3 JICA Study Poster

CHAPTER 18
Preparation of the Urban Transport Master Plan in 2025

18. PREPARATION OF THE URBAN TRANSPORT MASTER PLAN IN 2025

18.1. PROPOSED PROJECTS FOR THE COMPREHENSIVE URBAN TRANSPORT MASTER PLAN

The Master Plan is formulated to maintain the basic planning policies mentioned previous such as to improve the poverty life, to preserve the natural and social environment aspects, and to increase the traffic capacity and also to control the traffic demand. In addition, the public transport priority policy is introduced as the basic strategy for identification of transport network in the Study area.

In Chapters 13, 14, 15, and 16, the four (4) transport sector plans, namely the road facilities, the railway transport, the trunk bus transport, and the traffic management plans studies are examined, based on the selected basic transport network Alternative -N described in Chapter 12. In this Chapter, based on the results of each sector's above mentioned study plan, the projects for the Urban Transport Mater Plan in Lima and Callao Metropolitan area in 2025 are identified.

18.1.1. THE ROAD FACILITY DEVELOPMENT PROJECTS

In Chapter 13, the various road development plans are examined based on the selected basic transport network alternative -N. Based on the road hierarchy of future road network plan approved by Lima and Callao municipalities, the road facility development plans consist of new road construction plans, a widening of the existing road plans, improvement of the existing road plans, improvement of the intersection improvement plans, and road development plans for sub-urban areas which are examined below,

1) National and Regional Expressway development plan
2) Metropolitan Expressway development plan
3) Arterial and Collector road development plan

(1) Projects for National and Regional Expressway Development Plan

Various road development projects of the National and Regional Expressway Development Plan are examined in the above mentioned road section study in Chapter 13. Considering the project road characteristics, the following ten (10) projects are identified as shown in Table 18.1-1 for the Urban Transport Master Plan for Lima and Callao Metropolitan Area in 2025.

Table 18.1-1 List of Projects for National and Regional Expressway Plan

Name of Project	Components of plan	Project Size
RP-01	Construction of Peripheral Road Lima Section	31.0 km
RP-02	Construction of Peripheral Road Callao Section	12.4 km
RP-03	Construction of Extension of Autopista Ramiro Prialé	19.0 km
RP-04	Improvement of Panamericana Norte Section	16.0 km
RP-05	Improvement of Av. Canta- Callao	10.0 km
RP-06	Construction of Urban Peripheral Road(Punta Pierre—San Juan de Lurigancho Section)	37.7 km
RP-07	Construction of Urban Peripheral Road(San Juan de Lurigancho—Ate Section)	13.0 km
RP-08	Construction of Urban Peripheral Road(Ate Vitarte –Pachacamac Section)	15.0 km
RP-09	Construction of Urban Peripheral Road(Pachacamac Section)	10.4 km
RP-10	Construction of Urban Peripheral Road(Pachacamac—San Bartolo Section)	35.0 km
Sub-total		199.5km

(2) Projects for Metropolitan Expressway Development Plan

Considering the road projects characteristics planned, the following seven (7) projects are identified as shown in Table 18.1-2 for the Urban Transport Master Plan for Lima and Callao Metropolitan Area in 2025.

Table 18.1-2 Project List for Metropolitan Expressway Plan

Name of Project	Components of Project	Project Size
RP-11	Construction of Av. La Costa Verde Lima Section	11.5 km
RP-12	Construction of Av. La Costa Verde Callao Section	8.0 km
RP-13	Construction of Extension of Av. Paseo de la República South	5.0 km
RP-14	Construction of Av. Nestor Gambetta	19.0 km
RP-15	Improvement of Av. Elmer Faucett	5.6 km
RP-16	Improvement of Av. Javier Prado (La Marina Section)	22.3 km
RP-17	Construction of Extension of Av. Paseo de República North	3.8 km
Sub-total		75.2 km

(3) Projects for Arterial and Collector Road Development Plan

These plans consist of various large scale or small scale projects based on the existing road improvement projects. In accordance with the progress of new housing developments in the future, construction of new Arterial and Collector roads are required. Considering the project characteristics, the following sixteen (16) projects are identified as shown in Table 18.1-3 for Urban Transport Master Plan for Lima and Callao Metropolitan Area in 2015.

Table 18.1-3 Project List for Arterial and Collector Roads Development Plan

Name of Project	Components of Project	Project Size
RP-18	Improvement of Av. Universitaria	2.7 km
RP-19	Construction of Av. Próceres from Av. Independencia to Av. Grau	3.3 km
RP-20	Construction of Riobamba Bridge over Rio Rimac	1 unit
RP-21	Construction of Delgado de la Flor Bridge over Rio Rimac	1 unit
RP-22	Construction of Santa Rosa Tunnel	200 m
RP-23	Construction of Rimac Tunnel	300 m
RP-24	Construction of San Francisco Tunnel	270 m
RP-25	Improvement of Intersection Package-1	19 No.
RP-26	Improvement of Intersection Package-2	26 No.
RP-27	Improvement of Intersection Package-3	23 No.
RP-28	Widening of Existing Road in Built Up Area	161.0 km
RP-29	Widening of Existing Road in Vicinity Area	69.0 km
RP-30	Construction of Road of New Housing area	202.8 km
RP-31	Rehabilitation of Expressway	100.0 km
RP-32	Rehabilitation of Arterial Roads	587.0 km
RP-33	Rehabilitation of Collector Roads	691.0 km

18.1.2. RAILWAY TRANSPORT DEVELOPMENT PROJECTS

Based on the Alternative -N previously mentioned, the railway transport sector plan is carried out to examine the detailed railway route, type of railway transport system, and also location of railway yard. Based on the railway transport sector plan, the following four (4) railway plans are examined.

1) Line-1 (Villa el Salvador to San Juan de Lurigancho via Lima central area)
2) Line-2 (Callao to Ate via Lima central area)
3) Line-3 (Javier Prado)
4) Lina-4 (Javier Prado to Comas via Callo airport and Av. Universitaria)

Taking into account of the on-going railway projects, and the future transport demand on planned railway routes, the following seven (7) railway development projects are identified as shown in Table 18.1-4.

Table 18.1-4 Project List for Railway Development Sector Plan

Name of Project	Components of Project	Project Size (km)
TP-01	Line-1 (Villa el Salvador to Panamericana Sur) Existing	9.8 km
TP-02	Line-1 (Panamericana Sur to Av. Grau)	11.7 km
TP-03	Line-1 (Av. Grau to San Juan de Lurigancho)	13.0 km
TP-04	Line-2 (Callao to Ate)	29.0 km
TP-05	Line-3 (Av. Javier Prado West)	16.2 km
TP-06	Line-3 (Av. Javier Prado East)	11.9 km
TP-07	Line-4 (Av. Javier Prado to Panamericana Norte via Callo Airport	14.5 km
Total		106.1km

18.1.3. TRUNK BUS TRANSPORT DEVELOPMENT PROJECTS

Based on the trunk bus transport sector plan, the following fifteen (15) trunk bus projects and three (3) inter urban bus terminals are identified as shown in Table 18.1-5.

Table 18.1-5 Project List for Trunk Bus Sector Plan

Name of Project	Components of Project	Project Size (km)
BP-01	Av. Grau(On-going Project)	2.3 km
BP-02	Av. Tupac Amaru, Av. Ugarte, Paseo de Republica(on-going Project, COSAC)	29.0 km
BP-03	Carr. Central	8.36 km
BP-04	Av. Venezuela	9.05 km
BP-05	Av. Brazil	4.84 km
BP-06	Av. Angamos	15.9o km
BP-07	Av. Molina	6.54 km
BP-08	Av. Universitaria South	12.66 km
BP-09	Av. Callao-Canta	9.10 km
BP-10	Av. Néstor Gambetta	22.60 km
BP-11	Av. Javier Prado	21.07 km
BP-12	Av. Panamericana Norte	23.90 km
BP-13	Av. Panamericana South	25.60 km
BP-14	Av. Universitaria Norte	7.27 km
BP-15	Av. Tomas Villa	2.84 km
BP-18	Inter Urban Bus Terminal (Terminal-A)	1 unit
BP-19	Inter Urban Bus Terminal (Terminal-B)	1 unit
BP-20	Inter Urban Bus Terminal (Terminal-C)	1 unit

18.1.4. TRAFFIC MANAGEMENT DEVELOPMENT PROJECTS

In Chapter 16, the following four (4) traffic management development plans are studied, in accordance with the basic planning consideration and concept of traffic management development study. Basically, the traffic management development plans are implemented as urgent action plans or short and medium term plans, considering the characteristics and contents of traffic development management plans.

1) Traffic signal and control system improvement plan
2) Traffic safety management plan
3) Traffic demand management (TDM) system plan
4) Traffic information system plan

Taking into account the characteristics of the above mentioned plans, the ten (10) projects for traffic management plan are identified as shown in Table 18.1-6.

Table 18.1-6 List of Projects for Traffic Management Plan

Name of Project	Components of Project	Project Size
MP-01	Traffic signal control system	1 unit
MP-02	Improvement of intersections	1 unit
MP-03	Introduction of TDM system	1 unit
MP-04	Improvement of traffic safety facilities	1 unit
MP-05	Improvement of parking control system	1 unit
MP-06	Improvement of safety education system	1 unit
MP-07	Improvement of traffic accident monitoring system	1 unit
MP-08	Improvement of vehicle inspection system	1 unit
MP-09	Improvement of traffic control	1 unit
MP-10	Improvement of traffic information	1 unit

18.2. FORMULATION OF COMPREHENSIVE URBAN TRANSPORT MASTER PLAN IN 2025

The Urban Transport Master Plan for Lima and Callao Metropolitan Area in 2025 is formed by all of the above mentioned projects included in the transport sector plans. The Urban Transport Master Plan for Lima and Callao Metropolitan Area in 2025 is shown in Figure 18.2-1. The outline and major contents of the Master Plan are described below.

(1) Transport System in the Future

1) Transport Mode to be adopted in 2025

The transport mode of Lima and Callao Metropolitan Area recommended by the Master Plan is operated by public and private transport. The public transport modes are classified into five (5) categories, namely 1) the railway transport, 2) trunk bus transport, 3) feeder bus transport(including comb, and mini bus), 4) ordinal bus transport, and 5) taxi transport (including moto-taxi). The private transport modes are classified into two (2) transport modes, namely 1) car, and 2) bicycle transport (non motorized transport).

2) Operation System by Each Transport Mode

The comparatively large scale housing development areas (living areas with large numbers of inhabitants) and commercial areas, the large scale institutional facilities, and the large scale universities are directly connected by the mass rapid transit systems (railway system or trunk bus system) to the existing radial and ring trunk roads as the basic public transport network in Lima and Callao Metropolitan Area in 2025. The operation systems between each transport mode are as follows;

a) Transfer between railway and railway: with integrated system introduced in railway station
b) Transfer between railway and bus system: without integrated system introduced
c) Transfer between trunk bus and trunk bus : with integrated system introduced on trunk bus stop
d) Transfer between trunk bus and feeder bus: with integrated system introduced at bus terminal only, and without integrated system introduced at each bus stop.
e) Transfer between trunk bus and ordinal bus: without integrated system introduced

The integrated systems railway – trunk bus and trunk bus – conventional bus, are not considered because its administrative operational system is not defined.

3) Inter -Urban Bus Transport System

The three (3) inter urban bus terminals are planned in the Santa Anita area (to the east of the center of Lima), Chorrillos area (to the of the center of Lima), and Independencia area (to the north of the center of Lima). The inter-urban bus passengers arriving in Lima and Callao Metropolitan Area from other cities should be transferred to the intra-urban bus transport at the above mentioned bus terminal. The functions of these bus terminals are provided to the passengers of trunk buses, feeder buses, intra-urban buses, and other modes of transport such as taxi, bicycle, and private car users.

4) Cargo Transport System

Cargo transport from Callao Areas (Callao port, Callao airport, and Oil refinery) to the other cities should be restricted to the following roads to avoid passing through the urban traffic congestion areas.

a) From Callao to the north; passing through Av. Nestor Gambetta
b) From Callao to the east: passing through Av. Tomas Valle, Urban Peripheral Rood

(new road), and Autopista Prialé
c) From Callao to the south: passing through Av. Costa Verde.

5) Traffic Lows and Regulation System

In spite of the fact that many traffic infrastructure development projects recommended by the Urban Transport Master Plan for Lima and Callao Metropolitan Area will be constructed in the future, the traffic congestion and air pollution conditions may not be improved completely. Therefore, the reinforcement of traffic laws and regulation plans (including TDM system and vehicle inspection system) are planned for the Short Term Plan of the Master Plan.

(2) Future Road Facilities Plan in 2025

1) Future Road Network

The future road network configuration based on the road hierarch classification is formed by the five (5) functional categories of roads, namely 1) National and Regional Expressway, 2) Metropolitan Expressway, 3) Arterial Road, 4) Collector Road, and 5) Local road.

On the other hand, the future trunk road network based on the functional classification of roads is mainly formed by radial and ring roads. The major radial roads basically are formed by the following fifteen (15) roads.

a) Av. Tupac Amaru (North to Center Direction)
b) Av. Panamericana Norte (North to Center Direction)
c) Av. Universitaria (North to Center Direction)
d) Av. Elmer Faucett (North to Center Direction)
e) Av. Néstor Gambetta (North to Center Direction)
f) Av. Venezuela (East to West Direction)
g) Av. Argentina (East to West Direction)
h) Av. Brasil (East to West Direction)
i) Av. Paseo de la República (South to Center Direction)
j) Av. Aviación (South to Center Direction)
k) Av. Costa Verde (South to Center Direction)
l) Av. Panamericana Sur (South to Center Direction)
m) Carretera Central (East to West Direction)
n) Autopista Ramiro Prialé (East to West Direction)
o) Av. Independencia (North to Center Direction)

In addition, the ring roads are basically formed by the following four (4) roads,

a) Inner Ring Road (Av. Grau, Av. Ugarte)
b) First Ring Road (Av. Javier Prado, Av. Universitaria, Urban Peripheral Rood)
c) Second Ring Road (Av. Angamos)
d) Outer Ring Road (Regional Peripheral Expressway)

2) Road Facility Development Plan

The outline of the road facility plans is as follows:

a) Av. Peripheral (Lima and Callao segments) is planned to form the Second Ring Road with new construction or improvement of the existing road as the diversion road of cargo transport from Callao to the east.
b) Extension of Autopista Ramiro Prialé is planned to form the trunk radial road with new construction road.
c) Av. Panamericana Norte is planned to form the trunk radial road with improvement

of the existing road.

d) Av. Canta Callao is planned to form the trunk radial road with improvement of the existing road.
e) Av. Urban Peripheral is planned to form the Outer Ring Road with new road construction and improvement of the existing road.
f) Av. Costa Verde (Lima and Callao segments) is planned to form the radial trunk road with new construction and improvement of the existing road as diversion road of cargo transport from Callao to the south.
g) Extension of Av. Paseo de la República is planned to form the radial trunk road with improvement of the existing road.
h) Av. Néstor Gambetta is planned to form the radial trunk road with improvement of the existing road.
i) Av. Elmer Faucett is planned to form the radial trunk road with improvement of the existing road. This road is under construction and will be operated on a concession basis.
j) Av. Javier Prado is planned to form the trunk ring road with improvement of the existing road.
k) It is planned to construct new arterial roads in the areas where there will be development in the future. These roads will be constructed in accordance with the future progress of housing development.
l) Many improvements of existing intersections form part of a package plan.
m) Widening of existing roads form part of a package plan.

(3) Railway Transport Development Plan

1) Railway Transport Line-1

Line-1 connects Villa El Salvador, Lima Centro, and San Juan de Lurigancho passing through Av. Aviación, Av, Grau, and Av. Independencia as the North-South railway route.

2) Railway Transport Line-2

Line-2 directly connects the Ate area, Lima Center, and Callao Port to utilize the land space of both sides of the existing cargo transport railway line.

3) Railway Transport Line-3

Line-3 located on the existing Av. Javier Prado.

4) Railway Transport Line-4

Line -4 connects the existing Av. Javier Prado, Callao Airport, and Comas area to utilize existing roads such as Av. Elmer Faucet, Av. Tomas Valle, and Av. Universitaria.

(4) Trunk Bus Transport Plan

1) Trunk Bus System to be Adopted

The trunk bus system consists of two (2) categories, one in which buses are operated exclusively in bus lanes, segregated from private vehicles, and the other in which buses are operated in the bus priority lane without being segregated from private vehicles.

2) Bus Fleets for Trunk Bus

In order to reduce the volume of bus traffic, the articulated bus fleet is adopted as the trunk bus system.

3) Operation System

The trunk bus and feeder bus connects at the trunk bus terminal with an integrated fare systems adopted, but without an integrated fare system adopted at the trunk bus stop. The bus stop between the trunk bus operates with integrated fare system adopted. The feeder bus operates as a supplementary bus system for the trunk bus system.

4) Exclusive Bus Way Routes

As a result of the trunk bus transport sector plan, the introduction of exclusive bus ways was selected on the following fifteen (15) existing trunk roads.

a) Av. Grau
b) Carretera Central
c) Av. Venezuela
d) Av. Paseo de la República(COSAC)
e) Av. Néstor Gambetta
f) Av. Brasil
g) Av. Angamos
h) Av. Universitaria (North)
i) Av. Panamericana Norte
j) Av. La Molina
k) Av. Panamericana South
l) Av. Universitaria (South)
m) Av. Javier Prado
n) Av. Tomás Valle
o) Av. Callao- Canta

(5) Traffic Management Plan

As a result of the traffic management sector plan, the following systems and reinforcement matters are planned to mitigate traffic congestion.

1) Introduction of Traffic Signal Control System

The traffic signal control system is planned to ensure smooth traffic flows and to mitigate traffic congestion within the Lima and Callao central areas and will also be set up on the trunk roads.

2) Ensuring Traffic Safety

Traffic safety systems including traffic education systems are planned to ensure traffic safety and to reduce traffic accidents in the Study area.

3) Introduction of TDM System

TDM system consists of reinforcement of various transport laws and regulations for the supplementary transport policy and strategies. Some TDM systems will be planned to mitigate traffic congestion in the Study area in the Short Term Plan in 2010.

4) Reinforcement of Traffic Regulation

To ensure good environmental conditions in the Study area, especially improvement in air pollution, reinforcement of vehicle inspection system and other traffic regulations are planned for the Short Term Plan in 2010.

5) Control of Car Parking

Prohibition of on-street car parking will be planed to ensure smooth traffic flows and to increase traffic capacity on the trunk roads for the Short Term Plan in 2010 or Long Term Plan of the Urban Transport Master Plan in 2025.

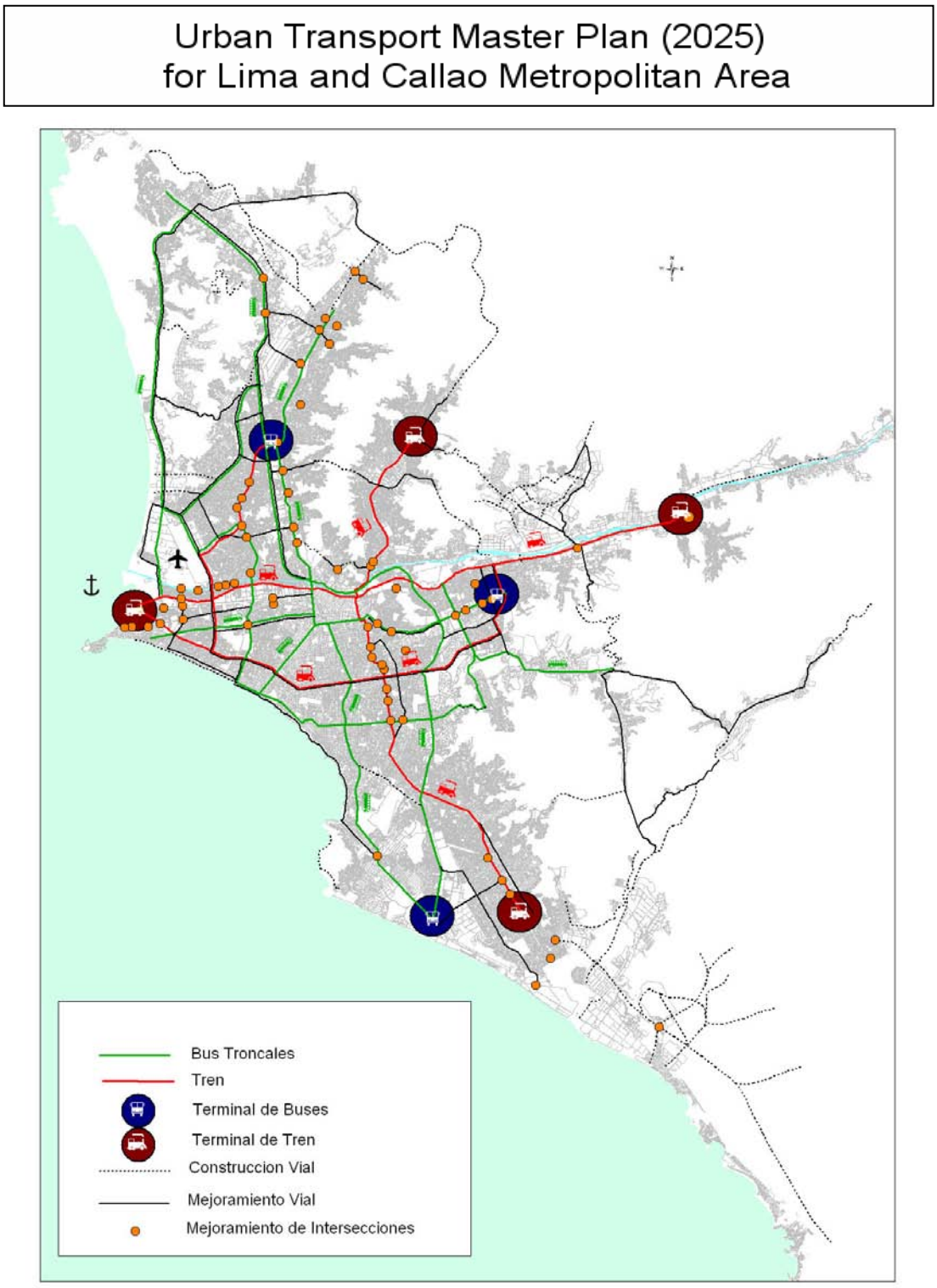


Figure 18.2-1 Comprehensive Urban Transport Master Plan of Lima and Callao in 2025

CHAPTER 19
Preparation of the Implementation Program

19. PREPARATION OF THE IMPLEMENTATION PROGRAM

19.1. PROJECT PRIORITY

In chapter 12 of this Report, the alternative transport network study (Alt-A to Alt-O) is described. In this study, the Alternative plan N was selected as the most effective transport network for Lima and Callao Metropolitan Area in 2025. In chapters 13 to 16, the road sector plan, the bus sector plan, railway sector plan, and traffic management sector plan are described based on the Alternative N. The following 68 projects are selected from among each sector plan as an Urban Transport Master Plan in the Lima and Callao Metropolitan Area in 2025.

1) Road Facilities Sector Plan: 33 Projects
2) Railway Transport Sector Plan: 6 Projects
3) Trunk Bus Transport Sector Plan: 18 Projects
4) Traffic Management Sector Plan: 10 Projects
5) Total: 67 Projects

This section describes the annual implementation and the investment schedule of the selected 68 projects for the period between 2005 and 2025.

19.1.1. IDENTIFICATION OF PROJECT PRIORITY

In order to identify the project priority of the above projects, the following six (6) criteria are taken into account.

1) Transport planning policy (priority of public transport development policy)
2) Economic effect of the project
3) Traffic improvement effect of the project
4) Characteristics and conditions of the project
5) Progress of the on-going project
6) Balance of investment cost every year

Figure 19.1-1 shows the procedure of identification of project priority based on the above 6 criteria. In the first instance, the transport planning policy determines basic project priority, then the economic effect of the project is examined in terms of cost-benefit analysis such as B/C and B-C. As a result of this screening, high priority projects are selected.

The second step establishes 1st, 2nd, and 3rd level of project priority based on the other criteria mentioned in No.3, and 4 above. Finally, the short, medium and long term projects are classified based on the criteria of progress of existing projects and balance of yearly investment cost.

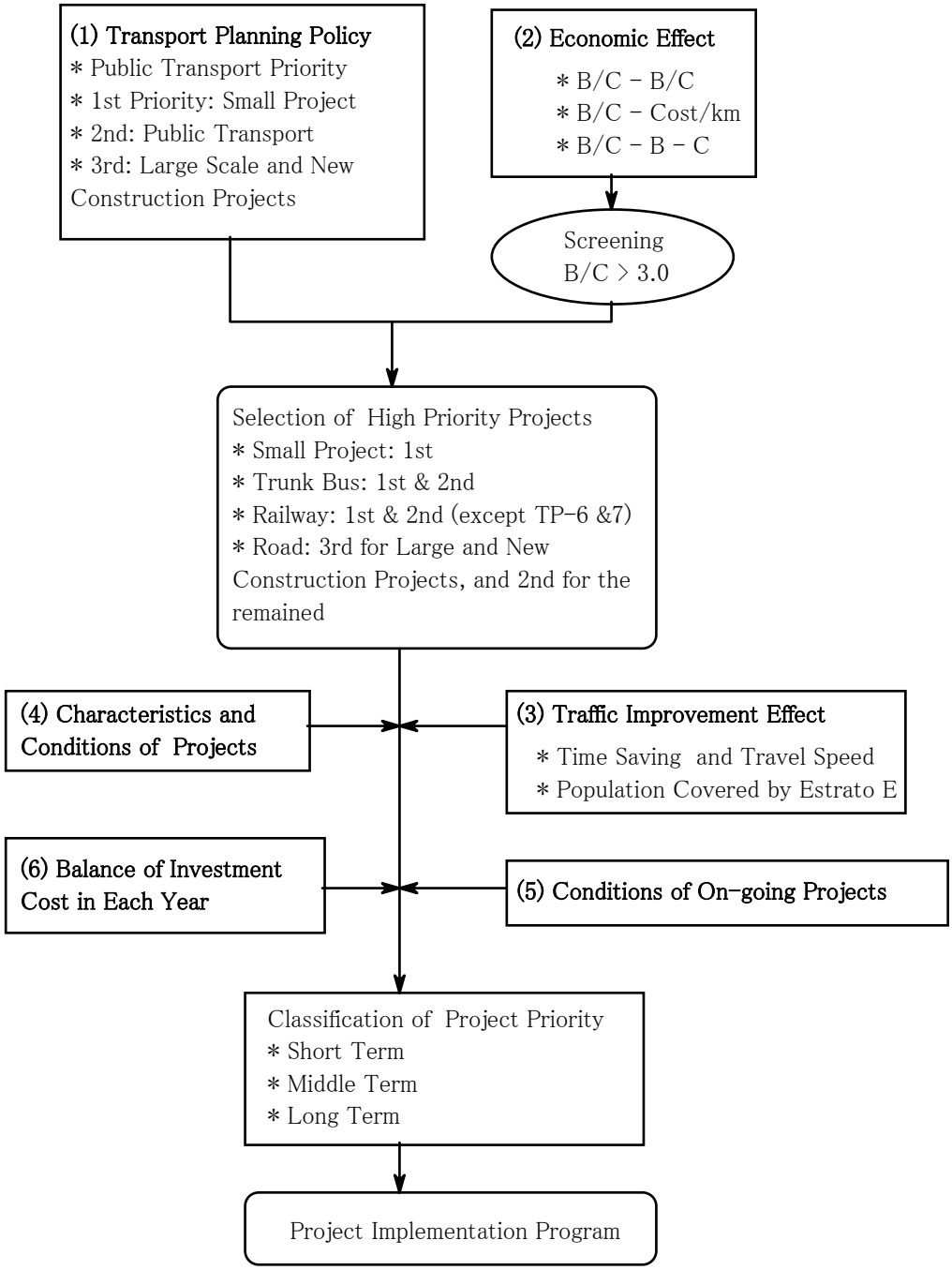


Figure 19.1-1 Procedure for Identification of Project Priority

(1) From the Viewpoint of the Transport Planning Policy

The public transport priority policy is adopted as a basic transport planning policy, considering the traffic characteristics and the existing road facility conditions in the Study area. To achieve the public transport priority policy, the following basic plans are considered.

1) As the first priority, the following projects should be implemented.
   a) Comparatively small-scale public transport projects such as trunk bus projects.

b) Comparatively small scale projects for the improvement of existing roads
c) Comparatively small scale projects for the rehabilitation of existing roads

2) As the second priority, the following projects should be implemented

a) Public transport projects
b) Projects for the improvement and rehabilitation projects of existing roads

3) As the third priority, the following projects should be implemented

a) Large scale projects for the improvement of existing roads
b) New road construction projects

(2) From the Viewpoint of the Economic Effect of the Project

1) Examination of the Economic Effect

a) As shown in Figure 19.1-2, the cost-benefit analysis (B/C) of the major projects from 65 projects is done for the identification of the priority of the project. The cost-benefit analyses (by "With" Project and "Without" Project) is made based on the two (2) transport networks; one is the future transport network in 2025, which is alternative-N, and the other is the current transport network in 2004.

In Figure 19.1-2, the horizontal axis shows the B/C ratio in the future transport network in 2025, and the vertical axis shows the B/C ratio in the current transport network in 2004. In this figure, projects with a high B/C ratio on both vertical B/C ratio and horizontal B/C ratio are selected as the higher priority projects, and the projects with a low B/C ratio on both axes are identified as low priority projects. In this figure, the projects are classified into 5 categories: small road projects (Nos. RP-13, 15, 18 and 19), which have a range of 5km or less in project size, road improvement projects (Nos. RP-01, 02, 04, 05, 11, 14, 16 and 17), large and new construction road projects (Nos. RP-03, 06 to 10 and 12), trunk bus, trunk bus and railway projects. The dots show those five (5) types of projects: one is the small project colored sky blue, the second is the road improvement project in green, the third is the large and new construction project in blue, the fourth is the trunk bus in pink and the last is the railway project in red.

As can be seen, the small-scale, trunk bus and railway projects are assigned a higher B/C ratio, especially 2 railway projects, which have a B/C ratio of over 3.0. The large-scale and new construction projects also have higher B/C ratios.

b) Figure 19.1-3 and Figure 19.1-4 show the results of cost-benefit analysis in the 2004 road network. The horizontal axis in the figure shows the project cost per project length, and the vertical axis shows the B/C ratio. In this figure, the projects, which are in the area with low cost/km and higher B/C ratio are selected as a high priority, and the projects with low B/C ratio and higher cost/km are selected as a low priority. The priority is decided in the final step of the procedure. Until this step, only high priority projects are selected.

As can be seen in Figure 19.1-3, the trunk bus projects show low cost/km and higher B/C ratio. On the other hand, in Figure 19.1-4 railway projects show a large volume of benefits, compared to the trunk bus projects.

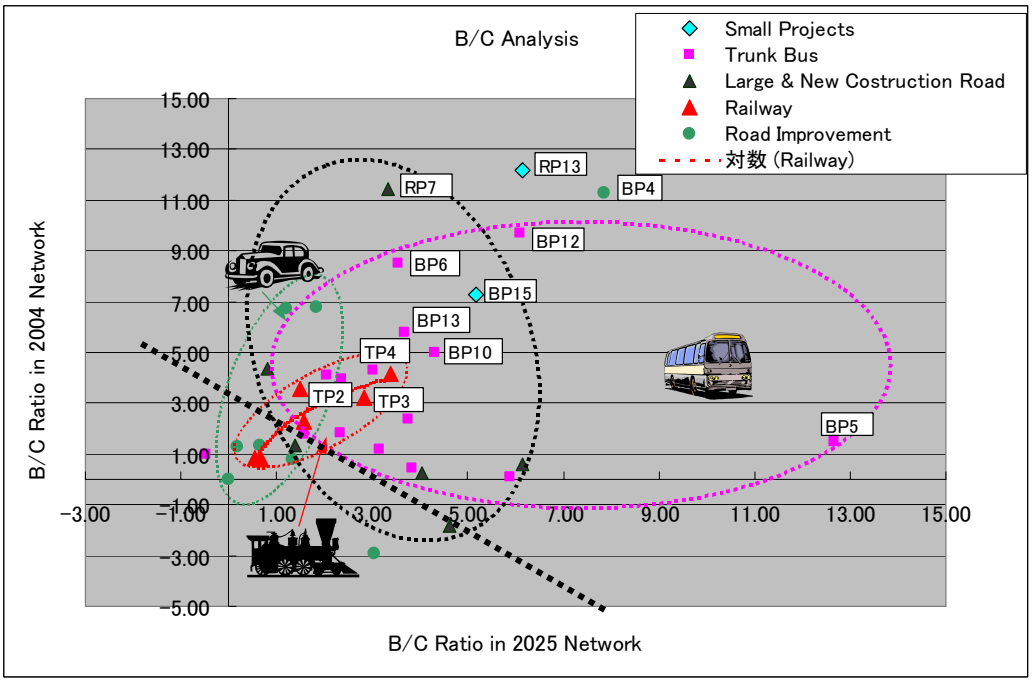


Figure 19.1-2 Cost / Benefit Analysis by Project in 2004 and 2025 Road and Transport Network

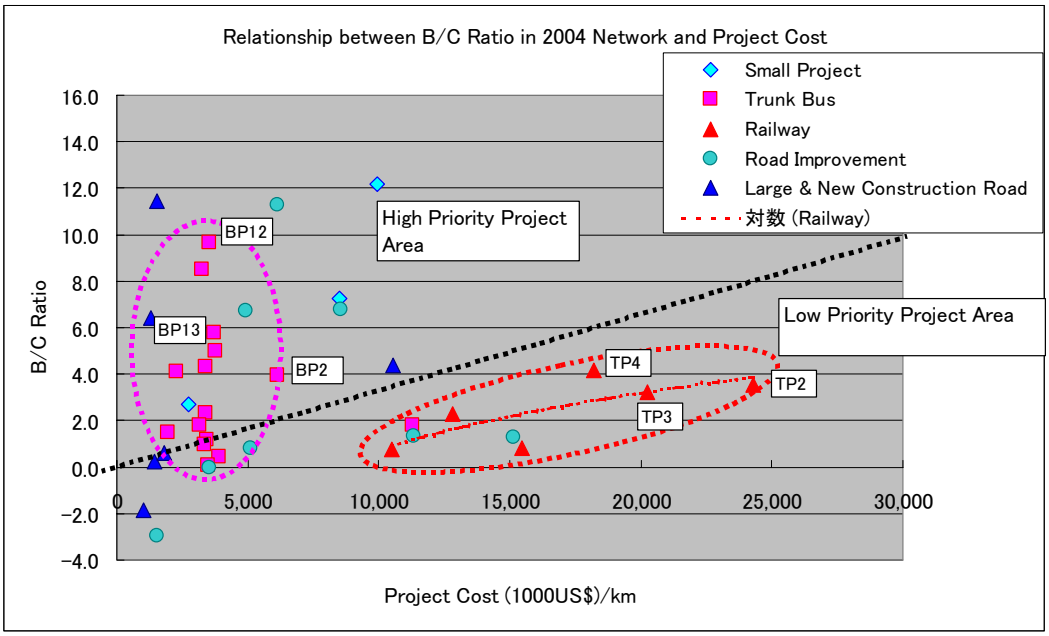


Figure 19.1-3 Relationship between B/C and Project Cost/km in 2004 Road Network

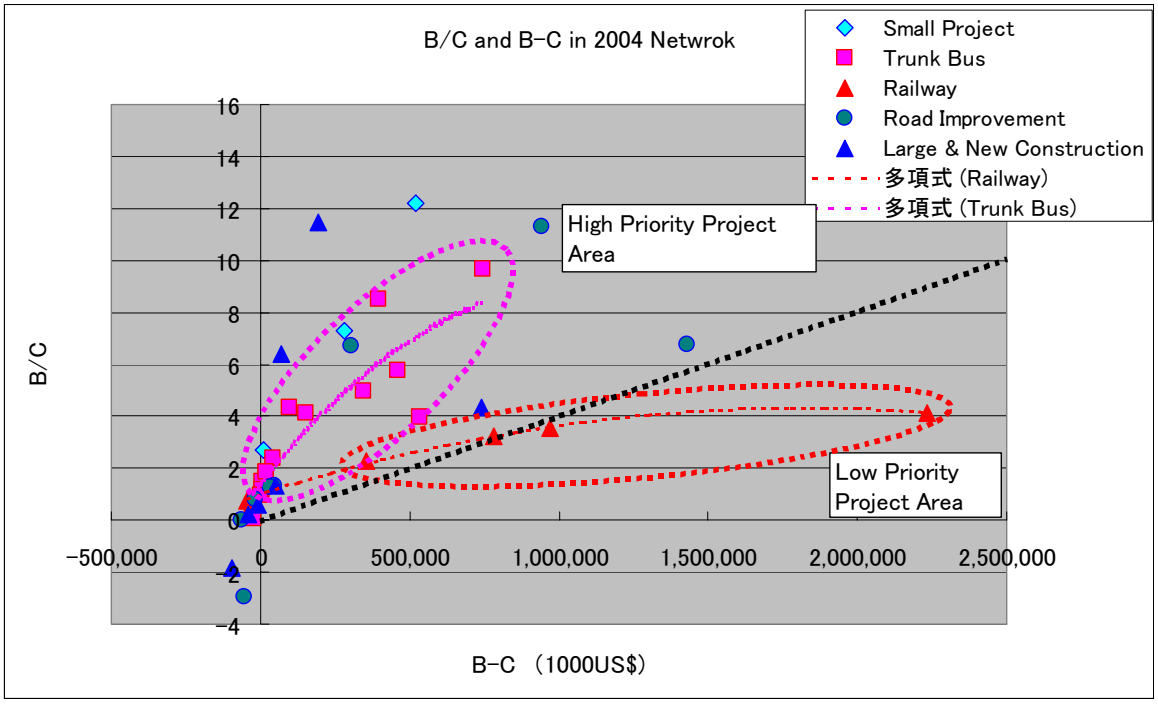


Figure 19.1-4 Relationship between B/C and B-C in 2004 Road Network

2) Project Priority from Viewpoint of Economic Effects

Based on Figure 19.1-2 to Figure 19.1-4, the following project conditions are pointed out.

a) The small projects are a 1st priority according to the transport planning policy.
b) Large scale and new construction projects are 3rd priority according to the transport planning policy.
c) Since the trunk bus projects have a considerably higher B/C ratio, 1st and 2nd priorities are given.
d) The railway projects also have a considerably high B/C ratio and B-C, except for project No.TP-6 and 7. The railway projects are given a 2nd priority.

(3) From the Viewpoint of the Traffic Improvement Effect of the Project

1) Examination of Traffic Improvement Effect

a) Figure 19.1-5 shows the comparison between the travel speeds of "With" Project and "Without" Project cases, based on the road network in 2004. In those figures, the horizontal axis shows the project cost and the vertical axis shows the travel speed on roads. In Figure 19.1-5, in the event that a project is included in the 2004 network, travel speed on roads is increased according to this project. Therefore, there is a direct association between increased travel speed and increased traffic effect. In this figure, the travel speed in "Without" project network in 2004 is approximately 9.0km/h. The difference in travel speed between "Without" and "With" cases is the effect of the project. As can be seen, travel speed is somewhat increased versus project cost. The trunk bus and railway projects are shown in circles with red and pink dotted lines, excluding some dots. The traffic effect in travel speed for the trunk bus and railway projects is somewhat higher than in other projects.

Figure 19.1-6 also shows the travel speed in the 2025 network, where a project is not included in the 2025 master plan network. The travel speed is decreased

according to the non-execution/inclusion of this project. In this figure, the travel speed in "With" project network in 2025 is approximately 16.0km/h. The difference of travel speed between "Without" and "With" cases is the effect of the project. As can be seen, the travel speed is somewhat increased versus project cost.

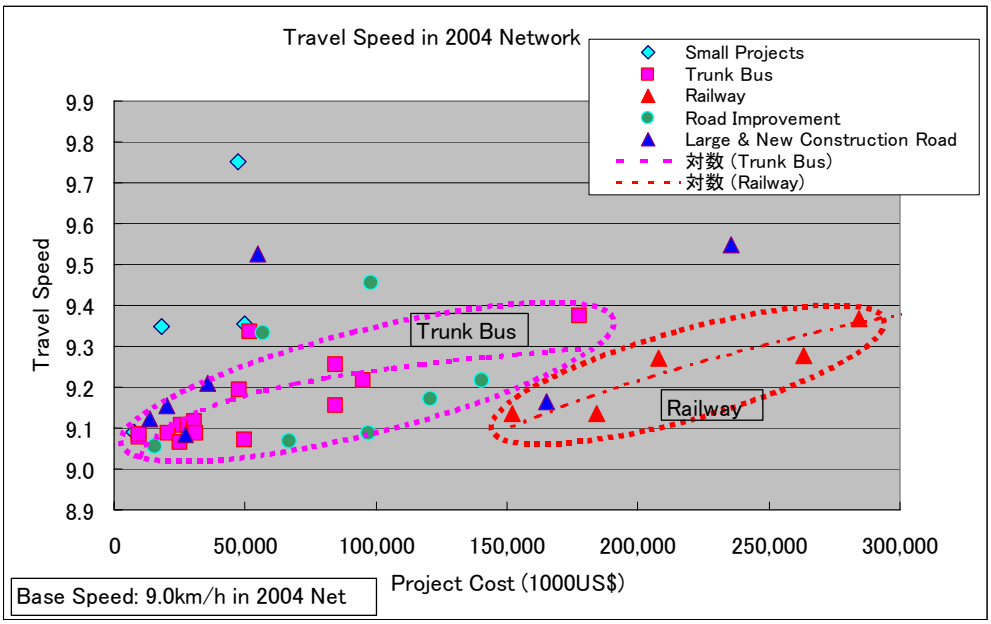


Figure 19.1-5 Average Travel Speed by Project in Road Network in 2004

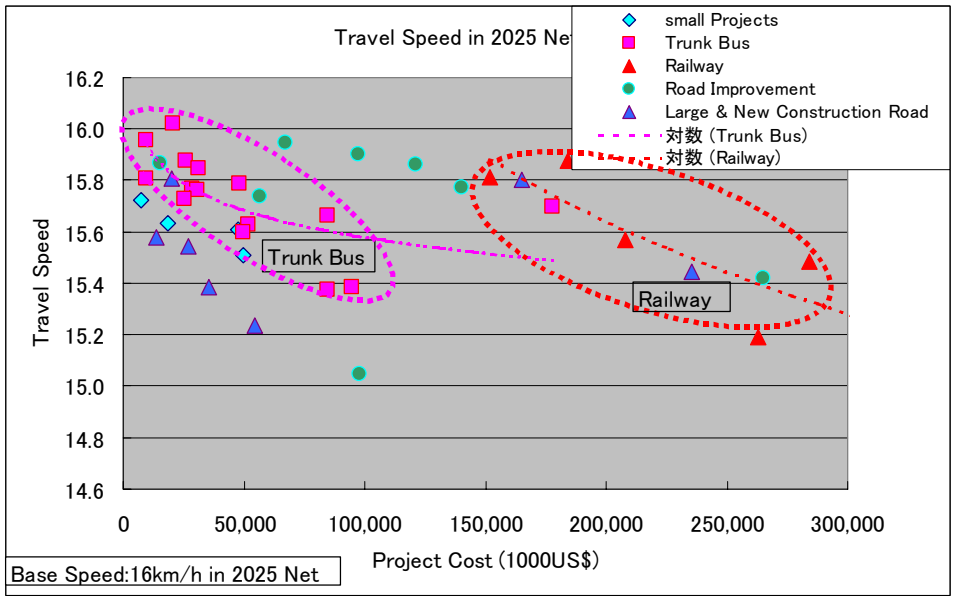


Figure 19.1-6 Average Travel Speed by Project in Road Network in 2025

b) Figure 19.1-7 shows time saving in terms of the different total travel time between "With" Project and "Without" Project cases in the road network in 2004. The horizontal axis in the figure shows the project cost, and vertical axis shows the time saving ratio to total travel time by projects. In this figure, the project with high time saving and low cost is given high priority. As can be seen, the trunk bus projects have the high time saving ratio at a medium cost. The time saving in railway projects varies from a ratio of 1.0 to 5.0% at medium and high costs.

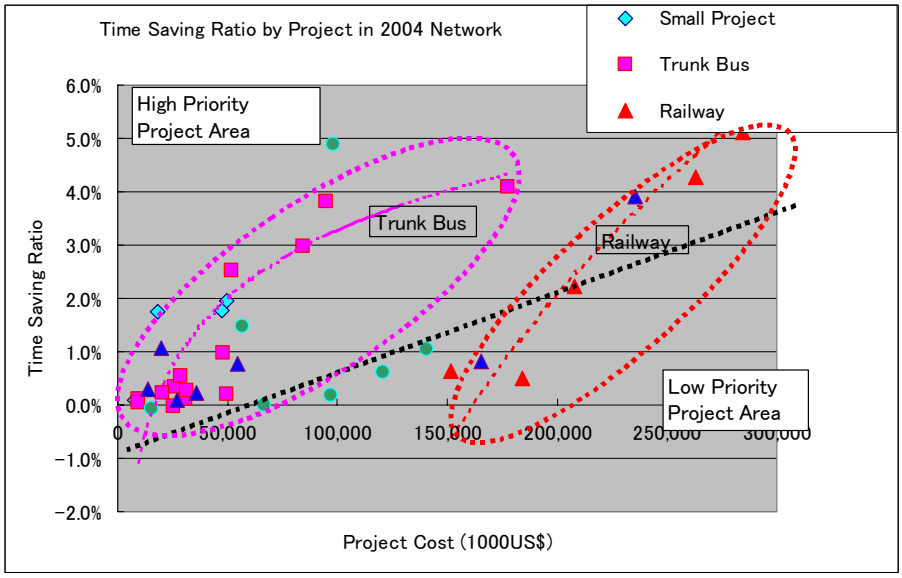


Figure 19.1-7 Saving Time by Project in 2004Road Network

c) Figure 19.1-8 shows relationship between population of Estrato-E (poor people) which is covered by project and project cost in the Master Plan network in 2025. The horizontal axis in the figure shows the number of population, which is covered within a radius of 1km along the project location according to Estrato-E, and vertical axis shows the project cost.

As can be seen, the project cost is not related to the population of Estrato-E, while the project location is related to Estrato-E. The trunk bus and railway projects are shown in red and pink dotted circles, exclusive of some dots. Since several trunk busways and railways run through poor residential areas, the covered ratios of those projects are somewhat higher.

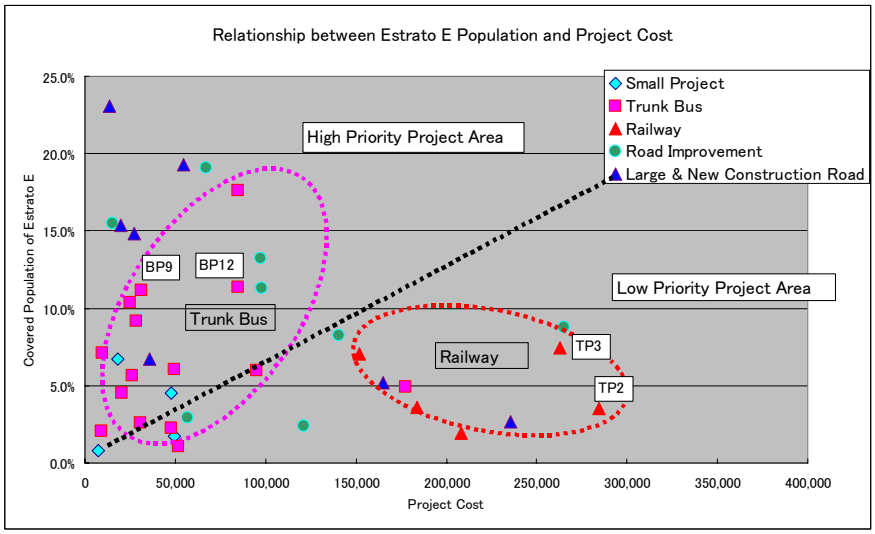


Figure 19.1-8 Relationship between Population of Estrato E and Project Cost

2) Project Priority from the Viewpoint of Traffic Improvement Effects

Based on the Figure 19.1-5 to Figure 19.1-8, the following project conditions are pointed out.

a) The traffic effect in travel speed for the trunk bus and railway projects is somewhat higher than in other projects.
b) The trunk bus projects have a greater traffic effect on travel speed and time saving versus the investment cost; especially projects No. 2, 12 and 13 are given 1st priority.
c) The railway projects have a greater traffic effect on travel speed and time saving. Especially projects No. TP-2 and 3 are given 1st priority.
d) With regard to poor people (Estrato-E), the various trunk busway and railway projects are effective.

(4) From the Viewpoint of the Characteristics and Conditions of the Project

1) Road Facility Development Projects

The 33 projects are identified as the road development project. Projects RP-01 to RP-26 are classified as comparatively large scale projects, however, projects RP-25 to RP-32 consist of many small scale projects as a package project. Taking into account the characteristics and conditions of the projects, the following implementation schedule of the small scale projects is proposed.

a) RP-25 project consists of the improvement of intersections on the existing trunk road network. Considering the importance of road function and characteristics of the trunk road network, the RP-24 should be implemented urgently as the first priority among intersection projects to mitigate the heavy traffic congestion on the trunk roads.
b) RP-26 project consists of the improvement of intersections on the existing arterial road network. Considering the importance of function and characteristics of the arterial road, RP-26 is implemented as the second priority project among intersection projects.
c) Rp-27 project consists of the improvement of intersections on the existing collector roads and local roads. To mitigate the traffic congestion on the collector and local roads, RP-26 may be implemented as the third priority project among intersection projects.
d) Rp-28 and RP-29 consist of many segments of the existing road widening projects in urban and sub-urban areas. From the viewpoint of traffic volume in the target area, RP-29 should be implemented faster than RP-29.
e) Rp-30 project consists of construction of many arterial roads and collector roads within new housing area in the future. These roads may be constructed in accordance with the housing development schedule.
f) RP-31 and RP-32 consist of many small sized rehabilitation projects such as small scale pavement on arterial roads and collector roads. Considering the importance of road hierarchy, RP-31 may need to be implemented faster than RP-32.

2) Trunk Bus Transport Development Projects

The trunk bus transport projects include construction of four (4) bus terminals. These bus terminals should be constructed together with the trunk busway construction schedule.

(5) From the Viewpoint of Implementation Progress of the On-going Project

In 2004, there are three (3) on-going projects in the Study area as shown below.

1) Av. Grau Improvement Project (RP-20)

This project is the improvement of Av. Grau which involves the construction of four (4) exclusive bus lanes by means of under passing and three (3) grade-separated intersections.

The construction of this project was commenced on August 2004 and will be completed in 2006.

2) COSAC Project (BP-02)

This project is to construct the trunk busway on Av. Tupac Amaru, Av. Ugarte, and Paseo de la República financed by WB and IADB. Construction will commence in 2004, and will be completed in 2006 in accordance with the schedule of this project.

3) Railway Line-1 Project (Panamericana Sur to Av. Grau on Av Aviación) (TP-02)

The detailed design and land acquisition of this project is already completed, and the construction is also approved by Lima municipality. The construction, operation and maintenance of the railway will be executed on a concession basis. The construction will commence in January 2005 and will be completed in 2006.

(6) From the Viewpoint of Balance of Investment Cost by Year

When preparing the implementation schedule for the Urban Transport Master Plan for Lima and Callao Metropolitan area, the balance of investment cost by each year should be considered, due to the importance of continuous implementation of the projects in the future.

The 1st priority project considers a Short-Term period of 6 years, from 2005 to 2010, and the 2nd priority is a Medium Term period which is 10 years, from 2011 to 2020, and the 3rd priority is a Long Term period of 5 years, from 2021 to 2025. Considering economic growth in Lima and Callao (annual growth ratio is 2.8%), the following balance of percentages is required for each period.

a) Short Term: 34 %
b) Mid Term: 48 %
c) Long Term: 19 %

(7) Classification of Project Priority

Considering the project conditions mentioned above, the following project priority is identified.

1) 1st Priority Projects
   a) Road Projects
      - RP-13: República Sur
      - RP-14: Nestor Gambetta
      - RP-18: Av. Universitaria
      - RP-19: Av. Independencia
   b) Railway Projects
      - TP-02 Line-1 (2)
      - TP-03 Line -1 (3)
   c) Trunk Busway Projects
      - BP-01 Av. Grau
      - BP-02 COSAC Project
      - BP-03 Carr. Central
      - BP-04 Av. Venezuela
      - BP-05 Av. Brasil
      - BP-08 Universitaria Sur
      - BP-09 Av. Callao-Canta
      - BP-11Av. Javier Prado

- BP-12 Av. Panamericana Norte
- BP-13Av. Panamericana Sur

2) 2nd Priority Projects

a) Road Projects

- RP-01 Peripheral Road Lima
- RP-02 Peripheral Road Callao
- RP-03 Autopista Ramiro Prialé
- RP-04 Panamericana Norte
- RP-05 Canta Callao
- RP-11 Costa Verde Lima
- RP-12 Coast Verde Callao
- RP-14 Nestor Gambetta

b) Railway Projects

- TP-04 Line –2
- TP-05 Line-3 (1)

c) Trunk Busway Projects

- BP-06 Av. Angamos
- BP-07 Av. La Molina
- BP-10 Av. Nestor Gambetta
- BP-14Av. Universitaria Norte
- BP-15 Av. Tomas Valle

3) 3rd Priority Projects

a) Road Projects

- RP-06 Peripheral Road (1)
- RP-07 Peripheral Road (2)
- RP-08 Peripheral Road (3)
- RP-09 Peripheral Road (4)
- RP-10 Peripheral Road (5)
- RP-16 Javier Prado (La Marina)
- RP-17 Paseo de República Norte

b) Railway Projects

- TP-06 Line-3 (2)
- TP-07 Line-4 (1)

19.2. IMPLEMENTATION SCHEDULE AND INVESTMENT

19.2.1. IMPLEMENTATION SCHEDULE

The implementation schedule of the Master Plan for each project is identified based on the above-mentioned viewpoints. The investment requirement for each year is calculated in accordance with the implementation schedule of each project. The implementation schedule of the Master Plan is shown in Figure 19.2-3.

19.2.2. INVESTMENT COST

(1) Total Investment Cost

The total investment cost in the 20 year period from 2004 to 2025 in the Urban Transport Master Plan for Lima and Callao Metropolitan Area is estimated at approximately US$ 5,535 million, and the investment cost of the transport project is shown below.

1) Road Development Plan = US$ 2,374 million
   a) National and Regional Expressway Development Plans = US$ 959 million
   b) Metropolitan Expressway Development Plans = US$ 928 million
   c) Arterial and Collector Road Development Plans = US$ 487 million
2) Railway Development Plan= US$ 2,024 million (including coach cost: US$1,223 million, equivalent to 60% of total)
   a) Line-1 Development Plans = US$ 684 million (coach cost: US$446 million)
   b) Line-2 Development Plan = US$ 660 million (US$ 461 million)
   c) Line-3 Development Plans = US$ 490 million (US$ 250 million)
   d) Line-4 Development Plan = US$ 190 million (US$ 66 million)
3) Trunk Bus Development Plans = US$ 981 million (including bus fleet cost: US$ 463 million, equivalent to 50% of total)
4) Traffic Management Development Plans = US$ 156 million
5) Total Development Plans= US$ 5,535 million

(2) Investment Cost by Year

The annual average investment costs of the project are shown below.

a) The average investment cost of all transport plans is estimated at approximately US$ 280 million per annum (5,535/20=280).
b) The average investment cost for the road development project is estimated at approximately US$ 120 million per year (2,374/20=120).
c) The average investment cost for railway development plan is estimated at approximately US$ 100 million per year (2,024/20=100).
d) The average investment cost for the trunk bus development plan is estimated at US$ 100 million per year (981/10=100).
e) The average investment cost for the traffic management plan is calculated at approximately US$ 30 million per year (156/5=30).

Figure 19.2-1 shows distribution of annual investment cost of the project and Figure 19.2-2 shows the accumulated investment cost. As can be seen, the short term trunk bus and railway project costs are invested in the Master Plan and then, road project cost is invested in the medium and long term.

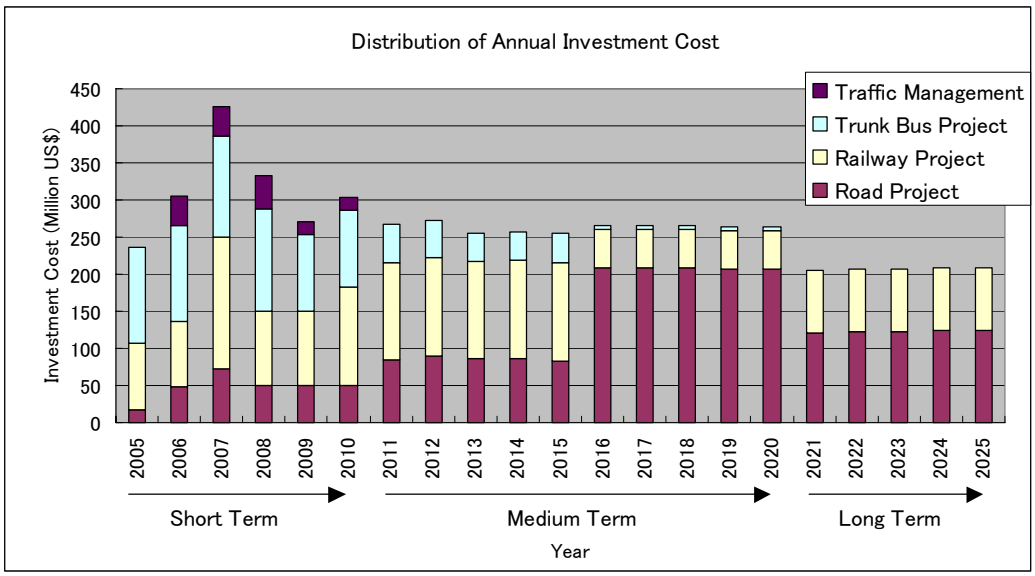


Figure 19.2-1 Distribution of Annual Investment Cost by Project

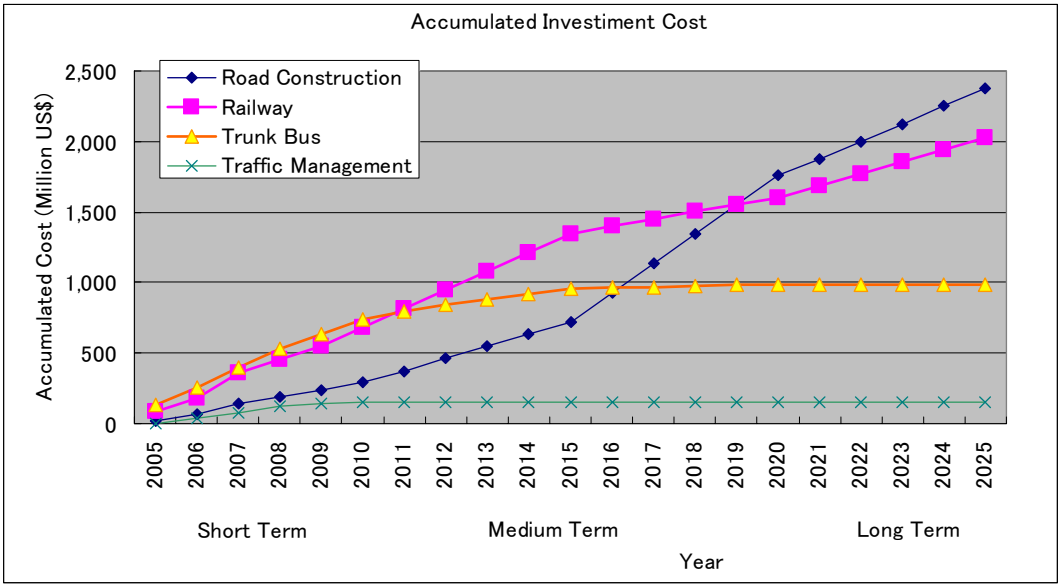


Figure 19.2-2 Accumulated Investment Cost by Project

Project Name	Project Size	Project Cost	Short Term						Middle Term										Long Term				
		1,000US$	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
1. Road Facilities Projects																							
1.1 Expressway (National&Regional)																							
RP-01 Peripheral Road Lima	31.0km	331,425																					
Rp-02 Petipheral Road Callao	12.4km	175,500																					
RP-03 Autopista Ramiro Preale	19.0km	121,500																					
RP-04 Panamerican Norte	16.0km	122,520																					
RP-05 Canta Callao	10.0km	19,200																					
RP-06 Periheral Road(1)	37.7km	68,290																					
RP-07 Peripheral Road(2)	13.0km	24,960																					
RP-08 Peripheral Road (3)	15.0km	33,830																					
RP-09 Peripheral Road (4)	10.4km	17,080																					
RP-10 Peripheral Road(5)	35.okm	44,550																					
Sub-total		958,855																					
1.2 Expressway (Metropolitan)																							
RP-11 Costa Verde Lima	11.5km	70,875																					
RP-12 Coast Verde Callao	8.0km	151,200																					
RP-13 Repubulica South	5.0km	62,100																					
RP-14 Nestor Gaveta	19.0km	83,730																					
RP-15 Elmer Foucett	5.6km	59,400																					
RP-16 Javier Prado (Marina)	22.3km	294,300																					
RP-17 Paseo de Repubulica No	3.7km	206,550																					
Sub-total		928,155																					
1.3 Arterian & Collector																							
RP-18 Av. Universitaria	2.7km	9,320																					
RP-19 Av. Independencia	3.3km	22,950																					
RP-20 Brideg Riobanba	1 unit	9,860																					
RP-21 Bridge Delgad de la Flor	1 unit	2,020																					
RP-22 Tunnel Santa Rosa	200m	16,200																					
RP-23 Tunnel Rimaac	300m	24,300																					
RP-24 Tunnel San Francisco	270m	24,300																					
RP-25 Intersection Packege-1	19 No.	76,950																					
RP-26 Intersection Package-2	26No.	54,050																					
RP-27 Intersection Package-3	23No.	31,050																					
RP-28 Widening Urban Area	161.0km	34,615																					
RP-29 Widening Sub-urban Are	69.0km	13,800																					
RP-30 Roads in Housing Area	202.8km	70,980																					
RP-31 Expressway Rehabilitatio	100.0km	54,700																					
RP-32 Arterial Rehbilitation	567.0km	22,963																					
RP-33 Collector Rehabilitation	691.0km	18,657																					
Sub-total		486,715																					
2. Railway Transport Projects																							
TP-01 Line -1 (1)	ompleted																						
TP-02 Line-1 (2)	11.7km	355,400																					
TP-03 Line -1 (3)	13.0km	328,900																					
TP-04 Line -2	29.0km	660,700																					
TP-05 Line-3 (1)	16.2km	260,000																					
TP-06 Line-3 (2)	11.9km	230,000																					
TP-07 Line-4 (1)	14.5km	189,900																					
Sub-total		2,024,900																					
3. Trunk Bus Transport Project																							
BP-01 Av. Grou	2.3km	32,395																					
BP-02 COSAC Project	29.0km	222,198																					
BP-03 Carr. Central	8.36km	35,508																					
BP-04 Av. Venezuera	9.05km	38,426																					
BP-05 Av. Brazil	4.84km	11,693																					
BP-06 Av. Angamos	15.96km	64,586																					
BP-07 Av. Molina	6.54km	25,627																					
BP-08 Universitaria South	12.66km	62,018																					
BP-09 Av. Callao-Canta	9.13km	43,816																					
BP-10 Av. Nestro Ganbetta	22.6km	107,855																					
BP-11Av. Javier Prado	21.07km	59,911																					
Bp-12 Av. Panamerican Norte	23.90km	105,676																					
BP-13Av. Panamerican South	25.6 km	118,660																					
BP-14Av. Universitaria Norte	7.27km	31,608																					
BP-15 Av. Tomas Valle	2.84km	11,879																					
BP-18 Terminal A	1 unit	3,000																					
BP-19 Terminal-B	1 unit	3,000																					
BP-20 Terminal-C	1 unit	3,000																					
Sub-total		980,857																					
4. Traffic Management Project																							
MP-01 Traffic Signal Contral	1 unit	38,640																					
MP-02 Intersection Improvemer	1 unit	650																					
MP-03 TDM Intriduction	1 unit	5,540																					
MP-04 Traffic Safety	1 unit	650																					
Mp-05 Parking Contral	1 unit	2,400																					
MP-06 Safety Education	1 unit	1,620																					
MP-07 Accident Monitoring	1 unit	2,700																					
MP-08 Vehicle Inspection	1 unit	20,800																					
MP-09 Traffic Contral	1 unit	50,000																					
MP-10 Traffic Imformation	1 unit	33,000																					
Sub-total		156,000																					
Total (US$, Milloin)		5,535	235.5	305.6	425.0	331.5	269.5	302.4	266.6	272.6	255.7	256.9	254.3	265.7	265.7	265.7	263.4	263.4	205.3	206.9	206.9	208.4	208.4
								1869					1306					1324					1036

Figure 19.2-3 Implementation Schedule for Master Plan

CHAPTER 20
Evaluation of Long Term Master Plan

20. EVALUATION OF LONG TERM MASTER PLAN

From among 15 alternative transport network plans, the alternative network-N was selected as the urban transport master plan in the Lima and Callao metropolitan area. The master plan consists of road, trunk busway, railway and traffic management projects. The development plans in the master plan were made in the sector plan.

In this section, the urban transport master plan, which consists of various projects/project packages, has been evaluated from various perspectives in order to justify a proposed Master Plan.

The major aspects for the evaluation are;

a) Economic aspects,
b) Financial aspects,
c) Environmental aspects,
d) Traffic aspects, etc.

20.1. ECONOMIC EVALUATION

20.1.1. METHODOLOGY

The economic evaluation of the selected master plan at the stage of the Progress Report was evaluated from economic perspectives in accordance with the following concept illustrated in Figure 20.1-1. The economic evaluation, in general, is to examine the economic feasibility of the project by comparing the economic cost of the project and the economic return (so called social benefits) generated in the regional economy by the project.

At first, factors for benefit calculation are selected, and then unit costs of selected factors are estimated according to the present condition. Secondly, traffic demands in 2010, 2020 and 2025 are forecasted according to the 'Do nothing' and 'with Project' cases respectively, and the benefits by each project can be obtained from comparing the two cases in each phase.

On the other hand, the project cost that is usually estimated in market price (financial cost) is converted into the economic cost by excluding the transfer cost and deducting price contingency, etc.

Finally both economic benefit and cost are compared through a discount cash flow analysis during the project life period.

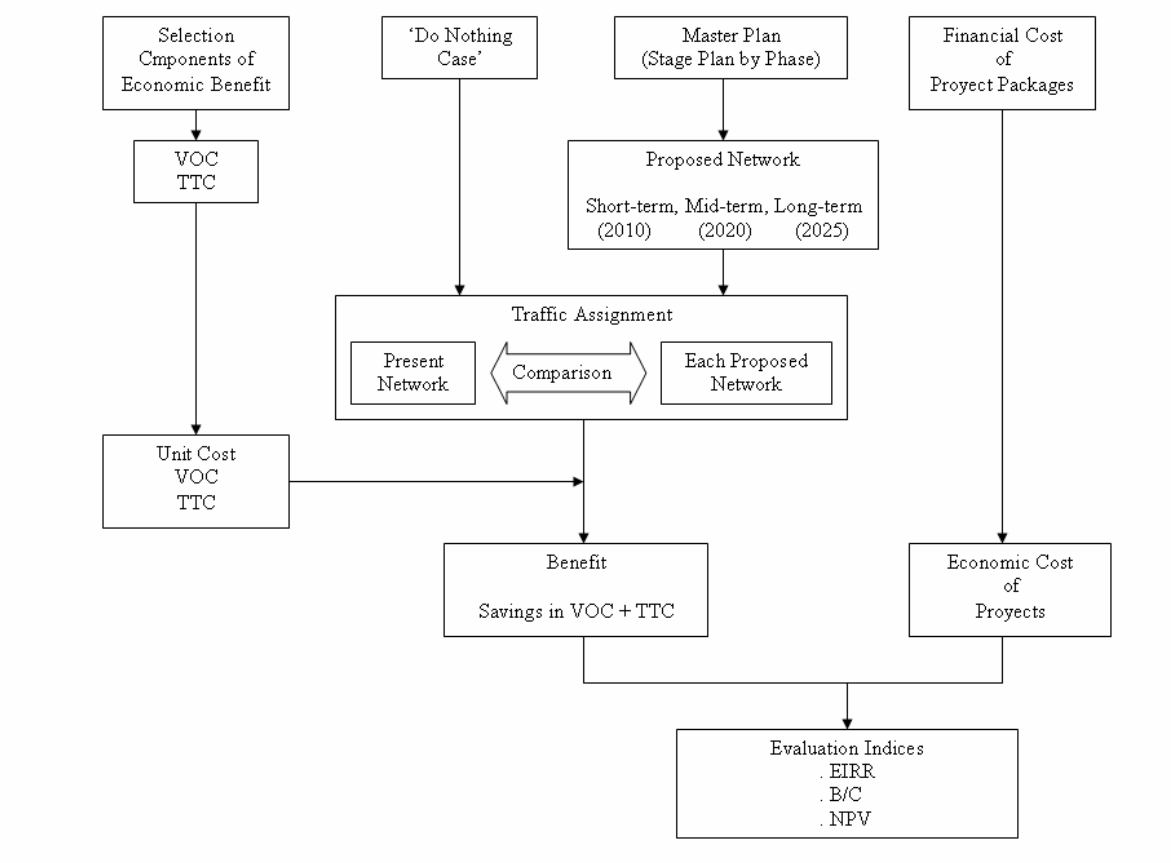


Figure 20.1-1 Concept of Cost-Benefit Analysis

20.1.2. ECONOMIC BENEFIT

There might be various kinds of economic benefits derived from the project execution; direct or indirect, tangible or intangible, temporary or permanent, etc., because beneficiaries of urban transport improvement projects vary quite widely, they are not only the direct users such as public transport users and private vehicle users but also all the residents within the urban area. At first, the savings of travel time due to the increment in average travel speed as a result of the improvement of the urban transport network and the reduction of the vehicle operation cost by improved traffic condition can be identified. There are, in addition, many other advantages caused by the project implementation such as increasing comfort by mitigation of traffic congestion, less damages for cargo transported by trucks, traffic safety improvements, advanced accessibility for every kind of urban activity, acceleration of urban development, so on.

Though there are many factors of quantitative economic benefits, the two most representative ones have been chosen in this study. It is popular to select some accounting factors as representative economic benefits by urban transport projects in the feasibility studies, such as savings of Vehicle Operating Cost (VOC) and Travel Time Cost (TTC), because they can be estimated more theoretically than others. The same factors were also considered in the feasibility studies recently conducted in Metropolitan Lima such as the 'PROTRANSPORTE project' and 'Line No. 1 Extension of the Urban Railway'.

As unit costs for both vehicle operation and travel time are analyzed in accordance with the following procedure, the examples tentatively applied in this evaluation are quoted from the relevant studies after due consideration, such as comparative examinations with results in recent studies in Latin American countries.

(1) Vehicle Operating Cost

The vehicle operating cost, in general, is estimated per unit distance and by type of vehicle. It is composed of the following components:

a) Fuel cost,
b) Lubricant oil cost,
c) Tire cost,
d) Repair cost,
e) Depreciation cost,
f) Capital opportunity cost, and
g) Crew and overhead cost.

Though it can be rather easily updated in accordance with the revision of each component, in cases where there is some vehicle operating cost data by which periodical trends can be analyzed, only results of vehicle operating costs by type of vehicle are available without basic data. These were carefully examined in comparison with those in other similar studies, and the following was applied in this evaluation.

Table 20.1-1 Vehicle Operating Cost

	New Buses		Replaced Buses		
Type of Vehicle	Articulated	Simple	Combis	Microbus	Omnibus
Cost per veh.-km	US$0.4388	US$0.3224	US$0.2173	US$0.2740	US$0.3224

In addition, as an urban railway system will be introduced in the multiple networks, the train operation cost is also determined following the results estimated in AATE. These analyses may be described in detail in the sector study, and only the results are mentioned here. They are, US$1.351 per coach-km (in 2007) and US$0.017 per passenger-km (in 2007), respectively.

(2) Travel Time Cost

A certain portion of the benefits brought from the improvements of the urban transport system are usually occupied by the savings of travel time. The travel time of certain trip purposes, both by car users and public transport users, is estimated as the opportunity cost to earn money in place of trips. The following factors, therefore, are considered:

a) Average income level,
b) Working hours,
c) Composition of trip purposes of ‘business’, and a part of ‘to work’ and ‘home’, and
d) Growth of GRDP per capita.

The final results of the travel time cost applied in this master plan evaluation are shown in .

Table 20.1-2 Travel Time Cost

Transport Mode	Travel time cost
Private car users	US$0.800/hr
Public transport users	US$0.309/hr

(3) Maintenance and Operation Cost

The maintenance and operation cost of each transport project such as road project, railway project, and trunk bus project is estimated to refer to the actual maintenance and operation cost of the past experience projects. When the benefit-cost analysis is examined, the maintenance and operation cost is adopted as one of the expenditures of the project.

a) The maintenance and operation cost of the road development projects is estimated at 5 % of the total project cost. This cost includes the daily maintenance and part time maintenance items of the roads, as well as administration items.
b) The maintenance and operation cost of the railway development projects is estimated at 15 % of the total project cost. This includes the daily maintenance and part time maintenance of the railway, as well as administration items.
c) The maintenance and operation cost of the trunk bus development projects is estimated at 10 % of the total project cost. This includes the daily maintenance and part time maintenance of the railway, as well as administration items.

20.1.3. ECONOMIC PROJECT COST

Since each project cost estimated in the sector plan is that of the financial cost (market price), it should be converted into the economic cost for the economic evaluation. Major items to be considered for this purpose are:

a) Examination of cost brake down for tax deduction,
b) Exclusion of both taxes on goods and service,
c) Deduction of price contingency and physical contingency, etc.

In this Master Plan stage, roughly estimated figures from consultants' experiences were applied for the economic cost calculation, since not enough information was available for both project cost estimation and cost brake down.

20.1.4. COST-BENEFIT ANALYSIS

The annual profit estimated for the project life period is compared with the investment in the form of cash flow. As a result of this analysis, three indices such as benefit-cost ratio (B/C), net present value (NPV) and economic internal rate of return (EIRR) are calculated under certain discount rates (in the case of this study 12% per year is applied).

Economic Benefit is defined as an amount saved in travel costs by a project. Travel costs consist of two components, vehicle operating cost (VOC) and travel time cost (TTC). The VOC and TTC are calculated by the traffic assignment method in which the integrated fare system is applied as shown in chapter 21.

(1) Master Plan as a Whole

A total amount of US$ 4,300 million (Economic Cost) is required to accomplish and maintain all the projects of the Master Plan, in economic costs at 2004 price. All projects in Figure 19.2-3, which shows the implementation schedule for the Master Plan, are included in the evaluation. They would be implemented from 2005 to 2025. When all the projects are completed, the total travel cost (both VOC and TTC) would amount to US$ 6,830 million (at 2004 price) in the year 2025. However, that would be US$ 11,656 million if the present transport network remains as it is, without any projects. Therefore, the economic benefit in 2025 derived by the master plan is estimated to be US$ 4,826 million. Out of this, 14% is attributed to VOC savings and 86% to TTC savings.

The annual cash flow (benefit - cost) is analyzed during the master plan/project life period, as shown in Table 20.1-3. Under the discount rate of 12%, the benefit cost ratio (B/C) is

4.76 and the net present value (NPV) is US$ 11,050 million, which assures quite high economic returns for the master plan. The economic internal rate of return (EIRR) is also high at 36.6%.

If benefit is calculated only by VOC, without TTC savings, both indicators of economic evaluation become smaller than the base case, because VOC only occupies a ratio of 14% of the total benefit; B/C ratio is 1.3 and EIRR is 16.2% (see Table 20.1-4). This indicates that the proposed master plan significantly contributes to the reduction of traffic congestion in Lima and Callao, although the master plan is only marginally economically feasible.

There are some uncertain factors in this economic feasibility examination of the master plan; such as conditions for traffic demand forecast, estimates on construction and maintenance costs of projects, implementation program, etc. Moreover, there might be other tangible benefits to have a direct/indirect effect on the projects' feasibility. Therefore, a simple sensitivity analysis is carried out, taking into account a considerable range of uncertainty as follows;

a) Variation of benefit: -10% to -30% against the base case, and
b) Variation of cost: +10% to +40% against the base case.

The results are tabulated in Table 20.1-5: the proposed master plan is quite economically feasible even in the worst conditions; EIRR = 23.4% in case of benefit = -30%, cost = +40%.

(2) Project Group by Implementation Stage

The proposed master plan consists of various project packages in three stages such as short-term, mid-term and long-term. The economic feasibility of the three terms by implementation period is compared in Table 20.1-6.

Though each term indicates an economic feasibility to a certain extent, the short-term package reveals a lower effectiveness than others in comparison with EIRR and B/C. The long-term package has a better effectiveness than the short and medium terms. This shows that in the proposed investment schedule, the public transport projects concentrate into the short and medium terms and these economic benefits are recovered in the medium and long terms.

Table 20.1-3 Benefit-Cost Analysis of the Master Plan as a Whole

	Year	Construction Cost (1000US$)			Maintenance Cost (1000US$)			Total Cost (1000US$)	Benefit (1000US$)		
		Road	Railway	Trunk Bus	Road	Railway	Trunk Bus		VOC	TTC	Total
	2004		0								
1	2005	14,256	71,080	103,038	0	0	0	188,374	0	0	0
2	2006	70,325	71,080	103,038	0	0	0	244,443	0	0	0
3	2007	88,399	142,160	109,462	0	0	20,608	360,629	0	0	0
4	2008	76,807	78,936	109,462	2,376	42,648	20,608	330,837	0	0	0
5	2009	53,447	78,936	83,221	2,376	42,648	20,608	281,236	0	0	0
6	**2010**	53,447	105,248	83,221	2,376	42,648	20,608	307,548	**153,151**	**588,290**	**741,442**
7	2011	67,297	105,712	40,234	17,834	82,116	59,144	372,337	177,133	720,782	897,915
8	2012	72,157	105,712	40,234	17,834	82,116	59,144	377,197	204,870	883,112	1,087,982
9	2013	68,373	105,712	30,441	17,834	82,116	59,144	363,621	236,951	1,082,001	1,318,952
10	2014	69,345	105,712	30,441	17,834	82,116	59,144	364,593	274,055	1,325,683	1,599,738
11	**2015**	66,375	105,712	31,392	17,834	82,116	59,144	362,573	**316,969**	**1,624,246**	**1,941,215**
12	2016	166,890	41,600	4,100	35,012	161,400	76,418	485,420	349,162	1,810,771	2,159,933
13	2017	166,890	41,600	4,100	35,012	161,400	76,418	485,420	384,624	2,018,717	2,403,341
14	2018	166,890	41,600	4,100	35,012	161,400	76,418	485,420	423,687	2,250,543	2,674,230
15	2019	165,050	41,600	4,100	35,012	161,400	76,418	483,580	466,718	2,508,991	2,975,709
16	**2020**	165,050	41,600	4,100	35,012	161,400	76,418	483,580	**514,120**	**2,797,118**	**3,311,238**
17	2021	97,066	67,184	0	76,550	192,600	78,469	511,868	544,330	3,025,573	3,569,903
18	2022	98,308	67,184	0	76,550	192,600	78,469	513,110	576,316	3,272,687	3,849,002
19	2023	98,308	67,184	0	76,550	192,600	78,469	513,110	610,181	3,539,983	4,150,164
20	2024	99,550	67,184	0	76,550	192,600	78,469	514,352	646,036	3,829,111	4,475,147
21	**2025**	99,550	67,184	0	76,550	192,600	78,469	514,352	**683,998**	**4,141,854**	**4,825,852**
22	2026	0	0	0	101,189	242,988	78,469	422,646	724,191	4,385,235	5,109,426
23	2027	0	0	0	101,189	242,988	78,469	422,646	766,745	4,642,918	5,409,663
24	2028	0	0	0	101,189	242,988	78,469	422,646	811,800	4,915,742	5,727,542
25	2029	0	0	0	101,189	242,988	78,469	422,646	859,503	5,204,598	6,064,100
26	2030	0	0	0	101,189	242,988	78,469	422,646	910,008	5,510,427	6,420,435
27	2031	0	0	0	101,189	242,988	78,469	422,646	963,481	5,834,227	6,797,709
28	2032	0	0	0	101,189	242,988	78,469	422,646	1,020,097	6,177,054	7,197,151
29	2033	0	0	0	101,189	242,988	78,469	422,646	1,080,039	6,540,027	7,620,066
30	2034	0	0	0	101,189	242,988	78,469	422,646	1,143,504	6,924,328	8,067,832
31	2035	0	0	0	101,189	242,988	78,469	422,646	1,210,698	7,331,211	8,541,908
32	2036	0	0	0	101,189	242,988	78,469	422,646	1,281,840	7,762,003	9,043,843
33	2037	0	0	0	101,189	242,988	78,469	422,646	1,357,163	8,218,109	9,575,272
34	2038	0	0	0	101,189	242,988	78,469	422,646	1,436,911	8,701,016	10,137,928
35	2039	0	0	0	101,189	242,988	78,469	422,646	1,521,346	9,212,300	10,733,646
36	2040	0	0	0	101,189	242,988	78,469	422,646	1,610,743	9,753,628	11,364,370
37	2041	0	0	0	101,189	242,988	78,469	422,646	1,658,067	10,151,941	11,810,009
38	2042	0	0	0	101,189	242,988	78,469	422,646	1,706,783	10,566,521	12,273,304
39	2043	0	0	0	101,189	242,988	78,469	422,646	1,756,929	10,998,031	12,754,960
40	2044	0	0	0	101,189	242,988	78,469	422,646	1,808,549	11,447,163	13,255,712
41	2045	0	0	0	101,189	242,988	78,469	422,646	1,861,685	11,914,637	13,776,322
42	2046	0	0	0	101,189	242,988	78,469	422,646	1,916,383	12,401,201	14,317,584
43	2047	0	0	0	101,189	242,988	78,469	422,646	1,972,688	12,907,635	14,880,322
44	2048	0	0	0	101,189	242,988	78,469	422,646	2,030,646	13,434,750	15,465,396
45	2049	0	0	0	101,189	242,988	78,469	422,646	2,090,308	13,983,391	16,073,700
46	2050	0	0	0	101,189	242,988	78,469	422,646	2,151,723	14,554,438	16,706,161
47	2051	0	0	0	101,189	242,988	78,469	422,646	2,214,942	15,148,805	17,363,747
48	2052	0	0	0	101,189	242,988	78,469	422,646	2,280,019	15,767,444	18,047,463
49	2053	0	0	0	101,189	242,988	78,469	422,646	2,347,007	16,411,347	18,758,354
50	2054	0	0	0	101,189	242,988	78,469	422,646	2,415,964	17,081,545	19,497,509
51	2055	0	0	0	101,189	242,988	78,469	422,646	2,486,946	17,779,113	20,266,059
Residual		0	0	0							
Total		2,023,780	1,619,920	784,686	3,689,776	9,598,164	3,506,642	21,222,968	53,959,010	341,080,246	395,039,256

VOC: Vehicle Operation Cost
TTC: Travel Time Cost

EIRR = 36.6%
B/C = 4.76
NPV = 11,050 millionUS$

Table 20.1-4 Benefit-Cost Analysis without TTC savings

Alternatives	EIRR	B/C	NPV
			million US$
TTC+VOC	36.6%	4.76	11,050
Without TTC	16.2%	1.29	853

Table 20.1-5 Summary of Sample Sensitivity Cost-Benefit Analysis

EIRR: %

Benefit \ Cost		Cost Up				
		Base Case	10% Up	20% Up	30% Up	40% Up
Benefit Down	Base Case	36.4%	34.4%	32.6%	31.0%	29.6%
	10% Down	34.2%	32.3%	30.6%	29.0%	27.7%
	20% Down	31.8%	30.0%	28.3%	26.9%	25.6%
	30% Down	29.2%	27.5%	26.0%	24.6%	23.4%

Table 20.1-6 Comparative Economic Analysis by Stage

	Economic Cost (Million US$)	EIRR (%)	B/C	NPV (Million US$)
Short Term	1,370.8	26.2%	2.12	1,888.3
Medium Term	3,357.2	36.0%	3.74	7,229.5
Long Term	4,303.6	36.4%	5.00	11,312.9

20.2. FINANCIAL EVALUATION

20.2.1. INTRODUCTION

As the necessary basic information for the financial analysis on the public transport operation business, such as trunk bus systems in the Lima metropolitan area, has not been prepared yet at this Progress Report stage, it will be conducted along with one of the major studies on financial evaluations in the Draft Final Report.

Accordingly, a general and preliminary review of the financial condition is examined in this section, with regards to the necessary public investments for the proposed urban transport master plan projects.

Roughly speaking, a total amount of US$5,535 million is required for the next 20 years from 2005 to 2025, in order to execute all of the projects proposed in the master plan adequately to cope with the forecasted future traffic demand as mentioned in Chapter 19. They consist of road facility improvements ($487 million), introduction of 4 lines of urban railway ($2024 million), over 200kms in total of trunk-bus system ($981 million) and traffic management project packages ($156 million). Meanwhile, the proposed investment program indicates that $1,869 million are required for the short-term (2005-2010), $2,630 million for the mid-term (2011-2020) and $1,036 million for long-term (2021-2025) respectively. It amounts to $200million - $420million per year.

It can be said that these are very huge amounts in comparison with the yearly current operational revenue of the central government of approximately US$8,000 - 9,000 million and yearly capital expenditure of US$1,200 - 1,700 million in recent years, and it is very important and difficult to secure the financial resources to satisfy the requirements. There are, of course, many different measures to invest in these urban transport improvement projects, not only the direct investments by public sectors but also the introduction and participation of private sector in the forms of BOT, PPP, etc. Since these concrete investment measures by project/project package will be examined and determined after careful investigations both in the feasibility study and the implementation stage, this section aims to suggest broad and preliminary ideas for the need to increase investment budgets to solve the future urban transport problems. Moreover, it doesn't aim to review and reform the project components in the proposed urban transport master plan at all.

20.2.2. PRESENT FINANCIAL STATUS OF EACH ORGANIZATION

The general financial condition of various organizations related to transport/urban transport sectors is overviewed from the recent budgetary trends at the beginning.

(1) Central Government

The total amount of the current revenue of the central government is almost stable during the past 5 years, 25,000 million Soles ($9,400 million) in 1997 to 28,000 million Soles ($7,950 million) in 2002. The balance of current revenue and expenditure shows the deteriorating trends after the peak of plus 4,300 million Soles in 1997, which became minus 1,375 million Soles in 2001.

Regarding the current revenue in 2002, 24,048 million Soles (85% of the total revenue) is derived from various kinds of national taxes among a total of 28,307 million Soles.

(Reference: Per capita national taxes are US$262 in Peru, US$3,140 in Japan, US$2,560 in Germany, US$5,630 and US$3,880 in USA).

The general sales tax (IGV) occupies the largest share of 52%, followed by income tax (25%), fuel tax (13%), and import duty of 10%. *(Reference: The shares of direct taxes among total national tax are 55-60% in Japan, 45% in Germany, 55% in Italy and 90% in USA).*

(2) Ministry of Transport and Communications

The Ministry of Transport and Communications is responsible for all modes of transportation infrastructure and services on an international, national and regional level, besides telecommunications and postal services.

The historical trend of budget allocation to the total indicates a decreasing share despite of its important role: 4.15% in 2000, 4.14% in 2001, 3.61% in 2002, 2.77% in 2003 and 2.55% in 2004.

70% to 80% of the total current expenditure is spent for investment purposes, it amounts to between US$250 million and US$380 million per year, in addition to a certain amount (US$70 million in 2004) for road maintenance. Accordingly, it is estimated that the scale of the investment budget of the MTC for national and regional roads is approximately US$200 – 300 million per year.

An almost equivalent amount of investment is required every year for the implementation of master plan projects.

(3) Metropolitan Municipality of Lima

The financial scale (total current revenue) of the MML, where the substantial part of the metropolitan area is formulated, ranges from approximately US$100.4 million (in 2000) to US$118.9 million (in 1998) during the last 5 years. As the total population of the MML was 7,500 - 7,750 thousand during these years, the local government budget per capita is very small and amounts to US$13.4 - US$14.6 per year.

Meanwhile, almost 70% of the total expenditure has been spent on current operational purposes such as personnel, consumptions, service expenses, etc. Accordingly, the budget amount of capital expenditure for development/maintenance of urban infrastructure is very limited, between 72 – 100 million Soles per year; that is, only US$21.4 - 28.5 million per year from 1998 to 2002. Approximately ten times the amount of previous budgets will be required for the proposed urban transport projects, if the MML executes all of the projects through its own budget resources. It is very important to study how to prepare the necessary amounts of financial resources for investments.

(4) Provincial Municipality of Callao

On the other hand, the MPC, another municipality that forms part of the metropolitan area, has a rather bigger scale of local government budget in comparison with the MML.

The total budget increased from US$21.2million in 2002 to US$31.3million in 2003, because of the additional revenue from a part of the duty income after the revision of the regulation. Since the population of Callao was 775 thousand – 800 thousand during that period, the per capita budget also increased from US$26.9 in 2002 to US$39.1 in 2003 and these figures count for 1.8 times or over twice of those of the MML.

(5) Other District Governments

There are 43 districts within the Municipality of Lima, of which Lima Cercado is under the administration of the MML, and each municipality has its own budget.

The total amount of the local district governments' budget was 723 million Soles in 1997, which is equivalent to US$272 million and over twice of that of the MML. (More recent data has been requested)

(6) Others

1) Consejo de Transport Lima and Callao (CTLC)
2) AATE
3) PROTRANSPORTE

20.2.3. TAXATION SYSTEMS AND TAX REVENUE

(1) General

The existing taxation system in Peru is summarized hereinafter, when a possibility of financial resource expansion is examined in order to realize the urban transport project implementation.

There are two kinds of taxes, for national and local governments.

1) Central Government

a) Income Tax**:** tax that is applied to incomes derived from working, capital or from the combined application of both, it is classified in the following manner:

- First: Incomes produced by leasing, sub-leasing and property assignments.

- Second: Incomes from other capitals.
- Third: Incomes from commerce, industry and others specifically considered by the Law.
- Fourth: Incomes from independent jobs.
- Fifth: Incomes from dependent jobs and other incomes specifically indicated by the Law.

b) General Sales Tax (IGV): This tax is applied to sales transactions, transfer of properties, promotions, bonuses, services, importation of goods (19%).
c) Excise Tax: tax that is calculated depending on the following systems: Value System, Specific System, Public Sale Price System.
d) Régimen Único Simplificado (RUS)/Unique Simplified System: System that includes persons, undivided successions and conjugal societies residing in the country where activities that generate Third Category Incomes are developed (stores, hardware stores, bazaars, town markets stands, etc.), which gross incomes per goods sale and/or rendering of services must not exceed S/. 80,000 in a calendar quarter (January to April, May to August, September to December).
e) Contributions to Health Social Security (ESSALUD): Contributions for the Health System (9%)
f) Contributions to the Oficina de Normalización Previsional/Prevision Standardization Office (ONP): The contribution belongs to the National Pension System (13%).

2) Local Government

Local Governments**,** corresponds the Municipal Taxes that are taxes in favor of local governments, whose compliance does not originate a direct consideration from the Municipality to the taxpayer.

These taxes are:

a) Tax on Immovable Property
b) Tax of Alcabala (Tax on Real Estate Transfers)
c) Tax on Vehicular Properties
d) Tax on Bets
e) Tax on Gambles
f) Tax on Public Shows that are Not Sport Related

a) Tax on Immovable Property, It is an annual tax and burdens urban and rustic real estate. Passive individuals, as taxpayers are: natural persons or corporate bodies (companies), owners of real estate, whichever is their nature. The tax is calculated applying the progressive scale (UIT) to the following cumulative tax base:

Category	Percentage
Until 15 UIT	0.2%
More than 15 UIT and until 60 UIT	0.6%
More than 60 UIT	1.0%

b) Tax of Alcabala, It is of immediate accomplishment and burdens the transfers of urban or rustic properties at burdensome or free level, whichever is its form or modality, including sales with domain reserves.
The tax base is the transfer value, which can not be lesser than the auto-valuation of the real estate corresponding to the financial year in which the transfer is being carried out, adjusted by the wholesale price index (IPM) for metropolitan Lima

which is determined by the INEI (National Institute of Statistics and Information Technology). The Tax rate is 3% and it is assumed solely by the purchaser.

c) Tax on Vehicular Property, it is annual and burdens the vehicle property, automobiles, vans, station wagons, trucks, buses and omnibuses not more than three (3) years old, until December 29, 2001. Currently all vehicles, regardless of the manufacturing year, have to pay the annual tax (1% of the tax base) during the next three (3) years following the initial registration. The value is calculated right after the first registration in the Vehicular Property Registry. The tax base is conformed by the original acquisition value, importation or income to the patrimony value, which in any case will be lesser than the reference table that the Ministry of Economy and Finance must approve on an annual basis, considering a value for the seniority of the vehicle.

d) Tax on Bets: burdens incomes of entities that organize riding events and similar activities which carry out bets. The passive Individual of Tax is the company or institution that carries out these burden activities. The tax is monthly. It is calculated based on the difference that results between the total income in a month by bets concept and the total amount of the prizes granted in the same month. The percentage rate of the tax on bets is 20%. The percentage rate of the tax on riding bets is 12%.

e) Tax on Gambles, the tax on gambles burdens the activities related with gambles, such as lotteries, bingos and raffles, as well as obtaining prizes in games of chance. The passive individual of the tax is the company or institution that carries out these burden activities, as well as the persons who obtain the prizes. The tax is determined applying the following rates:

- Bingos, raffles and balloting: 10%
- Pinball, video games and the rest of electronic games: 10%
- Lotteries and others games of chance: 10%

The tax is monthly. If it is the case, taxpayers and retention brokers will pay the tax within the first twelve business days (12) of the next month, by the modality that the Tax Administration establishes.

f) The tax on Public Shows that are Not Sport Related burdens the amount that is paid for a public show (non sport) on premises and closed parks, except for live shows such as theatre, operetta, classical music concerts, opera, ballet, circus and national folklore, properly qualified by the National Institute of Culture as public cultural shows.
Those persons who acquire tickets to assist to the shows are passive individuals of the tax.
The tax base is conformed by the value of the admission ticket to watch or participate in the shows.
The tax will be applied with the following rates:

- Taurine shows: 15%
- Riding races: 15%
- Films: 10%
- Other shows: 15%

OTHER TAXES

- SENATI Taxes
- SENCICO Taxes

(2) Fuel Taxes

The taxation system for gasoline is similar in Peru and Japan.

The retail price of fuel includes both the fuel tax and sales tax. As the actual retail price of gasoline has been increasing at very high rates these days, the cost composition is summarized as follows:

Table 20.2-1 Gasoline and Tax

(S/. per gallon)

Date		Gasolin 84	Gasolin 90	Diesel 2	Kerosen
20040821	Ex-Refinary	4.10	4.57	4.71	4.31
	Tax	**4.62**	**5.72**	**3.39**	**3.28**
	Rodaje	0.33	0.37	0.00	0.00
	ISC	2.90	3.71	2.10	2.07
	IGV	1.39	1.64	1.29	1.21
	Wholesale	8.72	10.29	8.10	7.59
	Profit	1.01	0.64	0.31	0.94
	Retail Price	**9.73**	**10.93**	**8.41**	**8.53**
	$/litter	*0.73*	*0.83*	*0.63*	*0.64*
	% of Tax	47.5%	52.3%	40.3%	38.5%
	in case of Japan		60%	40%	

20.3. ENVIRONMENTAL EVALUATION

(1) From a Topographical Perspective

1) Some portions of the road projects are located around surrounding mountainous areas where occurrences of landslide events are reported. Comprehensive slope destabilization and erosion studies shall be carried out and appropriate anti-landslide measures shall be taken.
2) Large-scale land-take is expected to occur for this mountainous road construction. Also, the existence of many illegal squatter's communities is reported. So, well-coordinated public involvement program shall be implemented in order to avoid or lessen unnecessary conflicts with those stakeholders.
3) It is reported that some sites around the Callao Port were severely contaminated with lead in the past and some portions of the project route of the road construction projects run through these contaminated sites. It is highly recommended to carry out a series of soil analysis around these sites as well as the implementation of the anti-spreading and/or treatment program of that contaminated soil.
4) Mainly, most of the project routes of the costal road projects, in the current coastal road that will be widened, are located at the bottom of the steep cliff where several traces of small-scale landslide events are recognized. Comprehensive slope destabilization and erosion studies shall be carried out, and appropriate landslide protection measures as well as the road bank protection measures against wave-induced erosion shall be taken. Also, the establishment of a contingency plan for a tsunami event would be desirable.

(2) From the Perspective of Flora and Fauna

In general, no rare flora/fauna exists along most of these project routes, although some project routes of the trunk busway projects (i.e., Av. Huaylas, ex-Panamericana Sur) may run through the environmental reserve, Villa wetland area, located around Chorillos. It is highly recommended to carry out the biological environmental study if any construction activities related with the trunk busway project are planned within the direct influence zone of this environmental reserve.

(3) From the Perspective of Flooding

Some project routes are to cross both the Rimac and Chillon Rivers, which are prone to flood events during the rainy season, in particular, El Niño. During El Niño, severe flood

events occur along the Rimac River and cause severe property damages. Most areas adjacent to the Rimac River, in particular, lowland areas around Callao, are inundated for about one month, and sometime, the outbreak of water borne diseases is induced. Generally, the river bank of the Rimac River is not well constructed and most areas adjacent to the Rimac River (except several gorge sections) are prone to usual flood events, which occur every January or February. It is recommended to carry out the hydrological study for the whole basin of the Rimac River as well as for the Chillon River, and appropriate flood and/or inundation mitigation measures shall be taken.

(4) From the Perspective of the Ruins

There are many pre-Inca and Inca ruins across the Lima-Callao Metropolitan Area and several ruins exist within 500 meters of both sides of most of the project routes. Also, some project routes run through the archaeological conservation zone, located around Ate and La Molina. Therefore, it is highly recommended to carry out an archaeological impact study and appropriate archaeological resource conservation measures shall be taken prior to and/or during the construction phases.

(5) From a Cultural Perspective

Several project routes run through the perimeter of the Historical Center (e.g., Av. Alfonso Ugarte and Av. 9 de Diciembre). Also, several important monuments and statues exist at plazas constructed inside of the roundabouts of Av. Alfonso Ugarte and Av. 9 de Diciembre. A visual resource impact study shall be carried out with the coordination of the public involvement, and it is recommended to take suitable mitigation measures to harmonize the transport facilities of the proposed project with the surrounding townscape.

(6) From the Perspective of Noise

Within this study, preliminary roadside noise and air quality surveys were carried out, and it was found that most of the Leq values measured at all roadside points exceed current Peruvian noise standards. So it can be said that the current daytime roadside environment is noisy and might cause some disruptions in human health such as hearing changes, losses, interference with speech communication and/or annoyance. Many parks, schools, churches and hospitals that would require a calm environment exist within 500 meters of both sides of most of the metropolitan expressway project routes. It is also reported that some historical facilities have been damaged around the Historical Center region. It is highly recommended to carry out 24-hour continuous noise surveys, as well as vibration surveys, in order to grasp the comprehensive time variation of the hourly noise/vibration fluctuation pattern and to evaluate the impact of the roadside noise/vibration on the human health quantitatively.

(7) From the Perspective of Air Pollution

1) In Peru, comprehensive vehicle inspection and maintenance programs have not been established yet, and most vehicles circulating across the metropolitan area are imported used vehicles. The exhaustion systems of those vehicles are not well-maintained, thus the roadside air quality and noise environment along major roads are not in good conditions due to the vehicular emissions, mainly originated from those poorly-maintained vehicles. Besides, the clean fuel policy that bans the use of leaded gasoline is not completely fulfilled, which also contributes to the city-wide air quality deterioration problem.
2) Relatively high PM-10 values were also detected along the heavy traffic roads, such as Av. La Marina, Panamericana Norte, and Av. Alfonso Ugarte, whereas relatively low value were detected at the park of San Borja, where the influence of the surrounding traffic conditions seems to be small. Air quality at open-cut

sections of Av. Alfonso Ugarte, Paseo de la República and Av. Javier Prado are worse due to both the stagnant air circulation (i.e., poor ventilation) and heavy vehicular emission loading. It is highly recommended to carry out a 24-hour continuous roadside air quality survey of PM10 as well as other important air quality parameters such as PM2.5, CO, NOx, SO2, HC and Pb.

3) Based on the computational results of the vehicular emission loading study (CO_2), it was found that the amounts of the vehicular emission-reduction of CO_2 to be caused by the operation of the proposed transport project in the Year 2025 vary between 22,526 ton/day (59 %-reduction: Alt-M) and 16,900 ton/day (44 %-reduction: Alt-D). So it can be said that a large amount of the regional CO_2 vehicular emission loading (i.e., environmental benefit) can be achieved as well as the roadside air quality environment around the Lima-Callao Metropolitan Area is expected to be improved to some extents.

20.4. TRAFFIC EVALUATION

Traffic evaluation is made in terms of traffic volume, passenger travel volume for busway and railway, travel speed, and congestion length. The OD tables for the years 2010, 2015, 2020 and 2025 were assigned on the networks of the Short, Medium and Long Term Plan projects, respectively, to evaluate traffic aspects. The achievements of planning purpose are examined by the traffic analysis. And then, the master plan is finally formulated.

(1) Daily Traffic Demand Analysis

The daily travel demand is analyzed in the "with and without" cases which are the master plan and do-nothing case, in the years of 2010, 2015, 2020 and 2025, respectively. The analyzed traffic indices are PCU-km, passenger-km, PCU-hour and passenger-hour. Those indices indicate the traffic volume, public transport volume, travel hour of vehicle and public transport passengers, respectively. Those analyses disclose the effects of the master plan on traffic and transport in the whole area.

Figure 20.4-1 shows traffic and passenger volumes in PCU-km according to "with" and "without" project cases, which show these ratios of change by three target years. The volumes in the "without" case are estimated by the traffic assignment by applying the present and future OD tables on the present transport network. The PCU-km indicates the traffic volume on roads, The PCU-km of both cases rises linearly until the year 2025. In 2025, the ratio of PCU-km in the "with" case stands at 1.9 times of the present figure, in contrast to 2.4 times in the "without" case. This indicates that the traffic volumes on roads in the "with" case are reduces in comparison to that in the "without" case.

As for the passenger-km in Figure 20.4-2, in which the passenger-km of public transport users (ordinary, trunk buses and railway) indicates passenger volume in the whole area, both figures in the "with and without" cases are almost the same each year. This indicates that the passenger volumes are the same in both cases.

On the other hand, transport facilities rise in the cumulative planning period where the distance ratio to the facility distance in 2010 rises higher than that of PCU-km. In 2025, the increase ratio of the facilities is at 3.0 times.

The above-mentioned situations can also be seen on the figures of PCU-hour as shown in Figure 20.4-3. In 2025, the travel time in PCU-hour in the "without" case rises to 10.1 times the present figure. The ratio is dramatically higher in contrast to 2.6 times in PCU-km. In the "with" case, the ratio decreases to 3.3 times. The reduction of travel speed in PCU-hour in both cases is remarkable, compared to the increase of traffic volume in PCU-km.

The passenger-hour in Figure 20.4-4 is also dramatically different between the "with" and "without" cases. In 2025, the passenger-hour in the "with" case rises 2.3 times, in contrast to 7.1 times in the "without" case. This is quite different between the passenger-hour and passenger-km. This indicates that the passenger volumes in both cases are the same, while the travel hour in passenger-hour is dramatically improved in the "with" case.

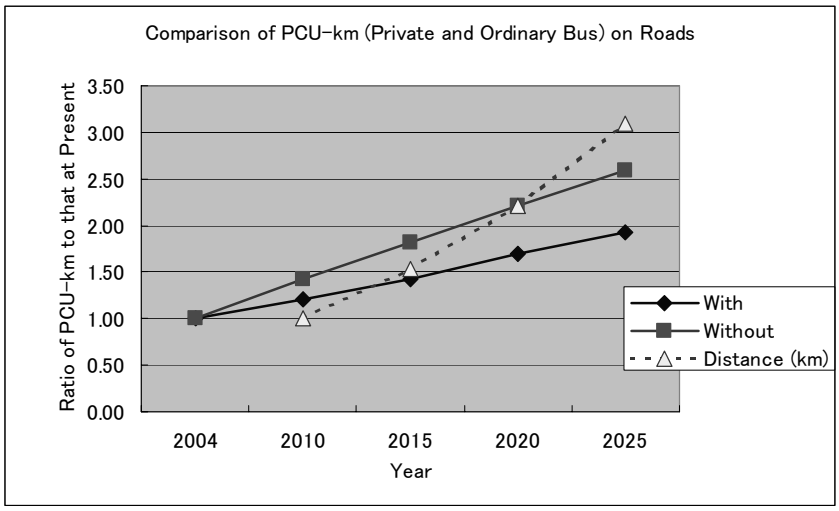


Figure 20.4-1 Traffic Volume in PCU-km on Road

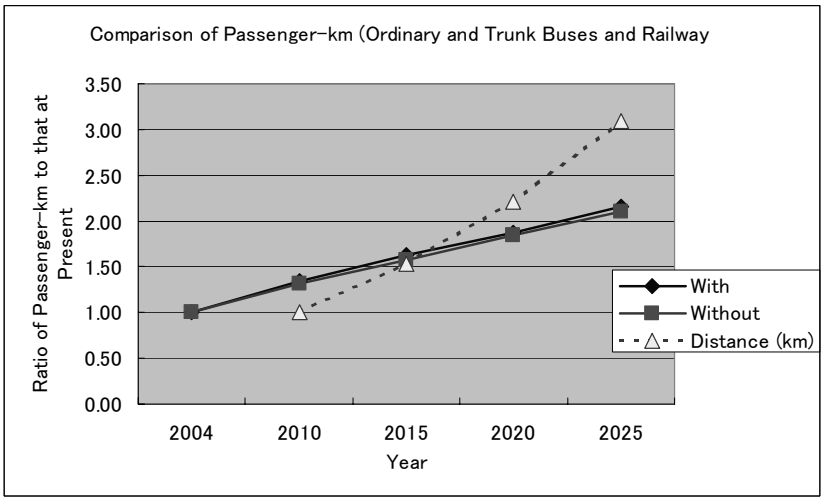


Figure 20.4-2 Traffic Volume in Passenger-km by Public Transport

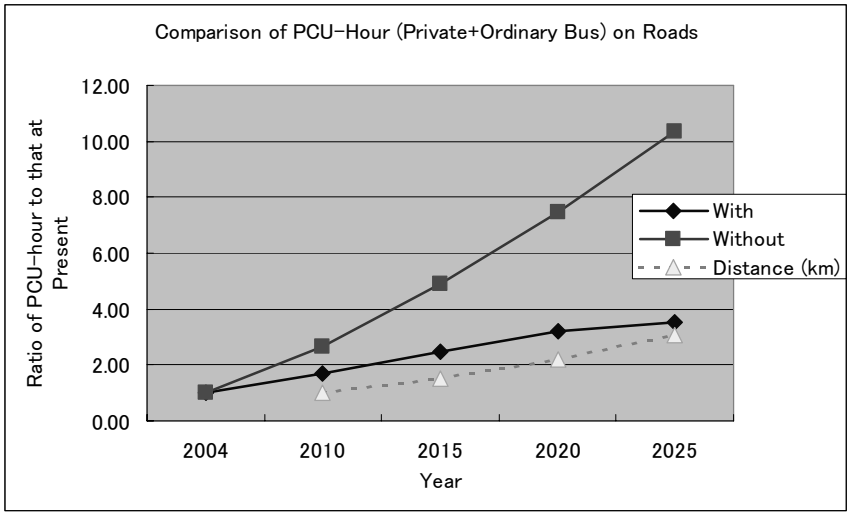


Figure 20.4-3 Travel Time in PCU-hour

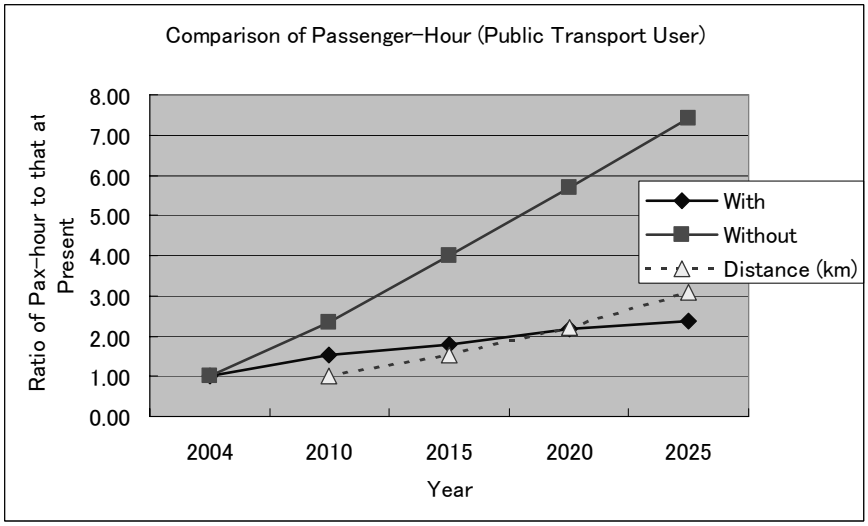


Figure 20.4-4 Travel Time in Passenger-hour

(2) Travel Speed

The average travel speeds served on each facility are shown in Table 20.4-1 and Figure 20.4-5. The average travel speed is a typical index to show a service level. The figures decrease from 33 km/h at the present to 17 km/h in 2025, which is equivalent to 0.5 of the present. It is obvious that the service level presented in Master Plan does not reach to the present level.

In comparison to the "without" case, as shown in Figure 20.4-5, the travel speed in 2025 is dramatically different in increase ratio to the present figure between the Master Plan (with) and "without" cases. The "without" case stands at 0.2 times of the present, while it is 0.5 for the Master Plan case. However, the travel speed in 2025 increases somewhat, in comparison to the figure in 2020 due to the development of the master plan projects. This indicates that the transport congestion is considerably heavier, if do nothing is selected.

Table 20.4-1 Average Travel Speed by Mode

OD Table	Unit	2004	2010	2015	2020	2025
Network		2004	2010	2015	2020	2025
With	km/hour	33.4	22.7	17.9	16.4	17.3
Without		33.4	17.4	11.9	9.3	7.8

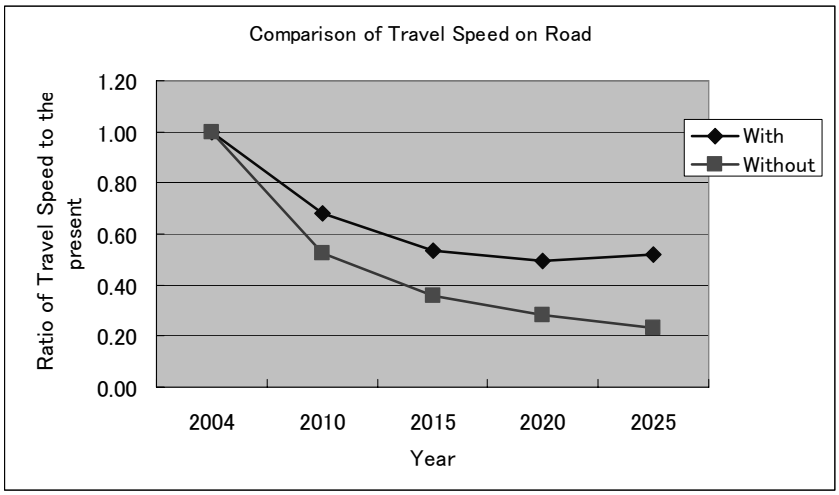


Figure 20.4-5 Rates of Change of Travel Speed

(3) Traffic and Transport Congestion

Figure 20.4-6 shows the traffic congestion in terms of congestion length ratio to the total length, which is served at a volume-capacity ratio of more than 1.0. Between 2004 and 2025, the figures in the "with" case decrease from 5.0 % at the present to 8.6 % in 2010. In 2025, the ratio rises to 12.8 %, which is equivalent to 3.0 times the present. It is obvious that the service level presented in the Master Plan does not reach the present level. However, in 2025, the congestion level is somewhat improved, in comparison to the figure in 2020.

Figure 20.4-6 shows the tendency of each target year comparing it to the "without" case. Both cases, "without" and the Master Plan, are somewhat different in congestion length. After 2010, the cases diverge, and the "without" case indicates severe congestion.

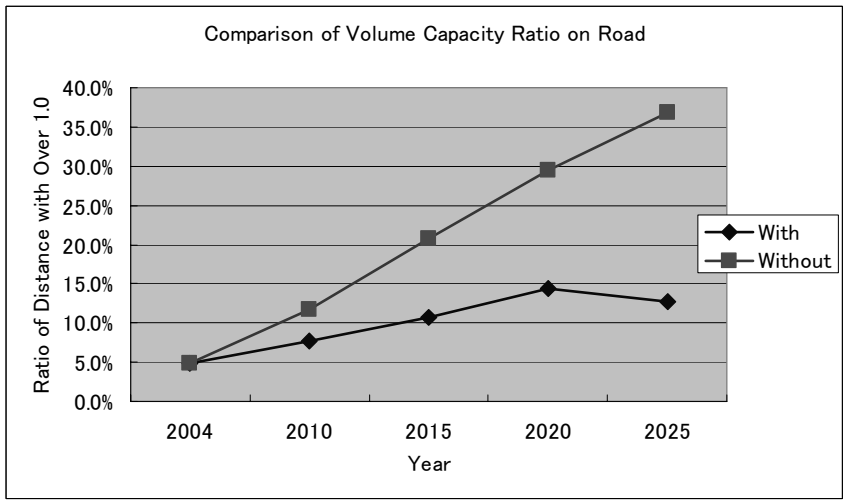


Figure 20.4-6 Ratio of Distance with a Volume-capacity Ratio of Over 1.0

(4) Traffic and Transport Volumes on Road and Transport Facilities

The traffic demands in 2004, 2010, 2020 and 2025 are shown in Figure 20.4-7 to Figure 20.4-10. In 2010, 2020 and 2025, the figure in the upper row shows the traffic demand in the "without" case in which future OD trips are assigned on the present transport network. The bottom figures show the traffic demand in the "with" case in which future OD trips are assigned on the master plan networks. In those figures, the traffic volume on each road transport facility is drawn by a narrow band whose width is proportional to the assigned traffic volume. In the right side figure in the bottom, a green color shows daily railway passenger volumes and a red color shows the daily trunk bus passenger volumes. When comparing traffic volume in the "without" cases, the segments with a traffic volume-capacity ratio of over 1.0 (pink and red color) gradually increase as the years advance and then, in 2025 almost all the roads exceed a ratio of 1.0. Therefore, the future traffic conditions will be severe if no improvements are made in the transport network.

When the master plan is developed in accordance with the implementation program, the segments on roads with a ratio of over 1.0 are considerably reduced, and public passenger demands divert to the mass transit system composed of the trunk bus and railway.

Figure 20.4-7 Traffic Demand on Present Road and Transport Networks in 2004

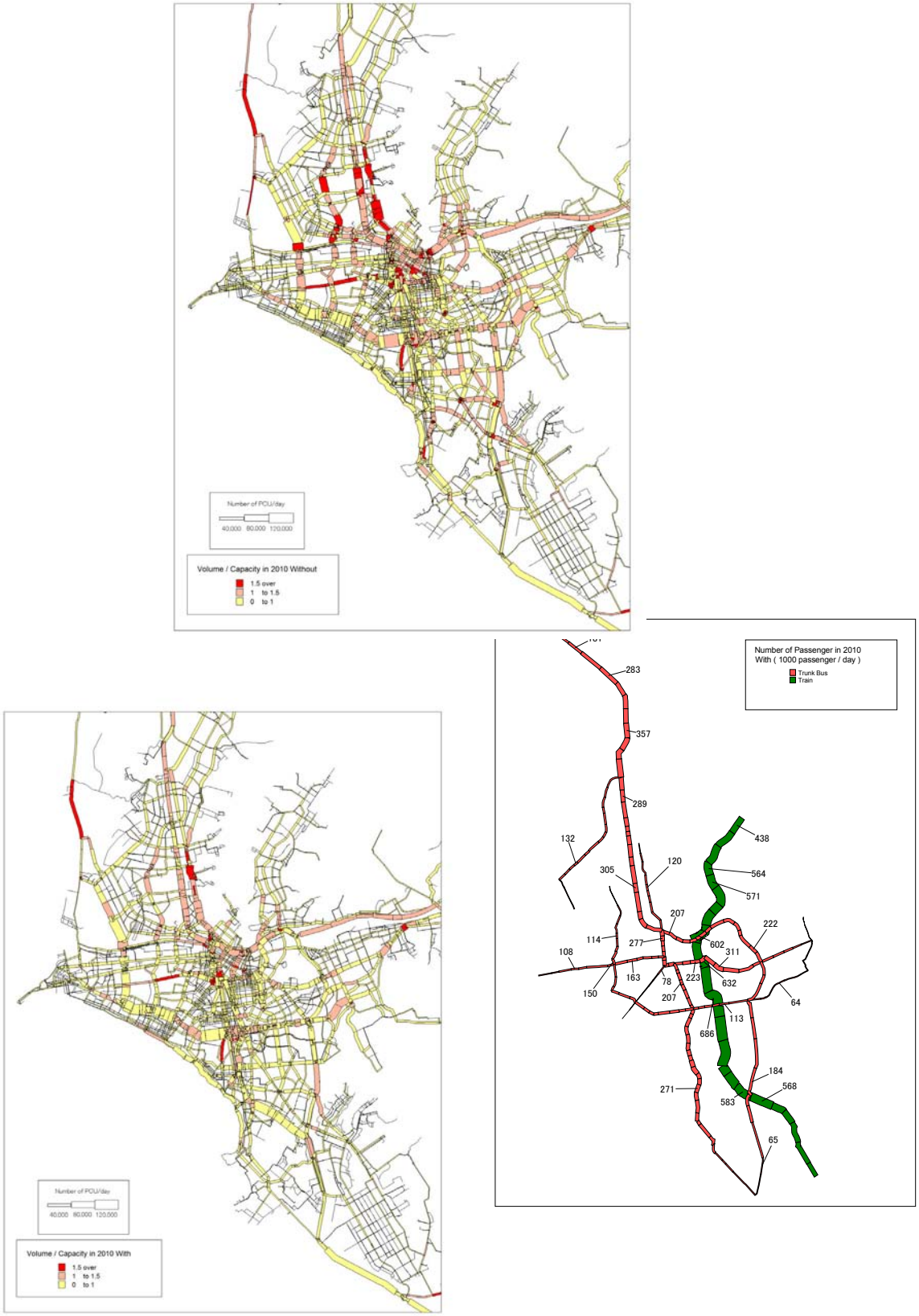


Figure 20.4-8 Traffic Demand (2004 Network/2010 OD for Upper Row and 2010 Network/2010 OD Table for Bottom Row)

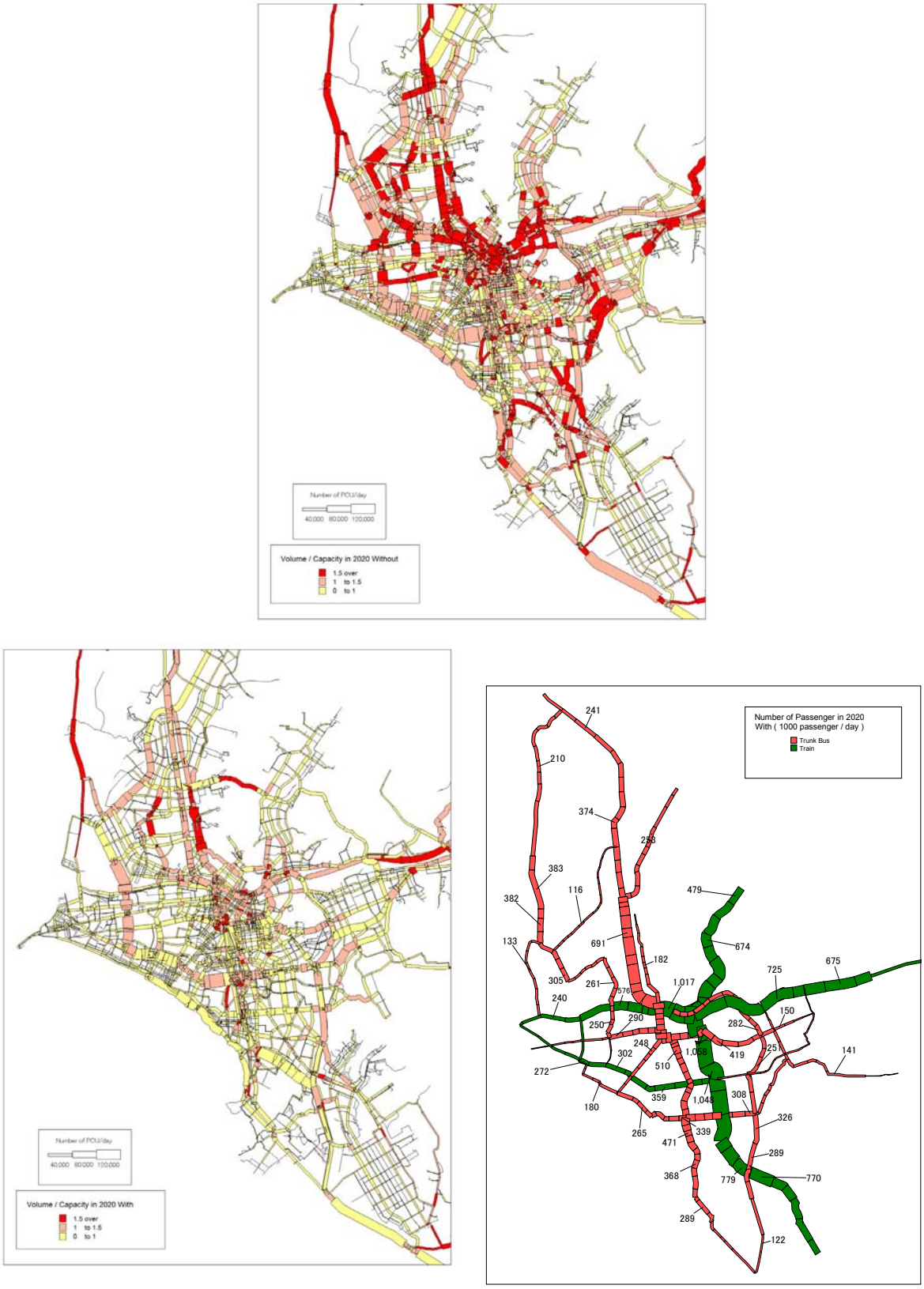


Figure 20.4-9 Traffic Demand (2004 Network/2020 OD for Upper Row and 2020 Network/2020 OD Table for Bottom Row)

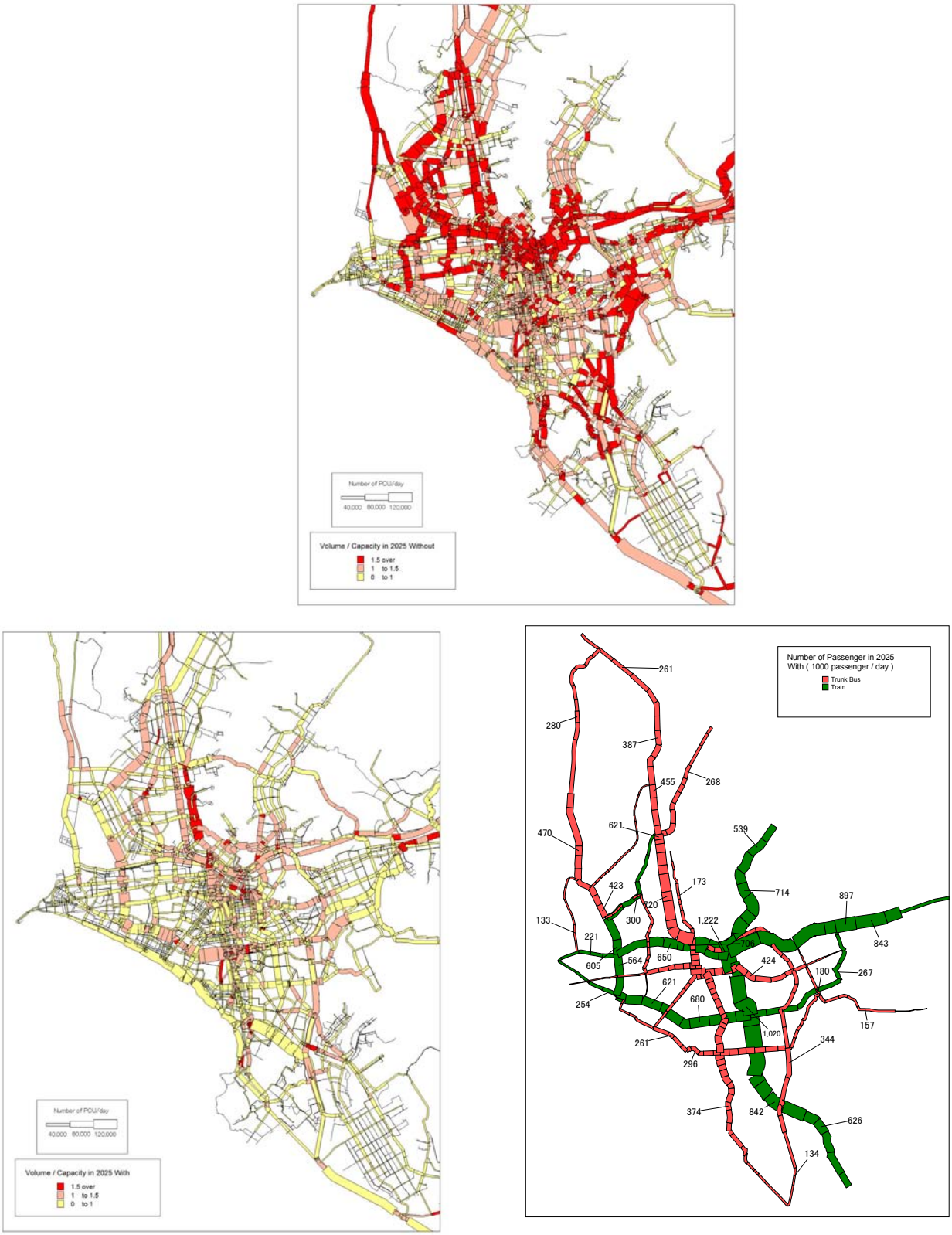


Figure 20.4-10 Traffic Demand (2004 Network/2025 OD for Upper Row and 2025 Network/2025 OD Table for Bottom Row)

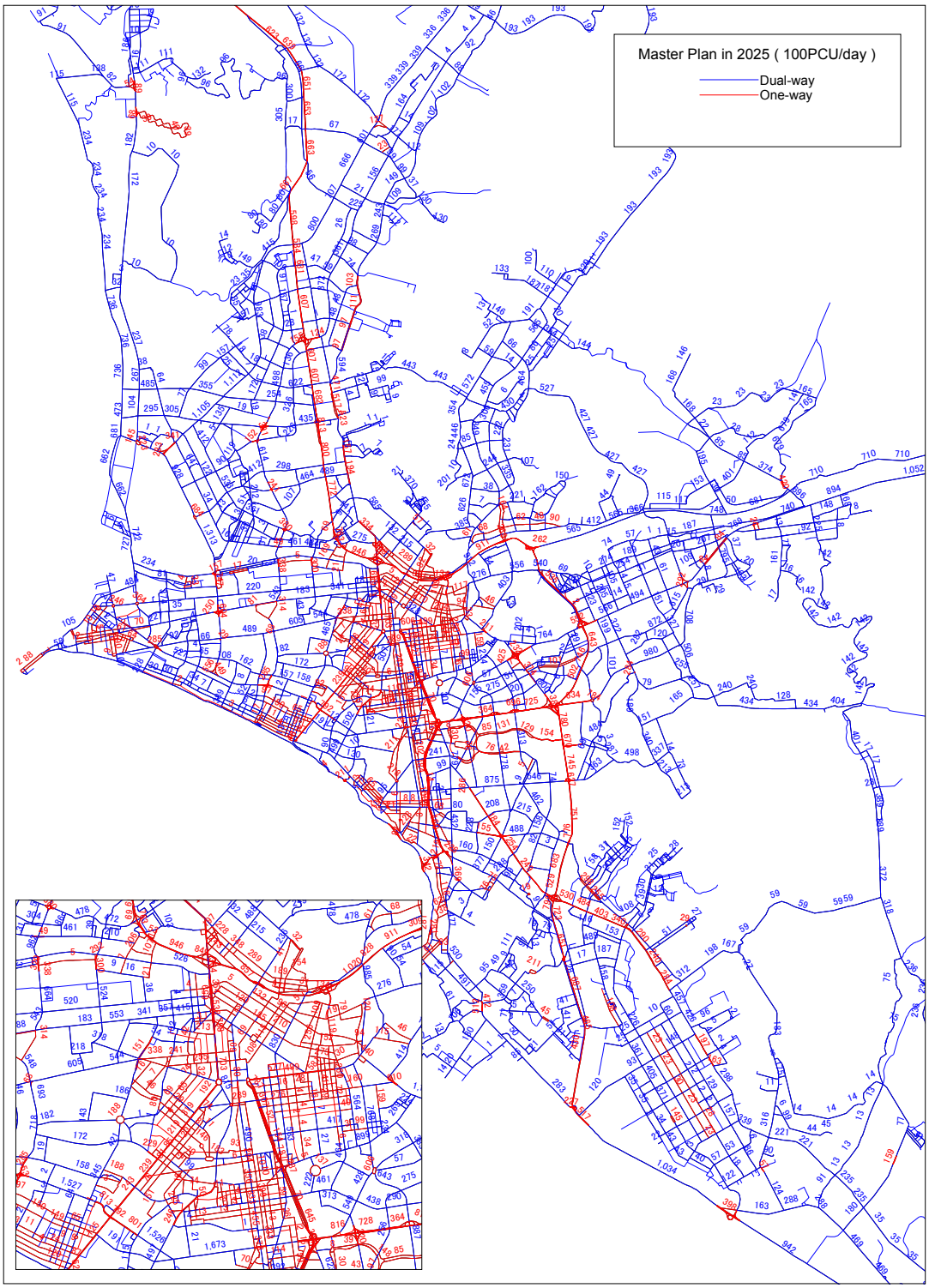


Figure 20.4-11 Traffic Demand on Roads excluding Trunk Bus and Railway passengers (2025 Network/2025 OD Table)

20.5. SOCIAL IMPACT

20.5.1. ENSUREING OF TRANSPORT EMPLOYMENT

(1) Social Impacts

The major existing bus operational problems are as follows,

a) To many bus routes are operated and these bus routes are concentrated on the existing trunk roads.
b) To many small bus fleets are operated and these bus operation length is very long.
c) To many private bus companies are operated on the same bus routes.
d) Travel time in the peak hour is very long.

The Master Plan was identified to solve the above mentioned problems and to mitigate the existing and future traffic congestions in the Study area. The major public transport systems in the Master Plan are recommended by the railway system and trunk bus system and original bus system. The trunk bus system including the following operation conditions;

a) To decrease the bus traffic volume and to mitigate the traffic congestions, the articulated bus (2-bus fleet is combined) for trunk bus system and ordinal bus fleet for feeder bus system are recommended.
b) To decrease the bus operation routes, the trunk bus system and feeder bus system is recommended.
c) To decrease the bus operation routes, some existing bus operation routes are eliminated by the trunk bus system and feeder bus system.
d) To decrease the travel time, the integrated system between trunk bus and feeder bus is recommended.
e) To ensure the smooth bus operation system, some bus companies are integrated in the future.
f) To decrease the air pollution, CNG bus fleets are recommended

When the Master Plan will be realized, the some social impacts as shown in Table 20.5-1 will be occurred. The most important social impacts are to decrease the bus transport employees and to decrease the numbers of bus companies.

Table 20.5-1 Social Impacts on Master Plan

Items	On Existing Bus Condition	On M/P Bus Condition	Social Impacts
Bus Routes	Many bus routes are located	15 trunk bus routes and some existing bus routes are located.	Many existing bus routes will be integrated. Decrease bus routes.
Bus Fleet	Many small buses (capacity is 20 to 50 persons) are operated.	Articulated bus (capacity 150 to 170 persons) will be operated.	Decreased bus fleets, and also bus drivers and conductors will be decreased
Bus Traffic Volume	Many buses are observed	Decreased bus traffic volume.	Mitigation of traffic congestion
Bus Company	Many bus companies are operated individually.	Bus company will be integrated.	Decreased bus company, and decreased employees.
Bus System	Many bus companies operate on same bus route.	Trunk bus and Feeder bus system introduced	Integrated bus company, and decreased employees.

(2) Further Study Needed

To smooth implementation of the Master Plan, the following further studies should be carried.

When the Master Plan will be realized, some bus transport employee engaged may be lost the there jobs. However, the Master Plan should be created there job to consider the following conditions in further studies.

1) The trunk bus system should be subscribed by the existing bus operation companies and citizens.
2) The trunk bus system should be created a new working place.
3) The trunk bus system should not be lost the bus transport employee engaged.
4) The trunk bus system should be created the following new jobs;
    a) Bus terminals and bus stops operation works
    b) Bus terminals and bus stops maintenance works
    c) Bus terminals and bus stops administration works
    d) Bus terminals and bus stops ticketing system works
    e) Bus depots operation and maintenance and administration works
    f) Bus companies (integrated)administration works
    g) Trunk bus and feeder bus operation works
    h) New bus operation for tourist(pickup bus)
    i) New bus operation for companies (pickup bus)
    j) New bus operation for school (pickup bus)

20.5.2. SCRAPPED OF EXISTING BUS FLEETS

Based on the data from DMTU and GGTU in September 2003, the approximately numbers of bus fleets and average operation bus age are shown in Table 20.5-2. The Table 20.5-2 shows, the total numbers of bus in Lima and Callao metropolitan area are about 31,500 buses, and the average age of bus fleets are 15 to 20 years old depend on the type of fleets. They are very old years.

Table 20.5-2 Approximately Number of Bus Fleet and Average Age of Bus (in 2003)

Items	Unit	Lima	Callao
Omuni Bus	Vehicle	4,500	2,000
Average Age	Year	20	
Micro Bus	Vehicle	11,000	
Average Age	Year	18	----------
Camioneta Bus	Vehicle	9,000	5,000
Average Age	Year	15	----------
Total		24,500	7,000

The bus operation systems in the Master Plan are formed by the trunk bus system, feeder bus system, and original bus system. The articulated bus for trunk bus system and small bus for feeder bus system and ordinal bus for ordinal bus system are recommended in the Master Plan. The implementation schedule of the 15 trunk bus system in the Master Plan is shown bellows,

a) in 2006: COSAC project will be operate
b) in 2006: Av. Grau project will be operate
c) in 2008: Av. Brazil project will be operate

d) in 2008: Av. Javier Prado will be operate
e) in 2010: Carr. Central project will be operate
f) in 2010: Av. Venezuera project will be operate
g) in 2010: Av. Universitsria South project will be operate
h) in 2010: Av.Callao-Canta project will be operate
i) in 2010: Panamericano Norte project will be operate
j) in 2010: Panamericano Suoth project will be operate
k) in2012: Av. Universitaria North project will be operate
l) in 2015: Av. Angamos project will be operate
m) in 2015: Av.Gambetta project will be operate
n) in 2015: Av. Tomas Volle project will be operate
o) in 2020: Av. Morina project will be operate

The detailed calculation of numbers of bus fleet purchase by each trunk bus route or trunk bus project should be examined in further studies, however, the numbers of articulated bus fleet required on the 15 bus projects in 2020 were roughly estimated as 3,500 vehicles depend on the progress of implementation of trunk bus projects. Therefore, the average numbers of required of articulated bus fleets by each year during period 14 years from in year 2006 to 2020 is roughly estimated as about 200 to 250 vehicles depend on the future passenger demand and operation length of the trunk bus system.

On the other hand, the total numbers of bus fleets of Lima is observed at about 24,500 vehicles, and the average age of these buses are about over the 15 years old. When the bus can be operated at 25 years, the scrapped bus fleets by each year are calculated at about 1,250 vehicles (24,000 vehicles * 50% / 10 years).

Considering the above mentioned bus fleets conditions, in generally, the following bus fleets purchase plan can be identified. The detailed bus fleet purchase plan should be examined in the further studies.

a) After open the COSAC project, about 200 to 250 new articulated bus fleets will be purchased by each year.
b) About 1,250 existing bus fleets will be scrapped by each year. The remaining of bus will be operated on the original bus system and feeder bus system.
c) A new bus fleets should be purchased as possible, due to the new buses can be used on the original bus system and feeder bus system operated in the future.

20.6. OVERALL EVALUATION

(1) Technical Evaluation

The detailed analysis of technical evaluation is described in chapter 22 of this report. As the result of technical evaluation, the following mitigation measures of the traffic congestion are evaluated based on the comparison study between with project and without project in 2025.

1) The Master Plan can be mitigated the average travel speed in the peak hour from 7.5km/h (without project in 2025) to 17.0 km/h (with project in 2025).
2) The Master Plan can be mitigated the traffic congestions at the Lima and Callao Metropolitan area.
3) The Master Plan can be mitigated the traffic congestion on the trunk roads.
4) The Mater Plan can be decreased the average travel time in peak hour from 65 minutes (without project in 2025) to 47 minutes (with project in 2025)
5) The Master Plan can be contributed the smooth traffic flows in Lima and Callao metropolitan area.

As the results of technical evaluation, the Master Plan can be contributed to mitigate the traffic congestion and to improve the traffic conditions in the Lima and Callao metropolitan area.

(2) Environmental Evaluation

The detailed analysis of environmental evaluation is described in chapter 17 of this report. As the result of environmental evaluation, the following mitigation measures of the environmental conditions are evaluated based on the comparison study between with project and without project in 2025.

1) The Master Plan can be decreased at 60 % air pollution in 2025 compare with without project.
2) The trunk bus system and the railway system can be constructed on the existing trunk roads, therefore, the large size additional land acquisition and many re-settlement are not needed.
3) The Master Plan can be contributed to promote the modern city structures.
4) The Master Plan can be contributed to decrease the traffic accidents, due to ensure the smooth traffic flows and to segregate the vehicle carriageways and bus lanes.

As the results of environmental evaluation, the Master Plan can be contributed to decrease the air pollution and to improve the traffic accidents and conditions in the Lima and Callao metropolitan area.

(3) Social Impact Evaluation

When the Master Plan will be realized, the negative social impacts such as decreased transport employments and decreased bus companies, however, theses negative social impacts can be solved in the further study.

On the other hand, the following intangible benefits are pointed out.

1) To promote the new jobs during the construction stage of the Master Plan
2) To create the new jobs for extremely poverty persons.(unskilled laborers)
3) To decrease the gasoline consumption

As the results of social impacts evaluation, the Master Plan can be contributed to increase the socioeconomic activities and to create the new jobs for extremely poverty persons in the Lima and Callao metropolitan area.

(4) Economic Evaluation

The detailed analysis of economic evaluation is described in chapter 20 of this report. As the result of economic evaluation, the following economic activities are evaluated based on the comparison study between with project and without project in 2025.

1) Economic Internal Return (EIR)=36.4%.
2) Benefit Cost Ratio (B/C)=5.0
3) Net Present Value (NPV)=Million US$ 4,303

As the results of economic evaluation, the Master Plan can be contributed to increase the socioeconomic activities in the Lima and Callao metropolitan area, and the implementation of the projects recommended by the Master Plan is economically feasible.

(5) Financial Evaluation

The detailed analysis of financial evaluation is described in chapter 26 of this report. As the result of financial evaluation, the Master Plan can be realized based on the additional

some new taxes introduced and the burden chare of beneficially of the trunk bus system and railway system introduced, and the following matters are pointed out.

1) The total project (financial) cost of the Master Plan is estimated at Million US$ 5,535.
2) The total project cost including the construction cost, engineering cost, administrated cost, contingency, and articulated bus fleets purchase cost for the trunk bus projects and wagon purchase cost for railway projects.
3) The total project cost also including on going project cost (total about million US$ 314) such as Av. Grau project (million US$ 33), COSAC project (million US$ 222), Av. Faucetto project (million US$59).
4) The articulated bus fleets purchase cost (total about million US$463) and the wagon purchase cost (total about million US$1,223) are including.
5) The total project cost on the Master Plan without above mentioned items 3) and 4) is estimated at about million US$ 3,5355 (535-314-463-1,223=3,535). The average procurement cost by each year during 20 years period from 2006 to 2025 is calculated at the about million US$ 177 per year.
6) There are many projects in the Master Plan constructed by the concession system or other system introduced. The detailed financial procurement study by each project should be conducted in the further study.