APPENDIX VII

DISASTER MANAGEMENT

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APPENDIX VII

DISASTER MANAGEMENT

1 General

The present management of river and disaster in the basin is not sufficient, which causes the various disasters or increases the damage.

This section investigates the present situation of the management, aiming at duly reflecting on the planning of the disaster prevention measure in the basin.

2 Present Structural Management

2.1 Existing Structures

There are various structures in or along the Rimac river as listed below.

(a) Road
(b) Railway
(c) Bridge
(d) Levee
(e) Parapet wall
(f) Channel works, Revetment, Ground sill
(g) Intake structure for city water supply
(h) Intake structure for irrigation water supply
(i) Intake and outlet structures for power generation, including dam
(j) Groyne
(k) Intake for water supply to refinery plant
(l) Houses
(m) Others

Most of them are located along the main stream. In tributaries, the scale of structure is relatively small.

Though there are many river structures, the following structures are mainly constructed for preventing the disaster.

(a) Levee
(b) Parapet wall
(c) Channel works
(d) Groyne

The other structures are constructed for individual purpose. Some of them are considered to be undesirable structures for disaster prevention as they would obstruct the smooth flow and reduce the flow capacity of river channel.

No overall structural plan in the whole basin has been prepared. The structures have been constructed for a limited point or section and for a limited purpose. As for the disaster prevention, the structures were constructed almost always after suffering disaster. In this case, it is expected that the area protected by new structures will not suffer the disaster at the time of flood for some years. However, the other areas will suffer instead.

In addition, it seems that the quality including design, materials and construction of some structures is not good enough as permanent structures. Especially, the design and construction of levee will need improvement in the future.

2.2 Operation and Maintenance of Structures

As far as the information obtained by the Study Team, there is no unified standard or rule for operation and maintenance of all the structures in and along the Rimac river as well as the Santa Eulalia river. However, the structures in the same group are controlled and managed by a certain body or office. The structures classified by the administrative office are generally as follows:

(a)	Hydro-electric power generation structures including intake and outlet of waterway	:	ELECTRO LIMA.
(b)	Irrigation water intake	:	MINIS. AGRICUL.
(c)	City Water supply intake	:	SEDAPAL
(d)	Railway and Railway bridge	:	ENAFER
(e)	Road and roadway bridge	:	MINIS. TRANSP.

The other structures such as levee, parapet wall, and channel works can not be classified by the administrative office as the administrative office or body is different by the location as well as by the owner. For example, the levee in Corcona was constructed by the mining company nearby Corcona, the levee on the left bank in Nana district was constructed by COOPOP and the levee constructed in the downstream stretch nearby the river mouth was constructed by Peruvian Navy. The parapet walls are also constructed by the different offices and bodies. The parapet walls located in the partial portion along the river ar usually constructed by a private person or a group of inhabitants/village nearby the river.

It can be said that the office or persons who need such structure or the office related to the structure and generally in charge of construction as well as operation and maintenance. If there are some offices related to the structure, the construction is generally carried out on shares.

In regard to the cooperation and regulation between or among the different offices, it seems that there is no authorized system for operation and maintenance. However, they usually assist the other offices if requested. For example, ELECTRO LIMA opens the gate of reservoir wider than its necessity when the downstream offices, specially SEDAPAL, request more water for their necessity.

3 Present Non-structural Management

3.1 Laws

There are many laws established by the Peruvian Government. However, there is no specific law limited for river or disaster. It is necessary to refer to some related laws if required to check any regulations for disaster prevention or for utilization of river, making it difficult to put into execution the regulations.

The laws and norms related to management of river and disaster are introduced in Annex.

3.2 Relief of Inhabitants

Though no special measures are taken to reduce the damage due to disaster, some activities after the disaster are carried out for the relief of inhabitants. The assistance for relief is mainly provided by the governmental offices concerned. Generally, several different offices start their work at the disaster area. For example, the following work is carried out.

(a) TRANSP. MINISTRY repairs the road and bridges.

(b) HOUSING MINISTRY takes care of the houses of the inhabitants.

(c) HEALTH MINISTRY serves the medical and health care of the inhabitants.

(d) Municipality office try to obtain the relief goods and provide the necessary information to the inhabitants.

(e) SE/INDC collects the information of disaster and damage and announces in public. The coordination of each government office is also performed by SE/INDC.

Note: It is noted that the name of CNDC was changed to INDC (Instituto Nacional de Defensa Civil) due to the reorganization in August 1987.

3.3 Training and Education for the Disaster Prevention

SE/INDC arranges the ordinary meeting as well as the occasional meeting of which members consist of the staff of the government offices and agencies related to the disaster. In the meeting, the information and data in respect of the recent disaster is made. Besides SE/INDC occasionally announces the importance and necessity of disaster prevention.

4 Related Offices for Management of River and Disaster

4.1 General

There is no unified organization which controls the whole river basin with responsibility in regard to the disaster prevention. That is, all the government offices and agencies individually carry out their activities for structures and facilities to be constructed or established by the budget of their offices.

However, Committe Nacional de Defensa Civil (CNDC) was established in 1972 as a coordinating authority for the inter-agencies at emergency, expecting that CNDC would control all the matters at the occurrence of disaster. The name of CNDC which has continued his activities since then was recently changed to INDC (Instituto Nacional de Defensa Civil).

In addition to the above INDC, there are many other offices relating to the disaster prevention more or less.

INDC, which is the main related office, is introduced hereunder. Other relevant offices are introduced in hereunder too.

4.2 INDC

As mentioned above, CNDC was established in 1972 as a coordinating authority for the interagencies at emergency after the great earthquake in Huaraz which killed more than 50,000 persons. Since then, CNDC has continued his activities: that is, CNDC has been accumulating the experience for disaster and improving the consciousness for the importance of disaster prevention. However, in view that the function of CNDC is required to be further reinforced, CNDC was recently reorganized to INDC which is newly provided with the autonomy.

The details of new organization in INDC are not definitively established yet, since the reorganization was just made in August 1987. Thus, the present organization is still as presented below without any substantial change from that of CNDC.

The general organizations of INDC and SE/INDC which is an executive office of INDC are shown in Fig. VII-4-1 and VII-4-2. Its organization and major activities are detailed as follows:

(A) Organization

Main Composition :

Under the original law, the Sistema de Defensa Civil was composed by the following organizations:

- Ministry of Interior
- Ministry of Health
- Ministry of Agriculture
- Ministry of Energy and Mining
- Ministry of Transport and Communication
- Ministry of Housing and Construction
- Ministry of Education
- President of the United Armed Force

Levels of Committee:

The organization provides also Defensa Civil Committees of different level by scale. A set of people gathers regularly to perform a definite purpose in each level of Committee.

There are 5 levels of Committees.

(a) National: For the whole nation. It is directed by the Minister of Interior. It has a Secretarfa Ejecutive Nacional in Lima.

(b) Regional: For each one of five regions with headquarters in Piura, Lima Arequipa, Cuzco and Iquitos. Each one of the regions has a secretarfa Ejecutive Regional.

(c) Department: For each one of the department of Peru.

(d) Province: For each one of the province of Peru.

(e) District: or each one of the district of Peru.

Note: For the last 3 levels, there is not Secretarias Ejecutivas Nacionales.

Regional Committee :

Each region covers the following departments:

(a) First Region

- Piura
- Tumbes
- Lambayeque
- La Libertad
- Cajamarca
- Amazonas

(b) Second Region

- Lima
- Ancash
- Ica
- Pasco
- Huancavelica
- Junin
- Huanuco
- Ayacucho
- Provincia Constitucional del Callao
- Ucayali

(c) Third Region

- Arequipa
- Moquegua
- Tacna
- Puno

(d) Fourth Region

- Cuzco
- Apurimac
- Madre de Dios

(e) Fifth Region

- San Martin
- Loreto

(B) Budget of SE/INDC

The Budgets of SE/INDC of these 5 years, from 1982 until 1986 budgetary year, are shown below.

(In thousands of Intis)

Year	Salary	Material: Goods	Material: Services	Material: Transfer	Total
1982	156	62	40	92	350
1983	327	249	158	494	1,248
1984	538	600	300	484	1,922
1985	1,043	910	609	829	3,391
1986	2,450	1,350	668	700	5,168

There are two kinds of budget. One is the ordinary annual budget and another one is the special budget for disaster. The special budget is required when a disaster happens and INDC does not have enough funds to face it. The flow chart of each case of budget procurement is respectively shown in Fig. VII-4-3 and VII-4-4.

(C) Activities

The major activities of INDC are (i) to act as the coordinating body of all the related offices at emergency, (ii) to investigate and prepare the reports for the disasters, (iii) to collect informations and data in relation to the disasters and (iv) to educate the public for the disaster prevention, etc. However, it cannot be said that a sufficient function necessary for the mentioned activities is provided to INDC. The detailed situation of present activities are presented hereunder.

(a) Organization of Investigation

According with the present law of Civil Defense there exist a unit in the Executive Secretarial which is concerned with the study and evaluation of disaster.

This unit is called "Operaciones" (Operations) In the regional level there also exist an equivalent unit in charge of the same function.

But actually, due to lack of qualified personnel when it happens a disaster, this function is carried out by local authorities and consists mainly of damage evaluation by sectors: Housing Health, Agriculture, etc.

Therefore, there is not an effective investigation of disasters and there are not clear roles for authorities to perform their duties.

(b) Schedule of Investigation

There is not a formal schedule, however, the example case is to be described below.

- When the disaster happens, "first moment" reports (Evaluation of Primary dangers) are sent to the heads of regions or to Lima by Local authorities, usually by the police, the political authority (Prefecto, Sub-Prefecto) or the major of the city or area affected. As stated before, due to the lack of clear roles for evaluation of damage, information is usually contradictory and confusing.

- First moment reports are evaluated by a unit called Emergency Operations Center (E.O.C.) in the head of region or in the Executive Secretarial in Lima (according to the magnitude of disaster).

- Based on the first moment reports, the Lima or Regional Civil Defense organizations send the basic first aid: medical, food and shelter-clothing help.

- There follows a more detailed report by the authorities of the affected place, which is evaluated by the EOC to send more help according to needs.

Sometimes Civil Defense of Lima or Regional heads send engineers or other personnel to evaluate damage, but this is usually carried out in a subjective way without a special methods.

Investigation on the causes of disaster is also ill mode. It is mostly done by Lima and there is not an "in situ" investigation.

Due to lack of resources, Lima can't send experts for more than a few days.

The problem is also more complicated because most of the time the experts do not work with Civil Defense, but with other organizations related to it, and their research is not well utilized.

(c) Method of Investigation

As stated above, damage evaluation is carried out in two phases: first moment reports and intermediate or final reports. Only for the first moment reports there exists a format.

This report should be in the hands of all authorities, but actually this does not happen. The authorities do not have them simply because Lima or Regional headquarters do not send them. Members of authorities change very often and most of authorities are not interested in requesting information, or do not know it exits.

Other problem is that most of authorities lack educational training.

Once the Lima or Regional headquarters have a clear idea of the magnitude of disaster a more detailed report is written by the Operation Unit to inform both the Executive Secretary or to the President of the National Civil Defense Committee.

This report has not a definitive format but it usually has the following parts:

Antecedents

This part consist of the past report about the disaster including location, damage, actions taken by Civil Defense and another information in regards to the emergency.

Situation

Here it states the condition of the emergency at the moment the report is being written.

Conclusions and Recommendations

Finally, in this part of the report, it states the main points which should be taken into an account and the recommendations or advices given to the superior authorities.

4.3 Other Offices

There are many offices in relation to the prevention and emergency activity of disaster.

Though INDC is originally composed of some ministries described in the previous Section 4.2, the other ministries are also more or less related to disaster. Additionally there are many government agencies and offices of which activity is also more or less related to disaster.

The main functions of each ministry office or agency is to be summarized below.

(A) Function of Ministry

(a) Aeronautica (Air Force). Military Air Force

(b) Agricultura y Alimentacion (Agriculture and Food). State planning and evaluation of Agricultural development and food production.

(c) Economia y Finanzas, (Economy and Finances). State planning and control of Economy and monetary policy.

(d) Educacion (Education). State planning and evaluation of Education and culture.

(e) Energia y Minas (Energy and Mining). State planning and Evaluation of Energy development (Electrical, Fuel, etc) and also of large and small scale mining.

(f) Guerra (War). Army Matters.

(g) Industria, Comercio, Turismo e Integracion (Industry, Trade, Tourism and Integration) State planning of Industry (all kinds large and small) also controls trade, mainly foreign trade. Has also the function of planning tourism and finally to develop plans for the economic, social and cultural integration of Latin Countries.

(h) Justicia (Justice). - Justice through different levels of courts. Has also functions related with prisons.

(i) Presidencia (Presidency). - Advise the president. It is concerned mainly with communal activities for poor people and also distributes the budget for the Cordes-Descentralized organizations for the development of the departments.

(j) Presidencia del Consejo de Ministros (Ministries Presidency Council). - Coordinates inter-ministry matters. At present, Civil Defense depends on this sector.

(k) Marina (Navy). - Military Naval Force.

(l) Pesqueria (Fishing). - State planning and Evaluation of fishing for both industrial and direct consumption.

(m) Relaciones Esteriores (Foreign Affairs) Concerned in the conduction of diplomatic matters.

(n) Salud (Health) State planning and evaluation of health.

(o) Trabajo y Promocion Docial (Labour and Social Welfare) Mainly to solve labour conflicts.

(p) Transportes y Comunicaciones (Transports and Communications) Construction and maintenance of roads and railways. It's also concerned with sea and the air traffic. Communications for matters about telex, telegraphs, letters and radio electronics.

(q) Vivienda y Construccion (Housing and Construction) State planning and evaluation of housing construction (mainly private) and construction of building in general.

(r) Interior (Interior) Keep social stability within the country.

(B) Functions of Other Government Offices

(a) Instituto Nacional de Desarrollo, INADE. It was organized primarily for the reconstruction of the areas which were damaged in 1983 in the North of Peru by the Fenomeno del Nino. It's functions are gradually taken over by the National Planning Institute.

(b) Corporacion Departamental de Desarrollo de Lima, CORDELIMA. Planning and implementation of development programmes for the department of Lima. With the new laws it has an autonomous budget.

(c) Corporacion Departamental de Desarrollo del Callao, CORDECALLAO. Planning and implementation of development programs for the Special Status Province of Callao. It has also an autonomous budget.

Note: Budgets are actually hard dispute between the Corporations and City Councils.

(d) Empresa de Electricidad de Lima, ELECTROLIMA. Provides electrical energy to the Lima area.

(e) Instituto del Mar del Peru, IMARPE. Studies internal geodynamic phenomena, physics of the atmosphere and cosmology.

(g) Instituto Geologico, Minero y Metalurgico, INGEMMET. Studies mainly external Geodynamic phenomena.

(h) Instituto Nacional de Administracion Publica, INAP. Plans and control of all matters related to Public Administration.

(i) Instituto Nacional de Planificacion, INP. It is the highest level organization for planning and policy orientation of the Peruvian government.

(j) Oficina Nacional de Evalucion de Recursos Naturales, ONERN. Studies all kinds of natural resources including the potential ones for agriculture, mining, fuel, etc.

(k) Servicio Nacional de Meteorologia e Hidrologia, SENAMHI. Provides information on meteorologic phenomena and water conditions (ocean, river, etc.).

(l) Servicio de Agua Potable y Alcantarillado, SEDAPAL. Provides water for human consumption and sewering facilities.

(m) Cooperacion Popular, COOPOP. It is an organization whose function is to provide human resources to help poor areas. It has an extension program called PAID that through temporary jobs helps in communal general activities.

(n) Inversion Metropolitana, INVERMET. It is an organization which depends on the Lima City Council and orients public inversion in the Lima Metropolitan area.

(o) Direccion de Hidrografia y Navegacion de la Marina, DHINA. Provides information on conditions of oceanic and continental waters for traffic and related purposes.

Figures

Fig. VII-4-1 Organization Chart of INDC

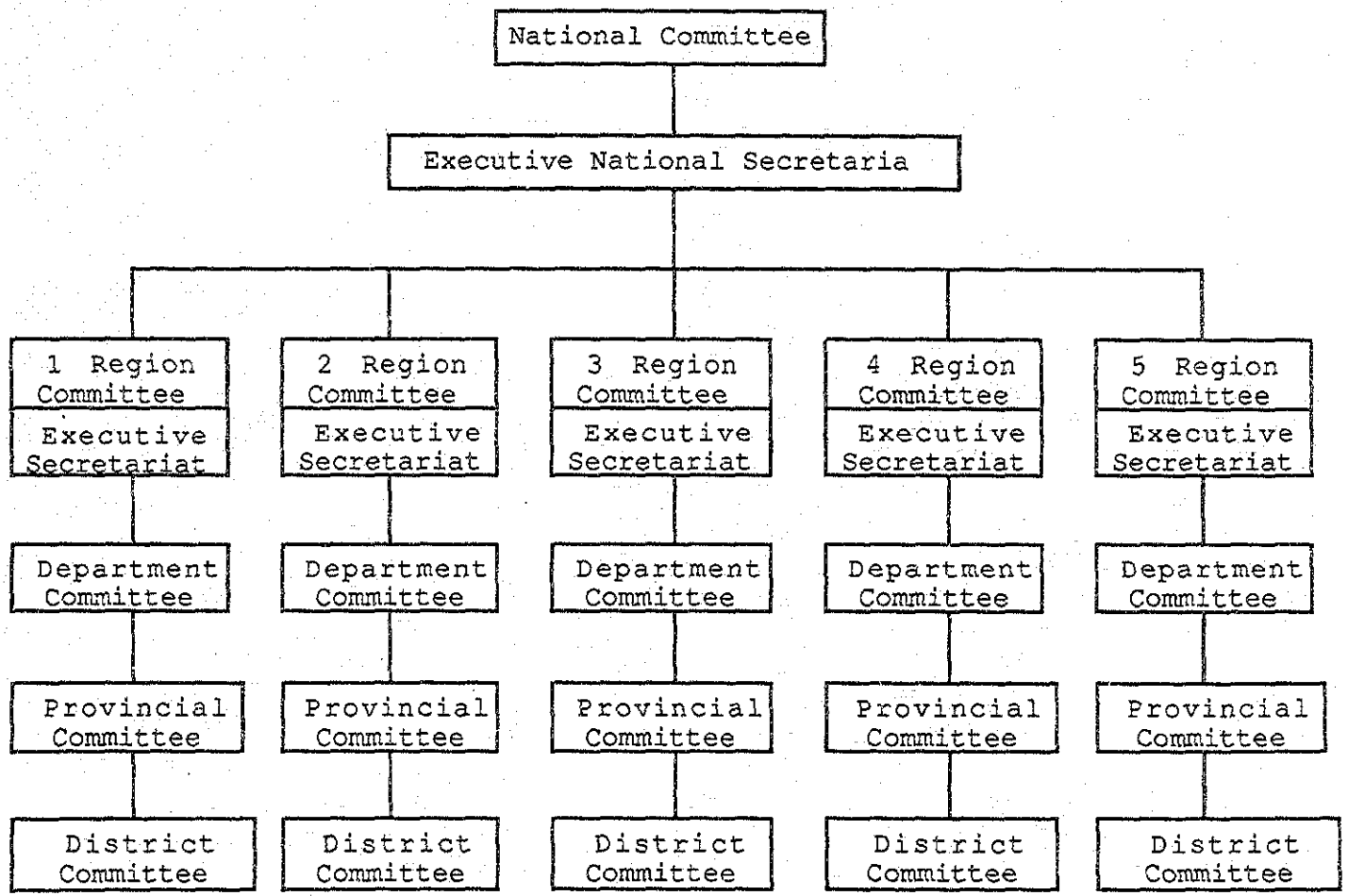
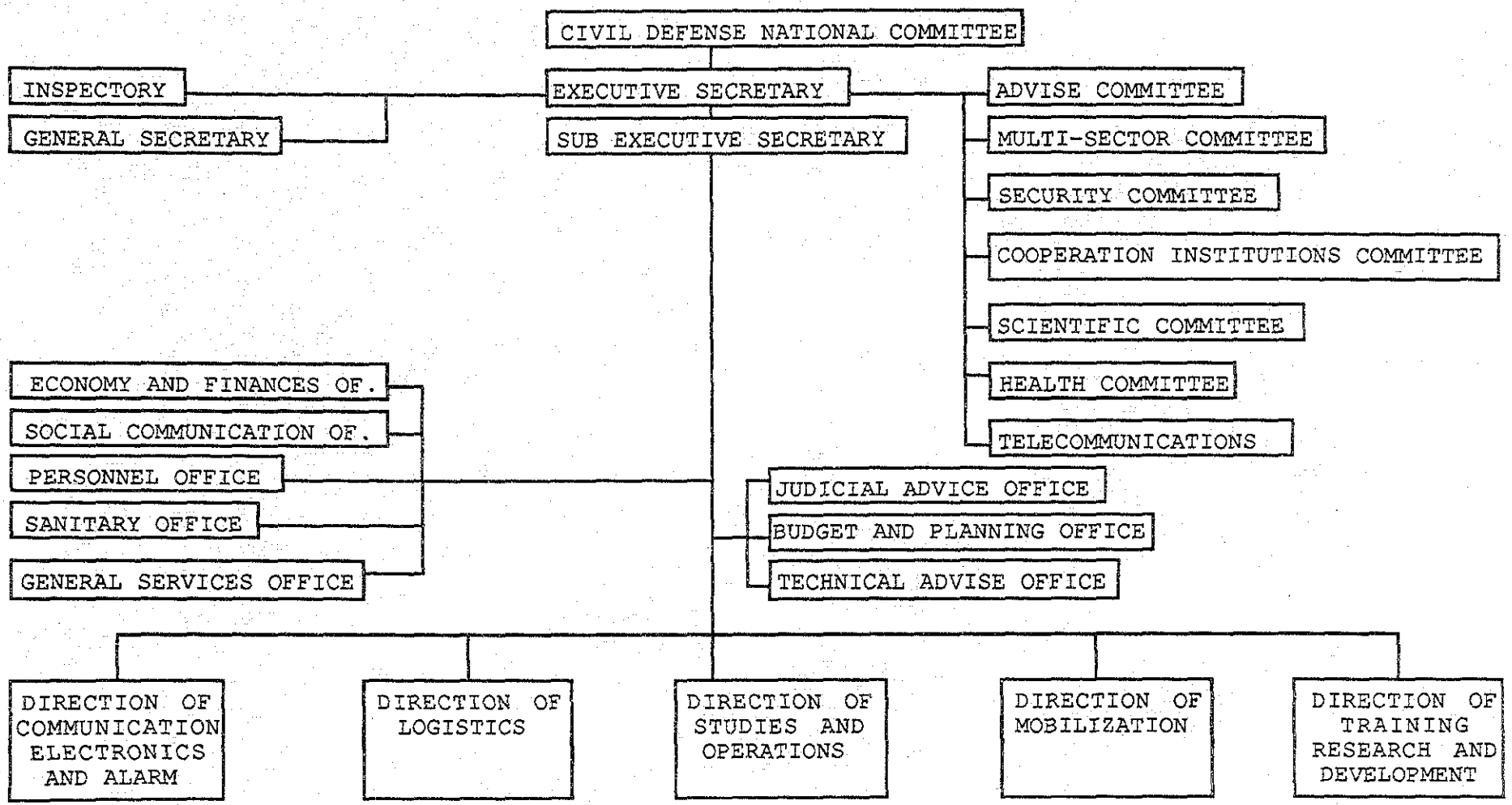
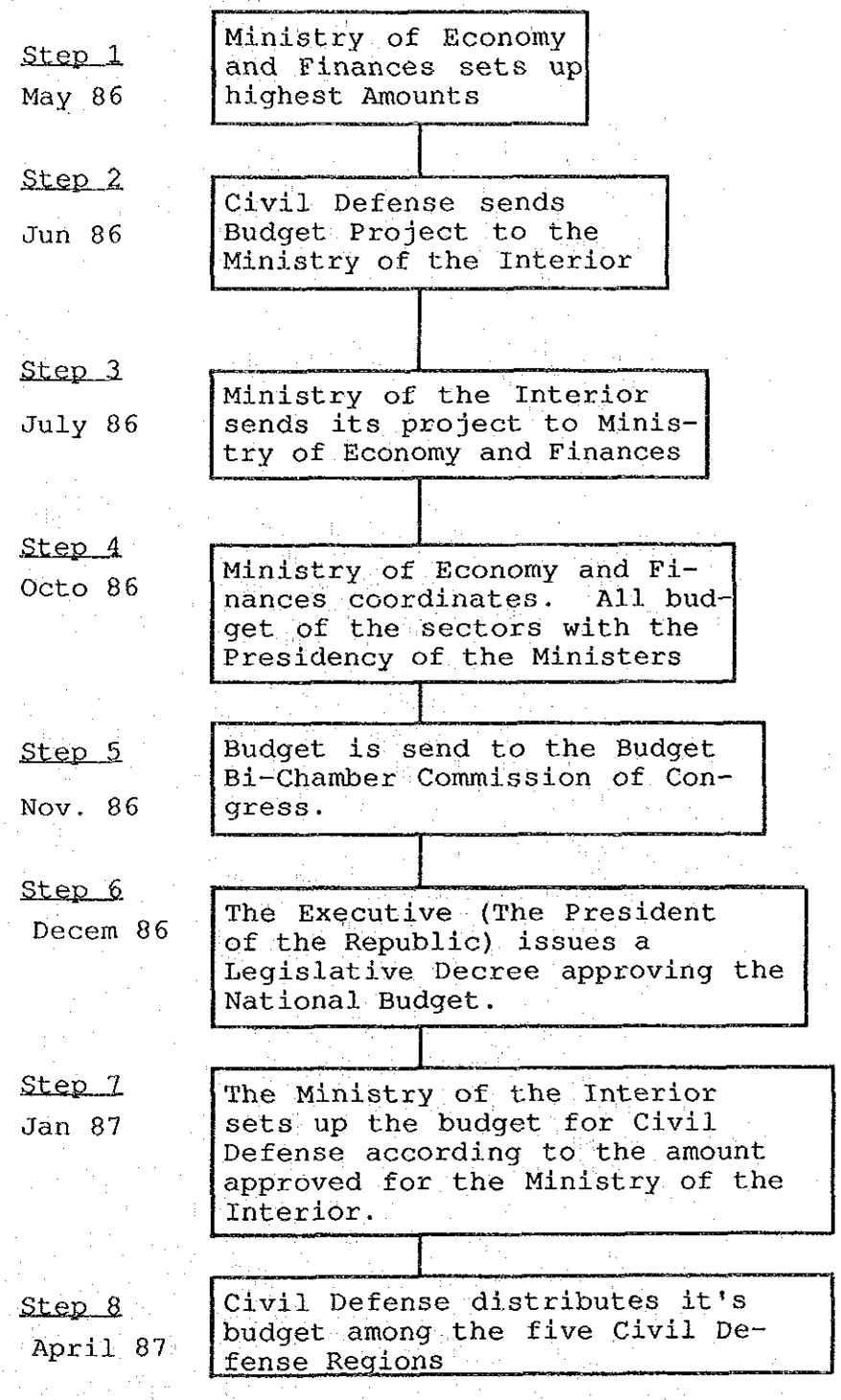


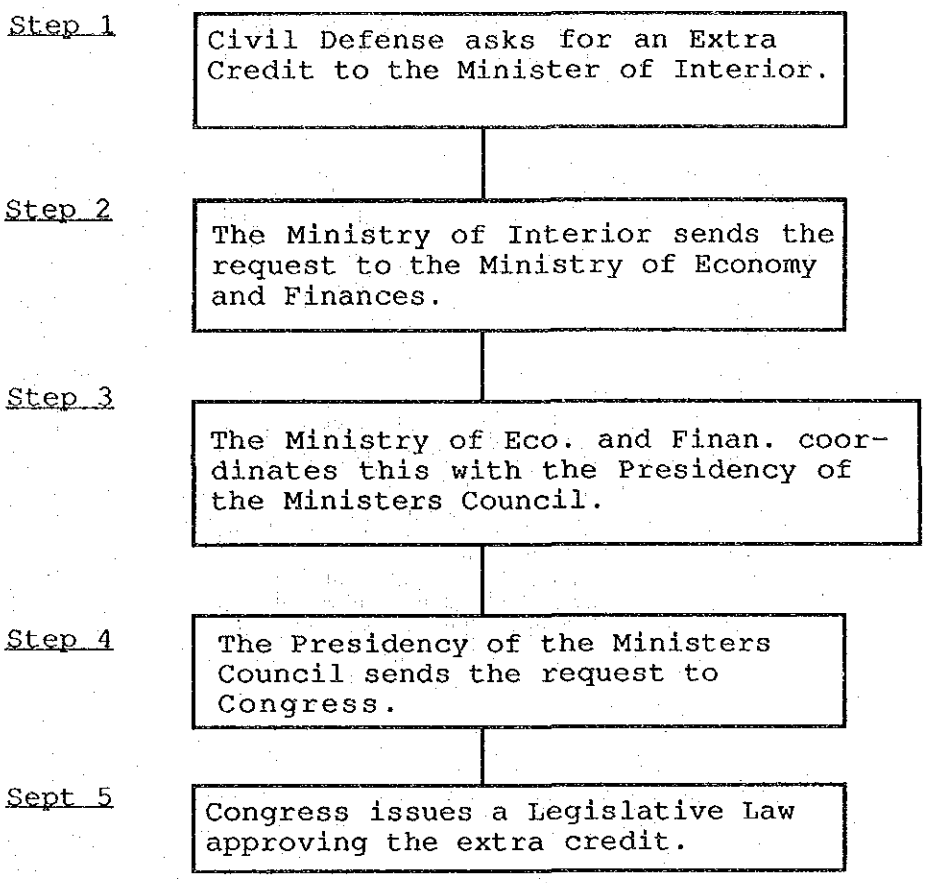
Fig. VII-4-2 Organization Chart of SE/INDC





Note: Probably with the new location of Civil Defense within the Office of the Presidency of the Ministers council; steps 2 and 7 will be jumped up.

Fig. VII-4-3 Flow Chart for Procurement of Ordinary Annual Budget



Note: With new regulations, Civil Defense may ask extra credits directly to the Ministry of Economy and Finances or the Presidency of the Ministers Council itself.

Fig. VII-4-4 Flow Chart for Procurement of Special Budget for Disaster

ANNEX LAWS AND NORMS

There are some laws and norms in regard to the administrative management of rivers and/or disaster. Though the specific contents are to be summarized below.

(A) National and Regional Laws and Norms about Administrative Management of Rivers.

(a) Lay General de Aguas - Decreto Ley 17752
General Law of Waters - Law Decree 17752
This is the most important of all regulation concerned with river matters. It contains specifications on conservation and preservation of the water resources. Also all the administrative requirements for the use of the river water for any purpose, (agriculture, industry, hydroelectric). There is also information about the Water Superior Council which is the highest level committee concerned with the use of water resources.

(b) Decreto Supremo 929-73-AG
Supreme Decree 929-73-AG
It is a complementary rule of the law of water, and is about the river defense and channeling waters. There are also regulations in regard to the use of river marginal areas.

(c) Decreto Ley 14220
Law Decree 14220
States the government general policy for intersectorial planning and use of the water resources, with the participation of the ONERN (National Office for the Evaluation of Natural Resources), SENAMHI, Agriculture Ministry, Health Ministry, and Housing Ministry.

(d) Reglamento de Organizacion de Usuarios de Agua
Decreto Supremo 005-79-AA
Regulations about Water Users Organization,
Suprem Decree 005-79-AA
Contains rules for the organization of committees of water users, mainly for agriculture purposes. Also their duties in the maintenance of the existing hydraulic works.

(e) Reglamento de Otorgamiento De Tierras Eriaas y de Aguas para Irrigaciones.
Decreto Supremo 019-84-AG
Regulations on the Granting of arid lands and irrigation water
Suprem Decree 019-84-AG
These regulations are about the granting of arid lands and water for private project of integral delopment.

(f) Ley de Promocion y Desarrollo Agrario
Decreto Legislativo No. 2
Law of Agrarian Promotion and Development
Legislative Decree No. 2
It states the duties of the Agriculture Ministry with regards to basin rivers protection in collaboration with Users Committees of different districts.

(g) Ley de Industria Electrica 12378
Laws of Electrical Industry 12378
This law regulates the use of the river water for the provision of electrical power.

(h) Ley de Reforma Agraria, Decreto Ley 17716
Law of Agrarian Reform, Law Decree 17716
Contains rules concerning the use of river water for agrarian reform purposes.

(B) Disaster Laws and Norms about Administrative Management of Disaster.

Most of the regulation about disasters in general are included in each one of organic laws of the institutions which belong to the Civil Defense System. It should be stated, however, that with the implementation of coordinating system between agencies, these organizations are gradually taking a bigger share of responsibilities that Civil Defense and the Ministry used to have in the past.

However, the present laws and norms are not sufficiently functional. For example, no control seems to be performed for the following conditions.

(a) People living along the river dump rubbish and waste into the river from the river banks or the bridges.

(b) There are many houses in flood channel where no house were identified some years ago.

(c) The parapet walls constructed by the inhabitant without any plan by the government make narrow the river channel width.

(d) Specially in Lima, heaps of earth and rubbish on a comparatively large scale are made inside of the river channel.

(e) Though the new road is under construction along the river, excavated materials are generally thrown or piled in the river or on the river bank without compaction.

(f) People who have no land build their houses on the slope of mountain or valley where the disaster tends to occur due to the heavy rainfall or earthquake.

(g) Mines located in the upstream areas often throw the mining disposal to the river without any treatment.

APPENDIX VIII

CONDITIONS FOR PROJECT COST ESTIMATE

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APPENDIX VIII

CONDITIONS FOR PROJECT COST ESTIMATE

1. General

The formulation of master plan needs an economic evaluation on the conceivable alternative plans, requiring the estimate of economic project cost on them.

The economic project cost will be estimated on the basis of the unit construction cost: that is, the construction cost will be estimated, multiplying the unit construction cost by the work quantity to be estimated based on the preliminary design.

This section presents the estimate of the above unit construction cost as well as the basic conditions and assumptions for the estimate of economic project cost.

2. Basic Conditions and Assumptions for Cost Estimate

2.1 Composition of Economic Project cost

The economic project cost will be composed of the costs for the preparatory works, main civil works, mechanical works (if any), compensation, engineering and administration, and physical contingency.

The preparatory works comprise the costs for,

(a) Temporary construction plans and equipment,
(b) Temporary power and water supply system for the construction work,
(c) Offices and camps,
(d) Stores, workshop and laboratory, etc.

The cost for the preparatory works is approximately proportional to the scale of main civil works, and thus, will be estimated at a certain percentage of the main civil work cost referring to the past similar projects.

The main civil works consist of the work items such as;

(a) Excavation,
(b) Embankment,
(c) Backfilling,
(d) Concreting,
(e) Wet Masonry,
(f) Gabion and so on.

Each of the above work items includes the cost items such as,

(a) Labour cost,
(b) Material cost,
(c) Machinery operation cost (Fuel cost),
(d) Equipment cost (Depreciation and repair cost), and
(e) Contractor's general expense.

The unit construction cost will be established for each work item of the main civil works, analysing the labour cost, material cost, machinery operation cost, equipment cost and contractor's general expense per a unit work quantity.

The mechanical work includes such works as the installation of gates and pipes, etc. The cost will be estimated by establishing the unit installation cost per ton based on the past similar works experienced in Peru.

The compensation cost is the necessary expense for the compensation of land acquisition and removal of residential houses. The compensation cost will also be assessed by establishing the unit cost per house or square meter.

The engineering and administration cost includes the costs necessary for the engineering services such as the design, preparation of tender documents and supervision of construction works, etc., and the government's administration. This cost is generally proportional to the cost for preparatory works, main civil works, mechanical work and compensation, and therefore, will be estimated at a proper percentage of the sum of the above items.

The economic project cost takes into account the physical contingency for uncertainties involved in the cost estimate. The physical contingency will be taken at 15 to 20% in consideration of the accuracy in the cost estimate at the master plan study stage.

The economic project cost does not include the costs such as the tax, price escalation (price contingency) and interest during construction, which the financial project cost will take into consideration. It is noted that the master plan study does not consider the financial project cost. The financial evaluation in the feasibility study stage, which will analyse the financial balance of an executive agency to be determined in the later stage, will require the financial project cost.

2.2 Basic Conditions of Cost Estimate

The basic conditions and assumptions applied for the cost estimate are presented below:

(a) The cost will be estimated at the price level in June 1987.

(b) The construction work will be carried out by the contractors to be selected through an international competitive bidding.

(c) The engineering service is assumed to be performed by a selected foreign consulting firm.

(d) The construction work will be made at the maximum use of the local source. Then, it is assumed that all requirements are locally available except the construction equipment and special steels such as H-beams, I-beams or channels, which are required to be imported.

(e) The exchange rate to be applied will be the prevailing exchange rate as of June, 1987 as follows:
US$ 1.0 = Yen 145 = Inti 30

(f) The labour wages as shown in Table VIII-2-1, which are based on the investigation result in June 1987, will be applied for the labour cost.

(g) The material and fuel prices as shown in Table VIII-2-2, which are based on the market prices investigated in June 1987, will be applied for the estimate of material and machinery operation costs.

(h) The equipment cost will consist of the depreciation cost, maintenance of repair cost and management cost of the equipment.

The equipment cost to be applied in the cost estimate is given in Table VIII-2-3 which is based on the market prices of equipment in Japan as of June 1987.

In the above equipment cost, the depreciation cost is taken at 90% of CIF price, assuming a salvage value of 10%. The maintenance, repair and management cost is taken at 100% of CIF price in accordance with the usual practice.

2.3 Estimate of Unit Construction Cost

Table VIII-2-4 presents the unit construction cost estimated for the respective work item based on the conditions and assumptions explained in the preceding section.

Tables

Table VIII-2-1 LABOUR UNIT PRICE

No.	Labour	Unit	Wage (INTI)
1.	Foreman A	M/day	230-
2.	Foreman B	M/day	210-
3.	Operator A	M/day	254-
4.	Operator B	M/day	230-
5.	Mechanic	M/day	254-
6.	Electrician	M/day	223-
7.	Driver	M/day	210-
8.	Welder	M/day	210-
9.	Miner	M/day	205-
10.	Steel worker	M/day	205-
11.	Concrete worker	M/day	200-
12.	Carpenter	M/day	210-
13.	Plaster	M/day	205-
14.	Mason	M/day	205-
15.	Common labour	M/day	200-

Note: Tax and allowance are not included

Table VIII-2-2 MATERIAL UNIT PRICE

No.	Description	Unit	Unit Price (INTI)
1.	Reinforcement bar 6 mm	ton	8,200
	9 mm	"	8,100
	12 mm	"	8,000
	16 mm	"	7,900
	25 mm	"	7,900
	35 mm	"	7,900
2.	Cement	ton	2,800
3.	Timber and plank	m^3	8,500
4.	Gasoline	G	21
5.	Diesel oil	G	15
6.	Dynamite	kg	180
7.	Structure steel	ton	25,700
8.	Brick (25 x 12 x 15 cm)	Unit	10
9.	Block (15 x 10 x 40 cm)	pc	30
10.	Asphalt	t	2,400
11.	COARSE AGGREGATE 1/2"	m^3	480
	1/4"	m^3	480
	3/4"	m^3	430
	2"	m^3	450
12.	FINE AGGREGATE	m^3	210
13.	COBBLE STONE	m^3	450
14.	Residential house		
	upper class	m^2	10,000
	middle class	m^2	5,000
	lower class	m^2	2,000
15.	Market facility	m^2	4,000
16.	School	m^2	5,000
17.	Government office	m^2	7,000
18.	Factory	m^2	5,000
19.	Commercial building	m^2	8,000

Table VIII-2-3 EQUIPMENT UNIT PRICE

No.	Description	Capacity	Unit	Unit Price (INTI)
1.	Pick up	80 Hp 1t	I/h	107
2.	Compressor	76 Hp 2t	I/h	200
3.	Payloader	110 Hp 16t	I/h	774
4.	Dragline	110 Hp 23t	I/h	1,120
5.	Bulldozer	75 Hp 9t	I/h	430
6.	Bulldozer	140 Hp 15t	I/h	701
7.	Bulldozer	240 Hp 20t	I/h	1,000
8.	Bulldozer	470 Hp 52t	I/h	1,970
9.	Tractor shovel	200 Hp 20t	I/h	1,015
10.	Tractor shovel	550 Hp 46t	I/h	2,200
11.	Vibrator	4 Hp	I/h	47
12.	Compactor	4 Hp	I/h	55
13.	Compactor	7 Hp	I/h	97
14.	Rller (Tank)	101 Hp 10t	I/h	460
15.	Roller (Tire)	80 Hp 5t	I/h	315
16.	Mixer (Concrete)	10 Hp 2t	I/h	56
17.	Grader	120 Hp 9t	I/h	510
18.	Belt conveyer		I/h	155
19.	Generator	75 kW 1.5t	I/h	68
20.	Pump	5 Hp 3"	I/h	20
21.	Pump	17 Hp 6"	I/h	69
22.	Agitater track	300 Hp 6 m^3	I/h	535
23.	Trailer	330 Hp 35t	I/h	535
24.	Dump track	140 Hp 4 m^3	I/h	274

Table VIII-2-4 UNIT CONSTRUCTION COST OF WORKS (1/2)

	Work Iterm	Unit	Unit rate
1.	Excavation		
1.1	Rock/Boulders	m^3	215- (7.2)
1.2	Common	m^3	110- (4.0)
2.	Concrete		
2.1	Plain concrete	m^3	2,400- (80)
2.2	Reinforced concrete		
2.2.1	R.B., 0 - 20 kg/m^3	m^3	2,500- (83)
2.2.2	R.B., 20 - 40 kg/m^3	m^3	2,700- (90)
2.2.3	R.B., 40 - 60 kg/m^3	m^3	2,900- (96.7)
2.2.4	R.B., 60 kg/m^3 up	m^3	3,000- (100)
2.2	Rubble concrete	m^3	1,350- (45)
3.	Revetment		
3.1	Concrete revetment	m^2	700- (23.3)
3.2	Wet masonry	m^2	650- 922)
3.3	Gabion	m^2	300- (10)
3.4	Concrete pitching (20 x 20 x 40)	m^2	800- (26.7)
4.	Backfill		
4.1	Gravel	m^3	215- (7.2)
4.2	Randam	m^3	110- (3.7)
5.	Gabion (3 x 1.5 x 0.5 m)	pc	600- (20)
	(2 x 1.0 x 0.3 m)	pc	300- (10)
6.	Dike		
6.1	Earth dike	m^3	625- (20.8)
6.2	Earth dike + concrete	m^3	1,525- (50.8)
6.3	Earth dike + wet masonry	m^3	1,275- (42.5)
6.4	Earth dike + gabion	m^3	1,225- (40.8)
6.5	Earth dike + concrete pitching	m^3	1,275- (42.5)
7.	Gate (1.2 m x 1.2 m)	set	345,725- (11,524)
8.	Pipe		
8.1	Concrete (ø3,000 m)	m	36,700- (1,223)
	(ø2,000 m)	m	16,000- (533)
	(ø 900 m)	m	4,300- (143)
8.2	Colgate pipe (ø1,500 mm)	m	15,600- (520)

Table VIII-2-4 UNIT CONSTRUCTION COST OF WORKS (2/2)

9.	Bridge			
	9.1	Concrete bridge (W:8 m)	m^2	34,800- (1,160)
	9.2	Steel bridge (W:8 m)	m^2	49,500- (1,650)
10.	Road			
	10.1	Paved road (t:2 m W:8 m)	m^2	660- (22)
	10.2	Metalling road (t;2 m W:8 m)	m^2	470- (15.7)
11.	Ground Sill/Sand Arresting		m^3	3,900- (130)
12.	Groyne			
	12.1	Concrete groin	m^3	2,515- (83.8)
	12.2	Gabion groyne	m^3	1,220- (40.7)
13.	Rockshed Tunnel		m	127,100- (4,236.7)
14.	Building			
	14.1	Residential house		
		upper class	m^2	10,000- (333)
		middle class	m^2	5,000- (167)
		lower class	m^2	2,000- (67)
	14.2	Market facility	m^2	4,000- (133)
	14.3	School	m^2	5,000- (166)
	14.4	Government office	m^2	7,000- (233)
	14.5	Factory	m^2	5,000- (166)
	14.6	Commercial building	m^2	8,000- (266)

APPENDIX IX

SOCIO-ECONOMIC CONDITIONS

APPENDIX IX SOCIO-ECONOMIC CONDITIONS

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APPENDIX IX
SOCIO-ECONOMIC CONDITIONS

1. INTRODUCTION

The socio-economic study focuses on general description of socio-economy of the nation and the Rimac river basin. The contents of this chapter are introduced as follows:

(1) National socio-economy

- Natural condition
- Population and labour force
- Macro-economic conditions

(2) Basin's socio-economy

- Administrative division
- Geographic conditions
- Social conditions
- Economic conditions

Although contents of national socio-economy in the Interim Report are the same as those in the Progress Report, contents concerning to basin's economy are rearranged since additional data were collected.

2. NATIONAL SOCIO-ECONOMY

2.1 Natural Conditions

The country of Peru has its clear geographic categories which are classified into three zones, namely: Costa, Sierra and Selva.

Costa bounded by coastal line and the Andes Mountains is basically low-lying like long corridor having its length of about 2,000 km from the North to the South. Although Costa belongs to the temperate Zone, average temperature is around 18°C due to a cold current called CORRIENTE DE HUMBOLDT. Many rivers having their sources on the Andes Mountains penetrate Costa with the fast-flowing stream and debouch into the Pacific Ocean. Rivers are not generally endowed with abundant surface water. Despite its areal ratio of about 12%, more than 50% of population settles down Costa, in particular around Lima City with rapid urbanization.

Sierra is the Andes Mountains area consisting of a series of high mountains. The climate nature is divided into two seasons, namely, rainy season in summer and dry in winter depending on the altitude. Most of land still remains to be under developed. Sierra is basically endowed with mineral and water resources. Potentiality of Hydropower is so high.

Selva is an extensive forest area spreading the Amazon river basin. Its climate has a typical tropical nature with much of precipitation. Selva having high elevation near the Andes is generally called Selva Alta where potentiality of developing agriculture is high due to good soil and drainage conditions.

The detailed land use by Costa, Sierra and Selva is shown in Table IX-2-1. In general, forest is dominant occupying about 66% of total land, whereas farm land is only 3%. Land use by geographic categories is explained in such that more than 50% of farm land and most of grass land concentrates on Sierra and about 97% of forest is identified in Selva.

2.2 Population and Labour Force

Population in the Census Year 1981 is demonstrated in the form of geographic and administrative demography in Table IX-2-2 and IX-2-3 respectively. Geographic distribution of population shows that about 51% of total population concentrated on Costa, followed by 41% of Sierra, and 8% of Selva. The classification into urban and rural population by geographic category indicates that 67% of urban population was identified in Costa while Sierra occupied 68% of rural population. From the viewpoint of geographic population by urban and rural category, about 85% of population in Costa concentrates on urban area, while population in Sierra and Selva is almost evenly distributed into urban and rural area.

The remarkable feature of administrative demography is shown in Table IX-2-3 by contrasting Metropolitan Lima with other area. About 28% of total population settle down in Callao and Lima city with its areal ratio of only 0.3% of total land. Consequently, the difference of population density is outstanding between Metropolitan area and other by showing 1,197 person/Km^2 in the former and only 10 person/Km^2 in the latter. Annual growth rate of population between 1972 and 1981 was 3.8% and 2.2% in Metropolitan and other area respectively.

As shown in Table IX-2-4, statistics of labour force is presented as economically active whose age group is more than 15 years old. Agriculture was still the leading sector consisting of about 40% of total economically active population, followed by service, commerce and manufacturing in order. Like other developing countries, labour force of Peru is characterized by working people in informal sector. However, this type of labour is not clearly shown in statistical data.

2.3 Macro-Economic Conditions

2.3.1 Recent Economic Performance

Recent economic structure of Peru during last sever years in shown in Table IX-2-5 describing supply and demand of economy. Economy of supple side indicated that the ratio of import to GDP fluctuated from 16% in 1984 to 27% in 1982. From the viewpoint of demand side, Peru has almost its consumption-oriented economy. The ratio of consumption to total demand has been around 55%. The export/GDP ratio has kept its steady rate around 23%. As shown in Table IX-2-6, export items are almost dominated by primary products such as mineral resources and agricultural materials. The leading export items expressed by US value has been petroleum products, followed by mineral resources like copper, lead, silver and agricultural products such as wheat and coffee. Non traditional exports still plays a negligible part of exports.

For economic performance of Peru, 1983 was marked by a severe recession accompanied by a sharp acceleration in inflation. Real gross domestic products (GDP) fell 12% while consumer price climbed 110% between December 1982 and 1983.

"Economic and Social Progress in Latin America" issued by IADB reports the Peruvian economy of 1983 in the following way:

Adverse climatic factors affected overall economic sectors. Agricultural production and fisheries' output dropped remarkably. Changes in ocean current temperature affected the output of the fisheries sector, and rainfall led to floods that ruined crops in the north of the country. Oil production was lower than previous year. This lower output was due to flood and landslide damage to the northern Peru pipeline.

Although to what extent disaster caused by adverse climate affected the Peruvian economy was not clear, the shortage of consumer goods caused by disasters coupled with the government control of import demand pushed up inflation rate. Consequently, purchasing power of wages declined, and real private consumption dropped by 10% in 1983.

2.3.2 Economic Sectors

(1) Agricultural Sector

The type of agricultural activity and kinds of farms products are clearly different by geographic categories, Costa, Sierra and Selva.

Since Costa belongs to arid or semi-arid climatic zone, farm land is not producible without irrigation system. A substantial funds for agricultural development has been invested for construction of irrigation facilities in order to reform desert into usable farm land. Production of cash crops has been developed in the form of plantation agriculture. As far as food crops are concerned, rice, maize and sweet potatoes are mainly produced in Costa as shown in Table IX-2-7.

Sierra is still featured by a traditional farm activity which is traced back to pre-Spanish colonial age. Most of farm houses featuring self-sufficiency produce cereal which is typical of the temperature zone. Food crops are principally barley and potato in Sierra. Most of farm land prevails in basins or valleys between the West and the East Andes.

As mentioned in 2.1, farm land in Selva are mainly identified in Selva Alta where natural conditions for agricultural production is favorable in terms of soil and drainage. Paddy is planted in rainfed field where appropriate level of precipitation is suitable for rice.

(2) Manufacturing

The government policy of promoting manufacturing industry has been based on import-substitution. Although GDP by manufacturing industry attained high sectoral growth rate in the past, its recent performance got stagnated. The recession in external economy slowed down development of manufacturing sector, and policy of import-substitution has been also a major bottleneck.

The government almost failed to switch from the first import-substitution to export-substitution in the past. Non-durable consumer goods which was major target of the first import-substitution must have been exported the next stage. As a matter of fact, the government policy jumped from the first to the second import-substitution represented by durable consumer or capital goods. Consequently, Peru has continuously faced with the chronic problem of deficient earnings of foreign exchange. Another problem can be also recognized in such that internal economy has not been so developed as to absorb capital-intensive goods.

As shown in Table IX-2-8, a sector share of food and drink dropped from 36% to 24% between 1970-1981, however it was still the leading sector in 1981. The marked features is that sectors of chemical and metal process increased their share during last decade.

2.3.3 Government Budget and Debt Issues

Budget and debt issues are closely interrelated with movement of the Peruvian macro-economy and government policy. The former Belaunde regime launched open economic policy, in particular by emphasizing trade liberalization. As a result, An increase of import and export stagnation due to economic recession of outside world, coupled with augmented repayment of debt worsened balance of payment in 1981.

1983 is the outstanding year when budget deficit increased up to 2,350 million intis because public-oriented investment was required for recovering damaged economic sectors.

Unfavorable balance of payment position in 1981 led to an increase of total debt. Debt service consisting of interest and amortization also argued in 1981. Although Debt service ratio declined down to 26% in 1983 due to reschedule of repayment condition, total debt was reported to increase up to 12,630 million US$. Macro-economic indicators relating to budget and debt is shown in Table IX-2-9.

3. BASIN'S SOCIO-ECONOMY

3.1 Administrative Division

The Peruvian standard of classifying administrative division is based on Departomentos, Provincias, Districtos, and a special Provincia Constitucional. Administratively, the Rimac river basin is identified in Provincias Constitutional Callao, and Departmentos Lima. To be more precise, administrative units of province relating to the said basin are Callao, and Province of Lima and Huarochiri within Departmentos Lima. The reason for designating Callao as special Provincias Constitucional is historically traced back to geographical importance of Callao for defensing Peru from colonial age governed by Spain. Province Lima locating in the center of Peru is Lima city where authorities of the government are concentrated on.

In the level of district, the Rimac river basin covers the whole districts in Callao, central part of them in Lima city, and the northern part of them in Province Huarochiri, which is shown in Fig. IX-3-1.

Although the basin's boundary is not the same as administrative one of the said three Province, socio-economic study will be principally made at Province level due to the difficulty of breaking down some of socio-economic data by district.

3.2 Geographic Conditions

The Rimac river basin having its catchment area of about 3,500 km2 is located in the central parts of Peru. The basin has its marked geographic patterns whose respective characteristics are represented by Costa consisting of Callao and Lima city, and Sierra covering the rest of basin area where corresponds to the northern part of Huarochiri.

In Costa area where coastal line faces with the Pacific Ocean, average temperature is around 18°C due to a cold current called CORRIENTE DE HUMBOLDT. Capital city of Lima which was independent of Spain in 1821 has its own history over five centuries since colonial age of Spain. The Lima city where used to be gentle and European type of town experienced the growing population pressure due to many migrants from area outside Lima city. Callao which is the second largest city in terms of population is well-known for its port for trade and fisheries. Lima and Callao taking the form of metropolitan area is characterized by economic and political center of Peru.

The northern part of Province Huarochiri categorized as Sierra geographically is characterized by mountainous area with elevation ranging from 1,000 to 5,000 m. Arid mountains featured by sterile soil are identified in the middle part of the basin area. In the northern part of the basin, an extensive area of wet mountains with prairies is identified, whereas

mountainous area with glacier favoured by much of precipitation is extended in the north-east part of the basin. Although Sierra part of the basin area is not basically endowed with fertile sail condition, resulting in poor agricultural products, farm land assisted by traditional water canals has been developed on the steep slope of hilly area along the Rimac river.

3.3 Social Conditions

3.3.1 Population

Administrative demography shown in Table IX-3-1 has a noticeable point. Metropolitan area of Callao and Lima form a striking contrast to province of Huarochiri. About 26% of the country's total population concentrated on metropolitan area of only 3,850 km2. As a result, population density in the Census year of 1981 is the most marked contrast between metropolitan area and Province Huarochiri. Density in Lima and Callao was more than 1,000 person/km2 while Huarochiri had only negligible density record of 14 person/km2 in 1981.

Annual growth rate of population in metropolitan area was more than 3.5 per cent compared to 1.8 per cent of Huarochiri for the period between 1972 and 1981. In Peru social movement of population into metropolitan area from the rest of Peru has been outstanding. According to the Census statistics of 1981, total number of migrants into metropolitan area between 1976 and 1981 was recorded at 405,863. Since the number of population increased for the period from 1972 to 1981 was 1,305,487 in metropolitan area, about 60% of increased population during the said period is attributed to migrants assuming that the number of migrants during 1972-1981 was around 800,000 which is almost double of recorded migrants during 1976-1981.

Migration into metropolitan area has been accelerated due to land reform and caused a social problem like Pueble Joven forming slum settlement in illegally occupied area. Although the increase of population during last decade was negligibly small in the Huarochiri, its argument is identified in small cities like Chosica and Matucana.

As shown in Table IX-3-2, distribution of houses by family size is presented by contrasting Lima city with Huarochiri. The number of houses whose family size was more than 6 persons in Lima city was recorded at around 308,880. This number corresponds to about 37% of total houses in Lima, while the same ratio was about 27% in Huarochiri. High percentage of houses with large family size in Lima city is partly explained by urban poor houses in settlement area called Peublo Joven. It is assumed that many youths seeking for job opportunities tend to settle down relatives' houses, resulting in large family size in these area.

As shown in Table IX-3-3, age group between 15 and 49 is considered to be the most core economically active population. Percentage of demographic distribution of age group between 15 and 49 has the marked difference between Lima city and Huarochiri. The proportion of the above age group was about 54% in Lima city, whereas the same ratio of Huarochiri was 43%. As stated before, it is presumed that there has been a trend of young generation to seek for jobs in urban area.

3.3.2 Labour Force

Economically active population by sector has also a remarkable contrast between metropolitan area and Huarochiri. Metropolitan Lima and Callao has a considerable number of labour force in secondary and tertiary sectors while Huarochiri still had economic activities on agricultural and mining sectors.

Historical change of labour force composition between 1972 and 1981 is negligibly small in metropolitan area, whereas labour force portion shared by agriculture between 1972 and 1981 dropped from 58% to 47% in Huarochiri. The decreased portion of agricultural labour force was compensated by mining, service and commerce sectors. Data on economically active population by sector is shown in Table IX-3-4.

3.3.3 Social Conditions of Inhabitants in the Basin

A major social concern is improvement of social environment surrounding human life and activity. Table IX-3-5 shows social conditions of inhabitants expressed by housing and utility services in order to make clear the level of social circumstances by district in Lima city and Huarochiri. Statistical data demonstrates general viewpoint that social conditions of residents are different in between metropolitan and peripheral area.

Like other developing countries, Peru has also faced with the growing urban population. It is understandable that the lack of houses has been a major social concern in metropolitan area by contrasting the number of existing families with that of available houses. The problem of homeless family is identified in every district of Lima city. Insufficient level of house construction is closely related to the expanding migrants who tend to form new settlement area called P. Joven. The rapid growth of urban migration makes it difficult to solve housing matter.

In the Census year of 1981, the number of houses categorized as P. Joven turned out to be about 23% of total number of houses in Lima city. Districts where the number of P. Joven exceeds over ten thousand are situated in central part of Lima city. Name of them are Chorrillos, Rimac, Comas, San Juan de Mira flores and so on. Although supply of electricity service was in fairly good condition, water supply and sewerage system were not in satisfactory condition in several districts. The number of district where service ratio of water supply and

sewerage system was less than 60% is nine. Most of them belongs to area surrounding central Lima city. The Rimac river crosses over some of districts where many of slum settlement scatters along the river side.

Major problem of slum area are the deterioration of sanitary condition. Insufficient level of sewerage and drainage system, and a pile of refuse left near settlement area worsened sanitary condition. Dumping of refuse into the river deteriorates not only environmental conditions, but also river condition by reducing flow capacity.

As far as social conditions of inhabitants in the northern Huarochiri are concerned, the lack of houses identified in metropolitan area is not observable. Most of local people dwells in poor quality of houses which are made of wood or adobe. These construction material are easily obtainable so that individual houses are almost self-made ones. Nonetheless, many houses are identified on the steep slope of hilly side or on a alluvial fan where debris flow tends to damage or destroy houses devastatingly once a torrential rainfall breaks out. In this respect, human life of inhabitants in those area faces with high probability of danger at disastrous time.

The coverage of utility services such as electricity and water supply is not in satisfactory condition. Houses at which utility services are not supplied still rely on kerosene and wood for energy, and ground water for drinking or washing. Social conditions of inhabitants in the northern Huarochiri is shown in Table IX-3-6.

3.4 Economic Conditions

3.4.1 Income Level

Since statistical data on gross domestic regional product is arranged by department, income level in the study area is analysed by using data on GRDP and population of Lima and Callao departomentos relating to the Rimac river basin. Income level indicator expressed by comparison of per capita GDP to per capita GRDP is shown in Table IX-3-7. Per capita in departomentos of Lima and Callao has been 1.7 times as per capita GDP. This difference can be explained by sharp contrast of economy between nation and the said departomentos. One reason is high concentration of economy in Lima and Callao on secondary and tertiary sectors with higher productivity than in traditional sector. The other is the existence of informal sectors which provide poor urban workers with additional wage. In this respect, workers whose wage is in the minimum level have plenty of opportunities to work in informal sectors. Considering these circumstances, the higher average income level in Lima and Callao area than national average can be understandable.

3.4.2 Recent Economic Performance

Since data on GRDP is based on departomentos, economic performance of province relating to the basin can not be analysed. However, by contrasting economically active population in province Lima and department Lima shown in Table IX-3-8, it is clear that labour force of secondary and tertiary sectors in province Lima (Lima city) constitutes more than 90% of labour force of Lima department. Besides, most of fishery and mining activities concentrates on province Callao and Huarochiri respectively. As a result, it is assumed that the value of GRDP in Lima-Callao department is approximate to GRDP in Province relating to the basin, except for GRDP of agriculture.

Table IX-3-9 shows that recent GRDP of Lima-Callao departomentos has kept its steady growth rate of about 4% between 1979 and 1982. 1983 was marked by a sharp recession. GRDP fell about 13% while consumer price index climbed more than double in 1983. The accelerated inflation hit overall economic sectors.

Manufacturing was the hardest hit sector whose GRDP dropped by about 19%. The value of reduced GRDP was approximately 100 million Intis at 1979 constant price, and GRDP share by its sector in 1983 was 416 million Intis which was lower than in 1979. GRDP of commerce and service sectors also fell about 14%. GRDP of two sectors were lower or equivalent to GRDP in 1979. In other words, regional economy was almost traced back to 1979 level.

Regional economic structure in terms of GRDP share by sector has not changed so much during 6 years between 1979 and 1984. Since metropolitan area consisting of province of Lima and Callao is a major load center of consumption and production, the secondary and tertiary sectors constitutes more than 90% of GRDP. It goes without saying that most of economic activities relating to above sectors concentrate on metropolitan area. Table IX-3-10 shows historical trend of GRDP share by sector in Lima and Callao departomentos.

3.5 Economic Sectors

3.5.1 Mining Sectors

Province Huarochiri is well-known for production of mineral resources and an enormous amount of their deposits. Potential deposits of such mineral resources as galena, lead and copper are already identified in igneous rocks. Aqueous rocks depositing around San Mateo are enriched with silver which has been prospected. Mining industry of producing lead, copper and zinc are quite active in Chicla. In particular, production of lead and zinc almost turns out to be about 10% of national production.

Since mineral resources was the most leading export item constituting about 45% of total exports in 1984, those natural resource produced or potentially deposited in the Rimac basin is an important material in terms of earning foreign exchange. However, to keep constant or augment production of mineral resources was quite often disturbed by workers' strike happening frequently, and fluctuation of international prices of minerals. Under these circumstances, mining sector consisting of middle size of companies and public corporation such as MINEROPERU or CENTROMIN was sometimes obliged to implement production adjustment.

3.5.2 Manufacturing Sector

The condition that metropolitan area of Lima-Callao has been industrial base of Peru is clearly understood by its high concentration of manufacturing activities on metropolitan area, shown in Table IX-3-11. The concentration ratio of manufacturing sector on Lima-Callao area has not dramatically changed for the period between 1970 and 1981. The said ratios indicated by the number of establishment, value added, and gross production turned out to be around 70% while about 75% of workers engaged in manufacturing sector is identified in metropolitan area. Table IX-3-12 also shows the same ratios as Table IX-3-10 in case manufacturing sector is further classified into three sub-sectors producing consumer, intermediate, and capital goods. The figures of four ratios in each sub-sector shown in Table IX-3-12 demonstrate that the concentration ratios of the sector manufacturing capital good was more than 80%, followed by consumer good of around 70%, and intermediate one of less than 70%. Capital-intensive products promoted by import-substitution of industrial policy are mostly produced in this metropolitan area.

Consumer goods were still the leading manufacturing products in terms of their production, the number of establishment and employees. Large production of consumer goods is mostly consumed in metropolitan area being load center of consumption. Among them, value added shared by food and drink was around 40% of value added of sub-sector producing consumption goods. Intermediate goods produced in metropolitan area are principally featured by chemical products and refinery of petroleum. Most of chemical products are a miscellaneous type of goods such as paint, medicine, soap and cosmetics. The typical capital goods are machinery for production of metal and electric apparatus, and transportation equipment.

A substantial number of manufacturing establishments were identified in small size of ones whose employees per establishment ranges 5 to 9 persons. However, big size of establishment whose employees per one is more than 50 had the largest number of employees and production. More than 75% of value added and production value was shared by big size of establishments while the number of establishments was largely concentrated on small size of establishments constituting about 65% of total ones. Consequently the middle size of

establishment was not so conspicuous as small or big size of them in terms of manufacturing activity. Statistics by size of establishment are shown in Table IX-3-13.

3.5.3 Agricultural Sector

Major crops produced in the Rimac river basin are maize, cassava, avocado, pumpkin and so on. About 72% of farm houses has holding size of farm land less than 0.5 ha. A substantial number of farm houses are identified in Lurigancho, Chicla, Matucana and San Mateo. Irrigation fields spread in the lower and middle reach of the Rimac river basin.

3.6 Infrastructure

3.6.1 Transportation

The principal trunk lines penetrating into the Rimac river basin were represented by national road of route 20 and railway along the Rimac river. This transportation infrastructure connecting metropolitan area with Sierra is economically important since both economies of Lima-Callao and Sierra area are interdependent to a certain extent. According to annual statistics published by Ministry of Transportation, daily traffic volume recorded on route 20 has been substantially higher than those on other roads linking costa with Sierra.

Interdependence between metropolitan area and Sierra is somehow characterized by types of consignment transported by railway. Most of consignment transported in the direction of Lima-Callao are raw materials such as metal, minerals, cement, and chemicals. Those materials are utilized as input ones for production of semi-finished or final products. What are principally transported in the opposite direction are liquid or solid type of fuel and foods such as flour, sugar. These types of consignment are required for local industries or consumed by inhabitants living in Sierra.

Since topographic conditions surrounding Carretera Central (Route 20) in the middle and upper reach of the main river is featured by mountainous area with unstable earth, the road as well as railway are in danger of being blocked by debris flow. The recent rehabilitation works were conducted on Carretera Central between Ricald Palma and Matucana. New by-pass around Surco and Matucana are also under construction.

3.6.2 Housing Scheme

Housing problem in Lima-Callao area is already mentioned in social conditions of 3.3.3. Since the lack of residential house has been an apparent social matter, Ministry of House put an emphasis on construction of new residential houses though public fund for this policy has been negligible. Construction of new residential house is implemented by Empresa Nacional de

Edificaciones (ENACE) which is a sub-institution under Ministry of House. Public fund for housing construction is derived from Fond Nacional de Vivienda (FONAVI).

Housing schemes for residents of low income are basically divided into three categories depending on income level of residents. The first is Complete House which are for residents being able to repay housing loan. The second is called Basic nuclear house less valuable than Complete house. Basic nuclear house is principally for residents of lower income. The third is only confined to land clearing and housing-related services without housing construction.

Housing schemes specified above are principally for homeless people and poor settlement having to be relocated. Nonetheless, insufficient amount of public fund makes it difficult to implement some housing plan. As a matter of fact, a plan of Lima City which would construct houses in new settlement area for urban poor is suspended owing to deficit of public budget to be utilized for housing construction although land clearing and other services are completed. The lack of budget also makes it difficult to realize a relocation programme for people who dwells in disastrous area of middle or upper reach along the Rimac river.

3.6.3 Water Supply

Water supply in metropolitan area has various kinds of supply sources. Intake facility at La Atarjea in the downstream of the Rimac river supplies the half of water demand in urban area. Its supply covers the area in the south of the Rimac river. Water availability in the rest of metropolitan area is derived from wells or reservoirs scattered extensively. Water intake for farm land and some industrial use are mostly relied on surface water from the Rimac river.

The connection of water pipe to houses with no water supply service has been the recent major concern of SEDAPAL which is an implementation agency of water supply. However, insufficient amount of public budget for SEDAPAL impeded the improvement of water supply service up to the target level. Moreover, the said agency will face with the more serious matter of how to cope with growing demand for water in the future. Although the future supply scheme of water was established in Master Plan (Agua Potable Plan Maestro Y Primera Estapa Del Programa De Ampliaciones) studied in 1981, chronic problem of insufficient domestic fund shall be the constraint for developing supply schemes.

Water quality of the Rimac river deteriorated owing mainly to inflow of debris or mud flow into the river in the middle reach, and drainage of contaminated waste from mineral industries. At present, as it's expected to take an enormous amount of cost to clean up the river water, non-contaminated water supplied from the upper reach of Santa Euralia to Huampani

power station for Hydro-power was furthermore planned to discharge to Atarjea Intake facility by aqueducts.

3.7 Economic Importance of Disaster Prevention Works

Since the nature of benefit derived from disaster prevention works is categorized as "preventive" to socio-economy in contrast with other type of project yielding productive benefit, an incentive to promote works of controlling disaster is not so strong as productive projects if a country's objective is based on growth-oriented policy. However, if prevention works remain to be intact for a long time in area where disaster such as Huayco or flooding are almost a permanent problem, cumulative economic loss or damage due to disasters would be a tremendous cost to socio-economy. It goes without saying that human life victimized by disaster is priceless loss unlike properties. In this sub-chapter, economic importance of disaster prevention works is analysed both qualitatively and quantitatively.

The rehabilitation cost of damaged infrastructure brings about financial pressure on government agencies which are responsible for operation and maintenance of respective infrastructure. In Peru, the allocation of central government budget to development expenditure of economic and social sectors was small portion ranging from 10 to 12% in recent years. 1983 was marked by a vivid memory or experience that disaster occurred extensively in the whole country. Disaster caused by a massive volume of debris flow and mud inflicted a considerable damages on road and infrastructure related to utility services in the Rimac basin. The rehabilitation cost of damaged road called Carretera Central reached to 5 million soles which corresponds to about 2% of total development budget allocated to transportation sector in 1983. If total rehabilitation cost in entire Peru is disclosed, the above ratio would reach to a controversial percentage.

The rehabilitation cost of damaged infrastructure administered by SEDAPAL and ELECTRO LIMA also demonstrates a noticeable point. In case of SEDAPAL, water intake facility of Atarjea plus other facilities were damaged. Damage facilities of ELECTRO LIMA were two power stations located at Callahuanca and Huampani. Total cost of rehabilitating damaged infrastructure of public utilities was recorded at 1.5 million soles which was approximately a quarter of development expenditure allocated to energy sector.

Since budget for development was not favourably allocated, as stated before, it is no doubt that government agencies felt financial pressure brought by the rehabilitation cost. Further, if damages had turned out to be considerably less than actual damages, due to facilities of controlling disaster, most of rehabilitation cost would have been invested in development schemes. In this sense, Peru incurred rehabilitation cost of infrastructure, but also has she lost economic benefit brought by development schemes which had been expected otherwise.

Economic benefit in the above means the value which would have accrued to society in the macro-economic framework if disaster prevention facilities had existed. It is repeatedly stated that traffic routes like Carretera Central and railway in the Rimac basin plays an significant role in connecting Sierra with metropolitan area being load central of Peru. Economic relation between Sierra and metropolitan area is to some extent characterized by interdependence of both economies in two geographic areas. Economic framework of interdependence is roughly explained by the supply of consumer goods from Lima-Callao to Sierra, and that of raw materials in the opposite direction. The recent government policy to promote development in Sierra and Selva area would result in the more activated economy in those areas. Consequently the relation of interdependence between metropolitan area and others would be more firmly established.

Under such circumstances, when Carretera Central and railway was blocked by debris flow in 1983, economic loss due to interruption of economic activities was derived from value added lost by operation stop of secondary or tertiary sectors due to non-supply of consumer or intermediate goods during period of traffic block. Although the approximate value of economic loss is not precisely estimated, several assumptions to estimate such economic loss are demonstrated in Inventory of Damageable Value shown in Chapter IX. If stock period of goods to be affected by disaster is averagely one week depending on the size of establishment having such stocks, economic loss per day is estimated to be 50 million Intis at 1987 price level if period of interruption lasts more than one week. This level of economic loss is estimated to be about 0.3% of GDP shared by manufacturing sector of Peru in 1987.

Since traffic volume transported on Carretera Central is much more than those on other roads connecting costa with Sierra, fuel cost of vehicles which must take other route than Carretera Central would become a substantial amount if the traffic on route 20 is blocked. Furthermore, the shortage of consumer goods would push up price level, which would result in reduction of real purchasing power of consumers.

Tables

TABLE IX-2-1 LAND USE AND GEOGRAPHIC CATEGORY

Unit: thousand ha

Land Use	Costa		Sierra		Selva		Total	
Farm land	806	(115.4)	2,280	(6.3)	605	(0.8)	3,691	(2.9)
Grass land	495	(3.3)	14,301	(39.6)	332	(0.4)	15,129	(11.8)
Forest	1,450	(9.8)	7,550	(20.9)	75,500	(97.3)	84,500	(65.7)
Others	12,112	(81.5)	11,961	(33.2)	1,128	(1.5)	25,201	(19.6)
Total	14,864	(160.0)	36,902	(100.0)	77,565	(100.0)	128,521	(100.0)

Source: Peru: Compendio Estadistico 1982" July 1983
Issued by Instituto Nacional de Estadistica

TABLE IX-2-2 POPULATION DISTRIBUTION BY GEOGRAPHIC CATEGORY

Unit: thousand ha

Land Use	Costa		Sierra		Selva		Total	
Urban	7,745.8	(67.0)	3,107.6	(27.0)	656.0	(6.0)	11,509.4	(100.0)
Rural	1,367.7	(21.9)	4,221.9	(67.5)	655.8	(10.6)	6,254.4	(100.0)
Total	9,113.5	(51.3)	7,329.5	(41.3)	1,311.8	(7.4)	17,754.8	(100.0)

Source: Direction General de Demografia
Remarks: Parentheses Indicates Distribution Percentage

TABLE IX-2-3 POPULATION DATA BY ADMINISTRATIVE CATEGORY

	Metropolitan Lima Callao	Other Area
Population		
1972	3,302,523	10,235,685
1981	4,608,010	12,397,200
Annual growth rate (%)	3.8	2.2
Area (km^2)	3,849.5	1,281,366.1
Density (person/km^2)	1,197	10

Source: Compendio Estadistico 1985

TABLE IX-2-4 ECONOMICALLY ACTIVE POPULATION IN 1981

Sector	Labour Force	Percentage (%)
	Unit: thousand	
Agriculture	2,279.1	(39.5)
Mining	115.4	(2.0)
Manufacturing	646.2	(11.2)
Utility	17.3	(0.3)
Construction	225.0	(3.9)
Commerce	767.4	(13.3)
Transportation	248.1	(4.3)
Finance	138.5	(2.4)
Service	1,332.8	(23.1)
Total	5,769.8	(100.0)

Source: Compendio Estadistico 1985

TABLE IX-2-5 ECONOMIC PERFORMANCE DURING LAST 7 YEARS

Unit: million Intis

	1979	1980	1981	1982	1983	1984
Supply						
GDP	3,490	3,647	3,808	3,817	3,346	3,478
Import	666	868	1,006	1,028	723	582
Demand						
Consumption						
Private	2,131	2,236	2,356	2,376	2,180	2,191
Public	301	368	362	410	374	348
Investment	724	882	1,024	1,003	712	666
Stock	33	149	218	150	-17	-32
Export	968	879	854	906	821	888

Source: Cuentas Nacionales del Peru
Input-Output Table
Remarks: Figures are The Value A.T. 1979 Constant Price

TABLE IX-2-6 VALUE OF EXPORT BY PRINCIPAL ITEMS

Unit: million US $

Primary Product	1980	1981	1982	1983
(1) Petroleum Products	792	689	719	544
(2) Copper	752	529	460	443
(3) Lead	383	219	216	293
(4) Silver	315	312	205	391
(5) Wheat	195	141	202	79
(6) Zinc	210	267	268	307
(7) Coffee	141	106	113	117
(8) Other	283	285	348	286
Non-Traditional	845	701	762	555
Total	3,916	3,249	3,293	3,015

Source: Compendio Estadistico 1985

TABLE IX-2-7 CROP PRODUCTION BY GEOGRAPHIC CATEGORY IN 1984

Unit: thousand ton

Crop	Costa	Sierra	Selva	Total
Rice	651.7	3.5	321.8	977.0
Barley	0.09	100.7	-	100.8
Maize	161.3	14.7	205.8	381.8
Banana	35.5	76.2	723.5	835.2
Sweet Potato	228.7	3.2	1.3	233.2
Potato	31.7	825.8	23.0	880.5
Cassava	19.2	20.7	604.3	644.2

Source: Encuesta Nacional de Hogares Rurales

TABLE IX-2-8 PERCENTAGE CHANGE OF PRODUCTION SHARE BY INDUSTRIAL SECTOR

Unit: %

Crop	1970	1975	1981
Food and Drink	36.0	27.2	24.4
Textile	14.3	13.0	12.2
Wood Products	2.0	2.2	1.6
Paper, Pulp	4.4	4.4	4.0
Chemical, Petro-chemical	12.4	16.5	18.5
Non-mental Mineral Process	3.3	4.0	3.8
Basic Metal Work	8.7	6.7	11.4
Metal Process	9.1	15.5	14.7
Handicraft	9.8	10.5	9.4
Total	100.0	100.0	100.0

Source: Compendio Estadistico 1982

TABLE IX-2-9 MACRO-ECONOMIC INDICATORS

	1979	1980	1981	1982	1983
				Unit: million Intis	
Government Finance					
Revenue	552.2	1,019.3	1,522.5	2,493.3	3,732.0
Expenditure	570.2	1,159.3	1,938.4	3,050.2	6,083.0
Deficit	-18.0	-140.0	-415.9	-556.9	-2,351.0
Index of Inflation					
1979=100	100	159	279	459	969
Exchange Rate					
Intis per US $	0.225	0.289	0.422	0.698	1.629
				Unit: million US $	
Trade Balance	1,598.9	762.7	-869.5	-744.0	39.4
Current Account	662.5	-72.3	-1,889.4	-1,777.0	-1,092.4
Capital Account	413.6	725.5	1,165.9	1,638.0	1,026.7
Balance of Payment	1,076.1	653.2	-723.5	-139.0	-65.7
				Unit: million US $	
Total Debt	9,334	9,594	9,638	11,097	12,632
Public	7,997	8,390	8,475	9,951	n.a.
Private	1,337	1,204	1,163	1,146	n.a.
Debt Service	919	1,501	1,895	1,536	779
Export Value	3,491	3,899	3,248	3,043	2,970
Debt Service Ratio (%)	26	38	58	50	26

Source: ECLAC IMF, Compendio Estadistico

TABLE IX-3-1 POPULATION DATA OF PROVINCES RELATED TO THE RIMAC RIVER BASIN

Province	Area (km^2)	1972	1981	Annual Growth Rate 1971-1981 (%)	Density 1981 Person/km^2
Lima	3,701	2,981,292	4,164,597	3.8	1,125
Callao	148	321,231	443,413	3.6	2,996
Huarochiri	4,487	50,729	59,792	1.8	14

TABLE IX-3-2 THE NUMBER OF HOUSES BY FAMILY SIZE

Province	Family Size						Total	Average Size
	1	2	3	4	5	6-8		
Lima	59,354	84,095	111,218	133,303	128,293	308,876	825,139	5.0
%	7.2	10.2	13.5	16.2	15.5	37.4	100.0	
Huarochiri	2,892	2,076	1,878	1,967	1,788	3,963	14,564	4.1
%	19.8	14.3	12.9	13.5	12.3	27.2	100.0	

TABLE IX-3-3 POPULATION DISTRIBUTION BY AGE GROUP

Province	Age Group 0-4	5-14	15-49	50-64	65-	Total
Lima	492,858	974,498	2,239,101	307,327	150,813	4,164,597
%	11.8	23.4	53.8	7.4	3.6	100.0
Huarochiri	9.197	16,924	25,690	5,140	2,841	59,792
%	15.4	28.3	43.0	8.6	4.7	100.0

TABEL IX-3-4 PERCENTAGE OF ECONOMICALLY ACTIVE POPULATION BY SECTOR

unit: %

Sector	1971			1981		
	Lima	Callao	Hauro-chiri	Lima	Callao	Hauro-chiri
(1) Agriculture fishery	3.2	6.4	57.6	2.3	4.5	47.2
(2) Mining	0.4	0.4	12.8	0.7	0.7	18.1
(3) Manufac-turing	21.0	21.1	5.7	17.8	19.4	4.2
(4) Electricity	0.4	0.2	1.4	0.6	0.6	0.6
(5) Construc-tion	7.2	5.0	2.8	5.5	4.2	3.0
(6) Commerce	19.6	14.3	6.4	19.0	14.0	7.5
(7) Transport	7.6	13.3	2.9	5.9	13.0	3.0
(8) Finance	3.1	2.5	0.3	5.6	4.4	0.6
(9) Service	33.7	28.7	7.5	33.2	32.0	10.0
(10) Other	3.8	8.0	2.6	5.9	5.4	3.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

TABLE IX-3-5 SOCIAL CONDITIONS OF INHABITANTS IN LIMA CITY

Name of District (Prov. Lima)	Total No of houses	No of family	No of P.Joven	Electri-fication %	Water supply %	Sewerage %
Lima	73,091	79,414	16,403	96	90	89
Ancon	1,270	1,453	196	74	87	72
Ate	25,635	28,166	1,038	78	69	64
Brena	22,723	24,414	598	99	97	96
Carabayllo	9,501	10,264	6,302	77	21	19
Chaclacayo	5,508	6,059	3,238	87	39	37
Chorrillos	24,447	26,976	11,182	77	55	45
La Victoria	52,760	56,294	7,103	96	93	92
Lurigancho	11,581	12,690	4,422	71	55	43
Lurin	3,055	3,382	1,196	29	22	19
M. Del Mar	10,728	11,601	383	98	97	96
M. Vieja	16,009	17,160	333	98	98	96
Puenta Piedra	6,033	6,524	2,191	57	35	24
Rimac	34,965	37,951	10,842	94	86	84
Comas	46,462	52,810	30,424	84	57	53
Judependencia	21,422	24,857	18,682	78	65	64
San Juan de Miraflores	26,466	30,252	15,775	88	83	80
El Agustino	27,440	31,605	16,560	77	47	40
San Juan Lurigancho	43,577	48,519	14,921	67	49	41

Source: National Census of Population and Houses 1981
Note : No of P. Joven means the number of houses categorized as P. Joven

TABLE IX-3-6 SOCIAL CONDITIONS OF INHABITANTS IN THE NORTHERN HUAROCHIRI

Name of District (Prov. Huarochiri)	Total No of houses	No of family	Electrification %	Water supply %	Sewerage system %
Chicla	1,430	1,447	44	51	44
San Mateo	1,820	1,893	66	16	14
Callahuanca	182	185	65	14	8
Huanza	658	663	72	10	10
Laraos	143	145	92	29	15
Huachupamga	141	142	50	0	0
Carampoma	325	325	50	13	4
Sna Juande Iris	121	121	69	9	9
San Pedro de Casta	309	309	74	-	-
San Mateo de Otao	433	434	4	-	-
Matucana	1,172	1,217	19	37	19
Surco	381	386	52	37	35
San Bartolome	266	268	49	-	-
Sta.Cruz de Cocac.	290	296	28	17	6
Ricardo Palma	639	652	67	26	24
Santa Eulalia	1,151	1,204	49	14	11
San Antonio	188	190	124	6	-

Soruce: National Census of Population and Houses in 1981
Note : Percentage in the above table indicates the ratio of houses with each utility service to total number of houses.

TABLE IX-3-7 COMPARISON OF PER-CAPITA GDP TO PER-CAPITA GRDP

	1980	1981	1982	1983	1984
(1) GDP	3,646.7	3,807.7	3,817.3	3,346.0	3,478.3
(2) Poulation	17,295.3	17,754.8	18,225.7	18,707.0	19,197.9
(3) Per-capita	211.0	214.5	209.4	178.9	181.2
(4) GRDP	1,666.2	1,752.6	1,734.5	1,501.3	1,530.7
(5) Population	4,668.6	4,836.3	5,005.6	5,176.8	5,349.4
(6) Per-capita	356.9	362.4	346.5	290.0	286.1
(7) Ratio of (3)/(6)	1.7	1.7	1.7	1.6	1.6

Remarks: (1) GDP at 1979 constant price
(2) Entire Population of Peru
(4) GRDP of Lima and Callao Departamentos at 1979 constant price

Source: Producto Bruto Interno
Proyecciones de Poblacion

TABLE IX-3-8 ECONOMICALLY ACTIVE POPULATION IN DEPARTAMENTOS AND PROVINCE OF LIMA

Sector	Departmentos Lima		Province Lima	
	Sector Share of economically active population	Economically active population of sector	Sector Share of economically active population	Economically active population of sector
	(%)	(Person)	(%)	(Person)
Manufacturing	18.3	556,134	19.6	528,659
Commerce	20.0	607,797	21.1	569,118
Service	34.4	1,045,410	36.9	995,281

Remarks: Economically active population in 1981 census year
Departamentos Lima 3,038,984
Province Lima 2,697,241

TABLE IX-3-9 HISTORICAL PERFORMANCE OF GRDP BY SECTOR IN DEPARTAMENTOS LIMA-CALLAO (AT 1979 CONSTANT PRICE)

unit: milion intis

Sector	Calendar Year					
	1979	1980	1981	1982	1983	1984
Agriculture	53.4	54.3	51.2	52.8	50.1	45.4
Fishery	3.1	2.0	2.1	2.7	1.9	2.1
Mining	16.9	15.3	11.2	16.7	14.2	14.2
Manufacturing	472.2	517.0	528.1	510.9	416.1	424.3
Construction	60.4	66.6	79.0	81.4	62.9	64.0
Commerce	378.1	409.7	432.0	423.8	365.7	362.7
Lease Service	35.0	36.8	38.7	39.2	39.8	40.6
Public Service	110.1	120.6	124.3	125.8	135.0	143.6
Other Service	414.2	444.7	485.8	481.1	415.6	433.8
Total	1,543.5	1,666.2	1,752.6	1,734.5	1,501.3	1,530.7

Source: Producto Bruto Interno (National Statistical Office)

TABLE IX-3-10 HISTORICAL TREND OF GRDP SHARE BY SECTOR IN LIMA-CALLAO

unit: %

Sector	Calendar Year 1979	1980	1981	1982	1983	1984
Agriculture	3.5	3.3	2.9	3.0	3.3	3.0
Fishery	0.2	0.1	0.1	0.2	0.1	0.1
Mining	1.1	0.9	0.6	1.0	0.9	0.9
Manufacturing	30.6	31.0	30.1	29.5	27.7	27.7
Construction	3.9	4.0	4.5	4.7	4.2	4.2
Commerce	24.5	24.6	24.7	24.4	24.4	23.7
Lease Service	2.3	2.2	2.2	2.3	2.6	2.6
Public Service	7.1	7.2	7.1	7.3	9.0	9.4
Other Service	26.8	26.7	27.7	27.7	27.7	28.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Producto Bruto Interno (National Statistical Office)

Table IX-3-11 A COMPARISON OF MANUFACTURING ACTIVITY IN THE NATION TO THAT IN LIMA-CALLAC

Item	unit	1970			1981		
		Nation	Lima-Callao	Ratio	Nation	Lima-Callao	Ratio
No of Establishment		6,463	4,532	70	10,660	7,365	69
No of Employees		195,681	143,897	74	239,605	179,706	75
Value of Shipment	(Thousand Intis)	105,096	69,771	66	4,729,235	3,185,441	67
Input Cost	- do -	45,304	29,727	66	3,003,258	1,882,663	63
Value Added	- do -	49,544	33,483	68	1,748,117	1,231,778	70
Investment	- do -	5,190	3,423	66	352,842	261,439	74
Export	- do -	-	-	-	131,622	71,093	54
Import	- do -	-	-	-	485,335	383,459	79

Table IX-3-12 MANUFACTURING ACTIVITY IN THE NATION AND LIMA-CALLAO BY TYPE OF GOOD

	No of Establishment			No of Employees			Value of Shipments			Value Added		
	N	M	R %	N (Thousand person)	M	R %	N (Million Intis)	M	R %	N (Million Intis)	M	R %
Consumer good	6,173	4,289	69	121.5	91.2	75	2,055	1,424	69	796	574	72
Intermediate good	2,448	1,445	59	74.1	50.2	68	2,014	1,194	59	706	438	62
Capital good	2,040	1,631	80	44.0	37.7	86	660	567	86	246	219	89
Total	10,660	7,365	69	239.6	179.1	75	4,729	3,185	67	1,748	1,231	70

Tableı IX-3-13 MANUFACTURING ACTIVITY IN LIMA-CALLAO BY SIZE OF ESTABLISHMENT

No of Employees per Establishment	No of Establishment	No of Employees	Value of shipment (Thousand Intis)	Value added (Thousand Intis)	Investment (Thousand Intis)
5 - 9	4,757	23,443	343,332	143,684	12,982
10 - 14	815	8,667	80,348	30,712	5,495
15 - 19	393	6,481	81,003	27,932	5,728
20 - 49	707	20,927	279,552	92,364	17,571
50 >	702	120,744	2,471,732	988,761	146,959

Figures

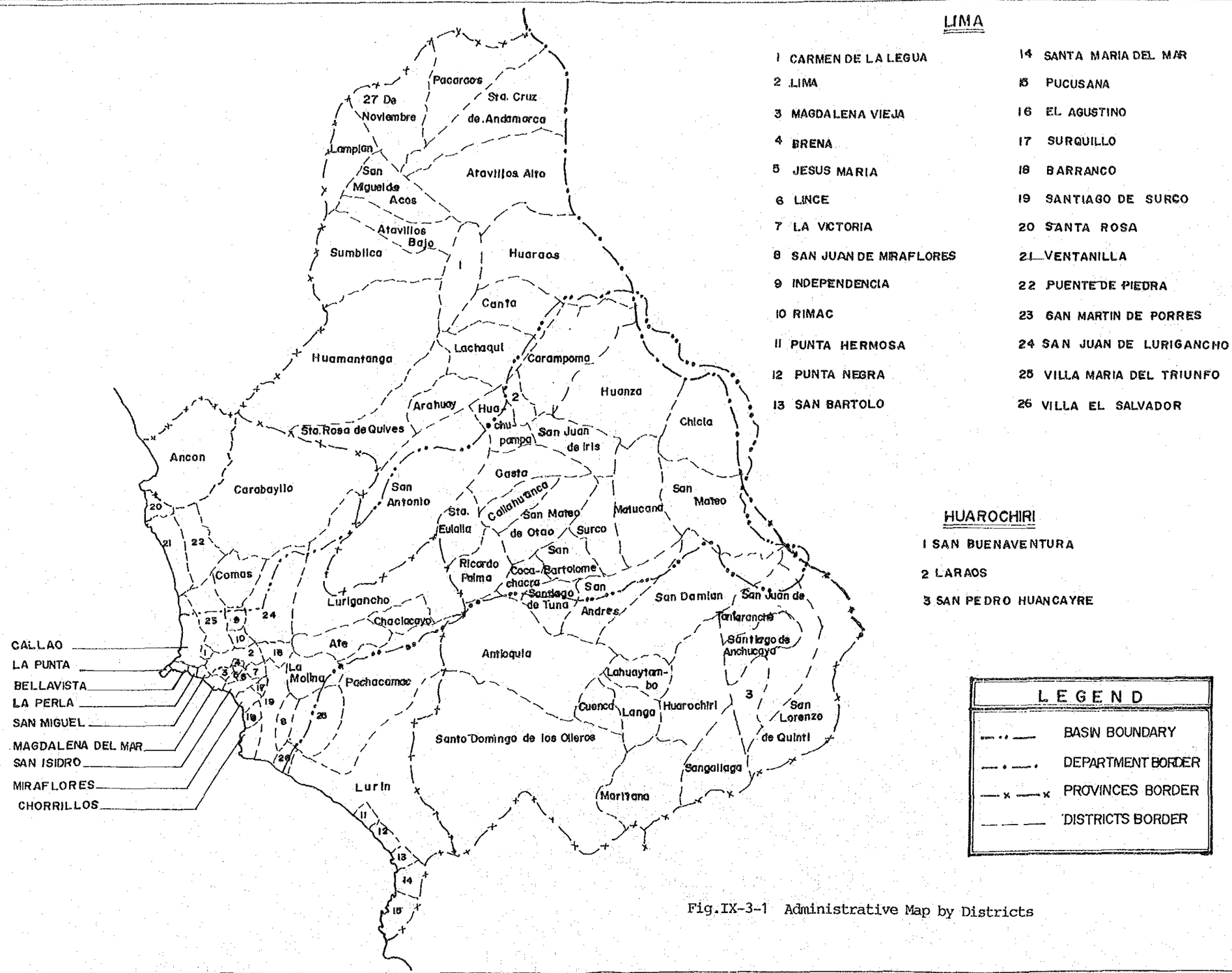

Fig.IX-3-1 Administrative Map by Districts

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