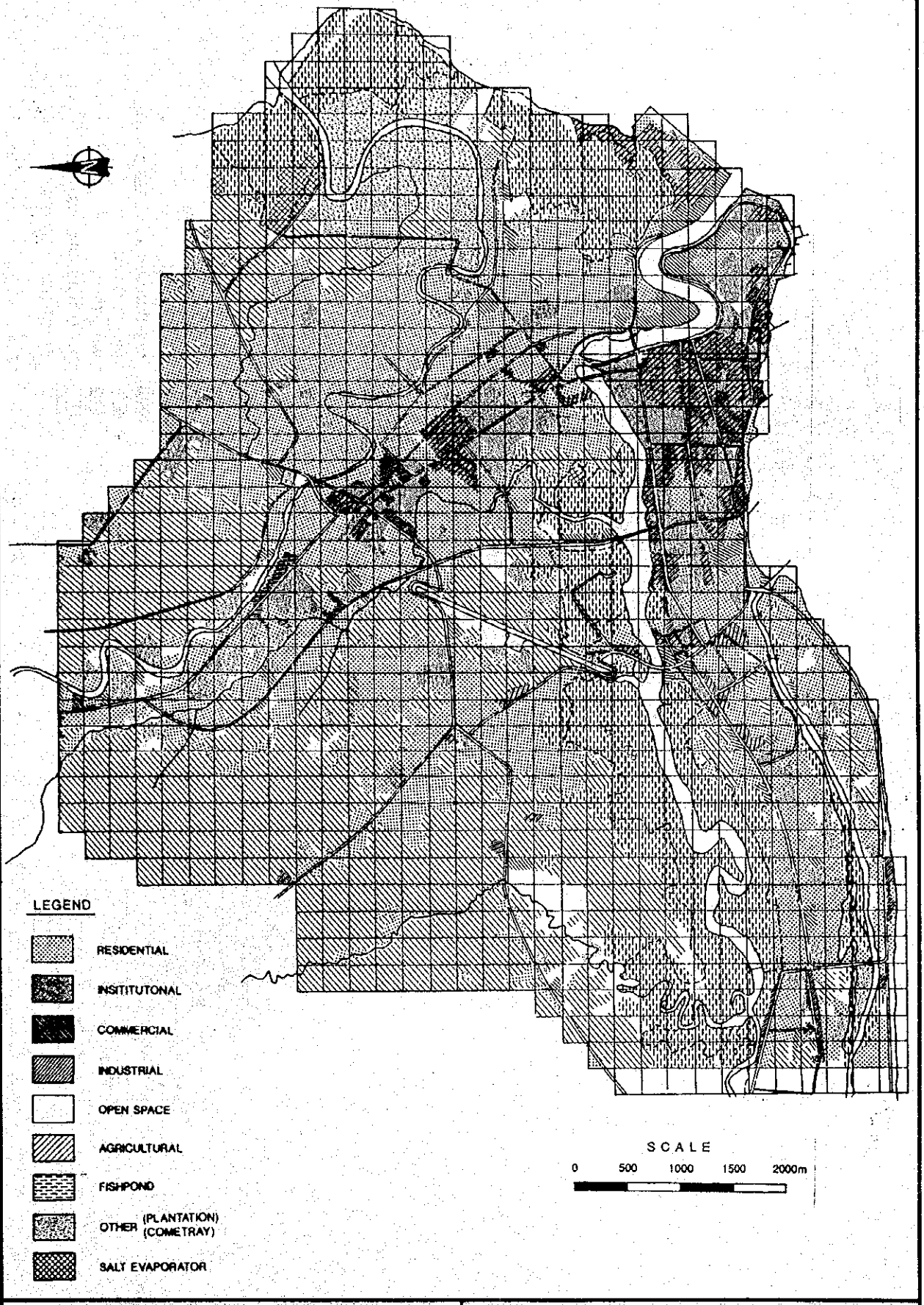
FIGURES



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

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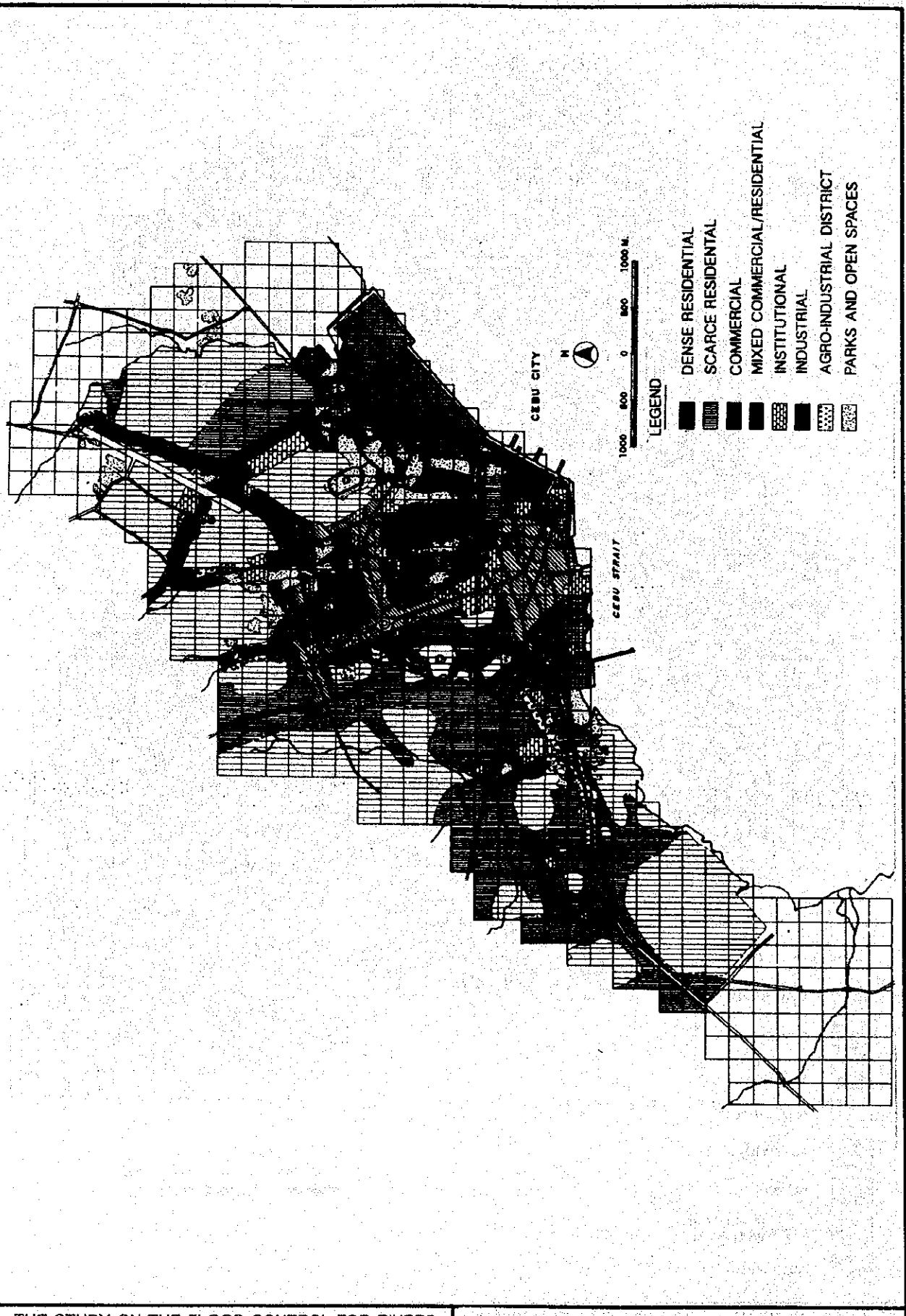
Fig. 1.1
Present Land Use, Iloilo



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

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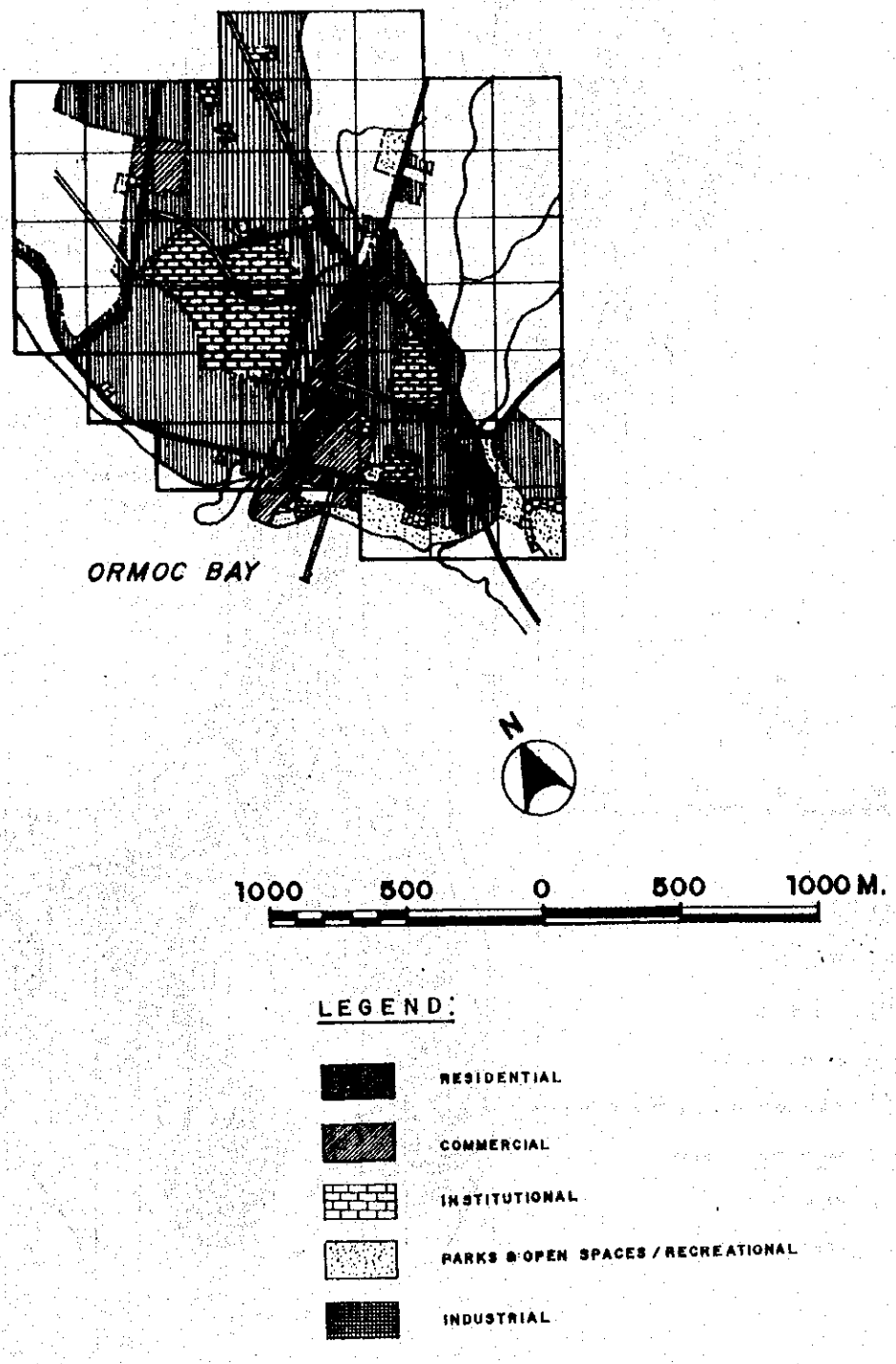
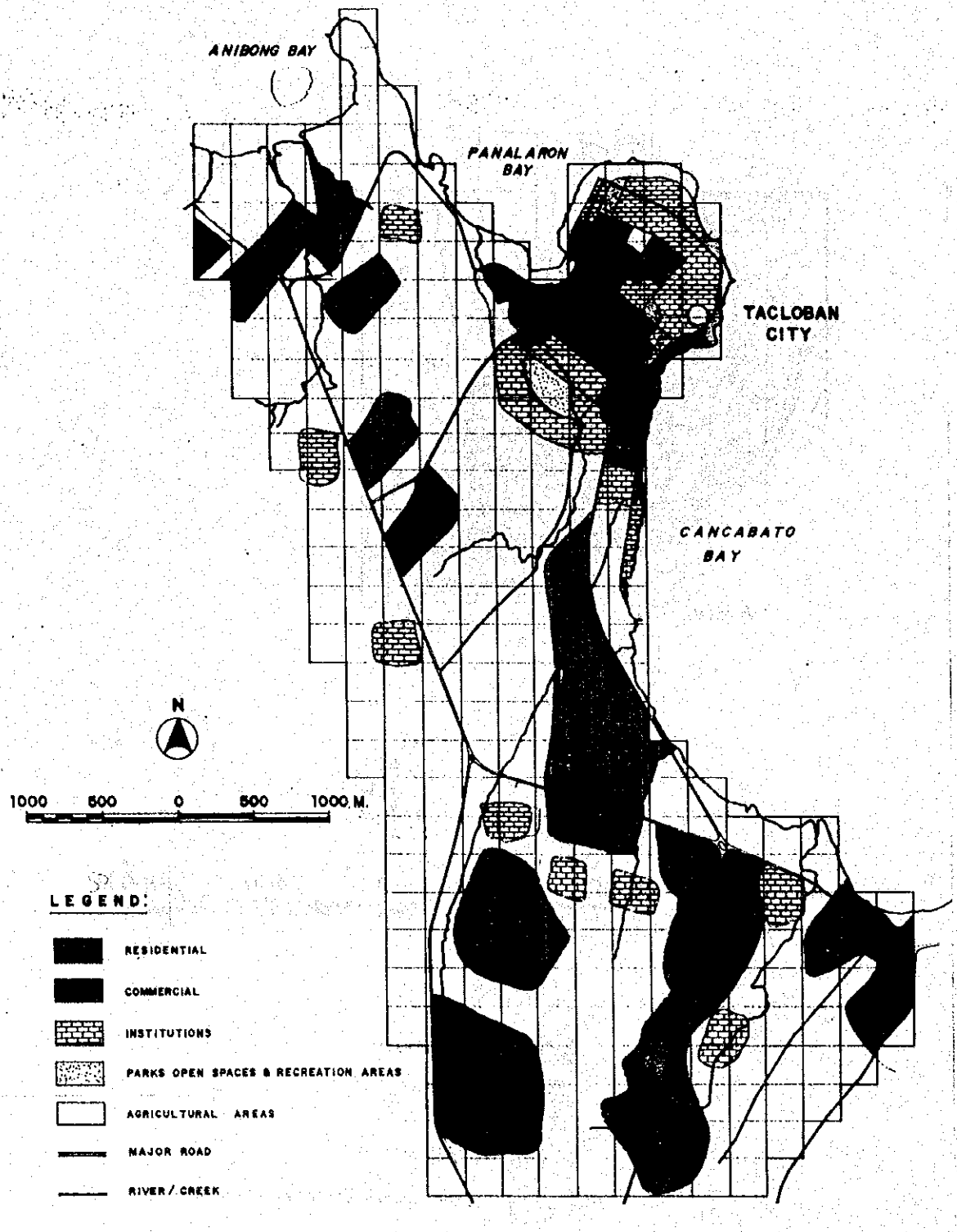
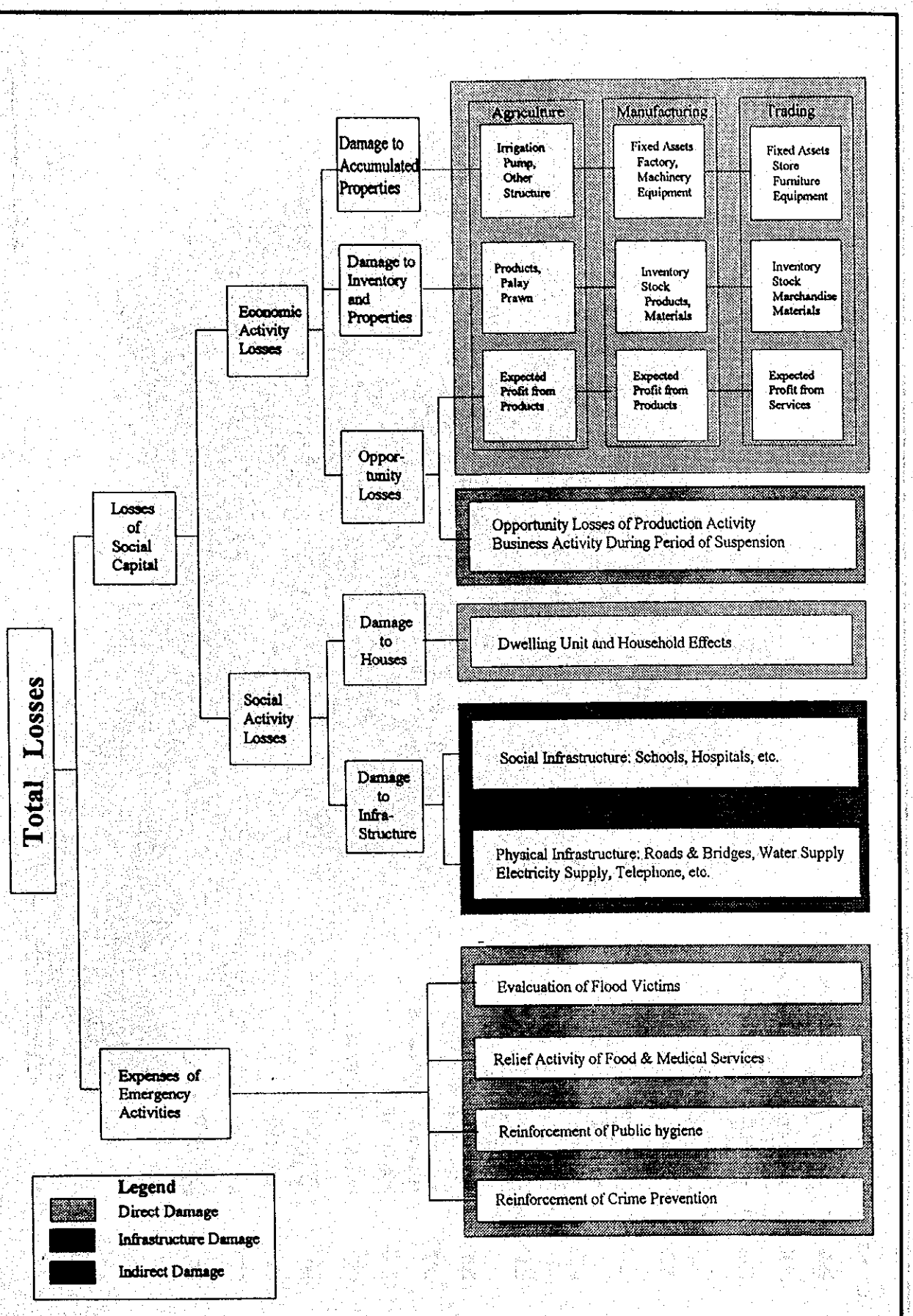
Fig. 1.2
Present Land Use, Cebu



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 1.3 Present Land Use, Ormoc



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 1.4 Present Land Use, Tacloban



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

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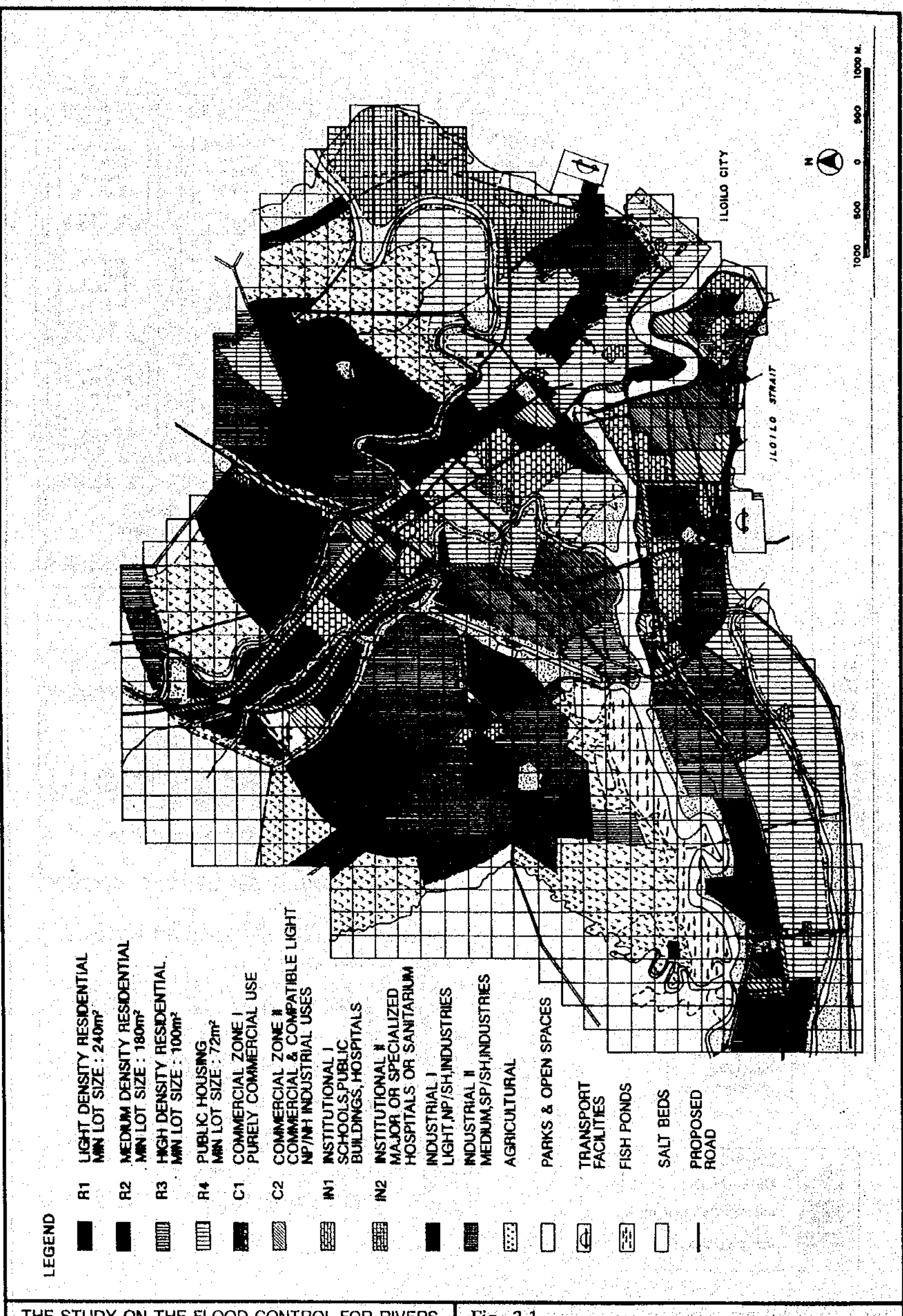
Fig. 2.1
Structure of Flood Damage



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS	Fig. 3.1 Land Use Plan, Iloilo
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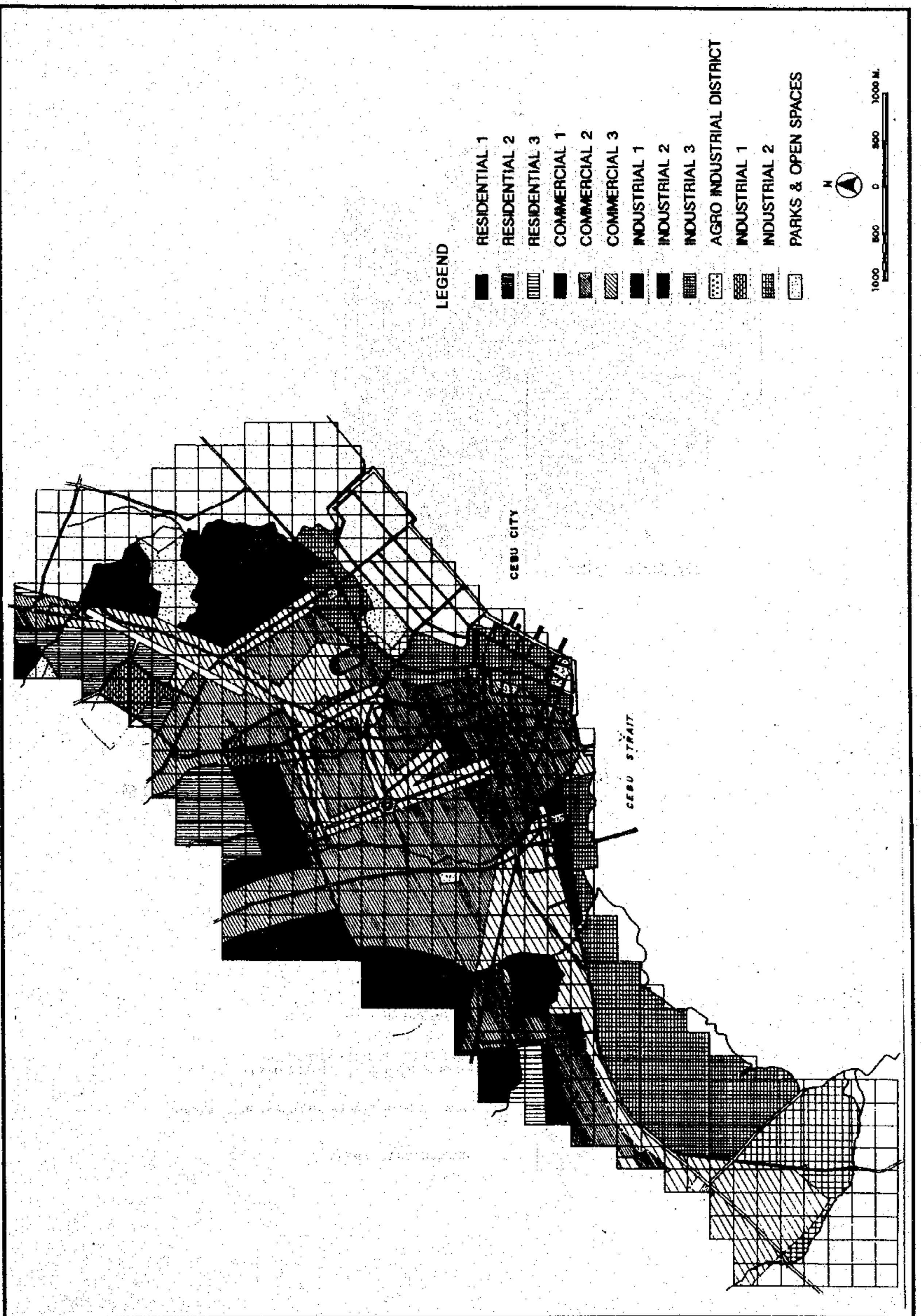

THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS	Fig. 3.2 Land Use Plan, Cebu
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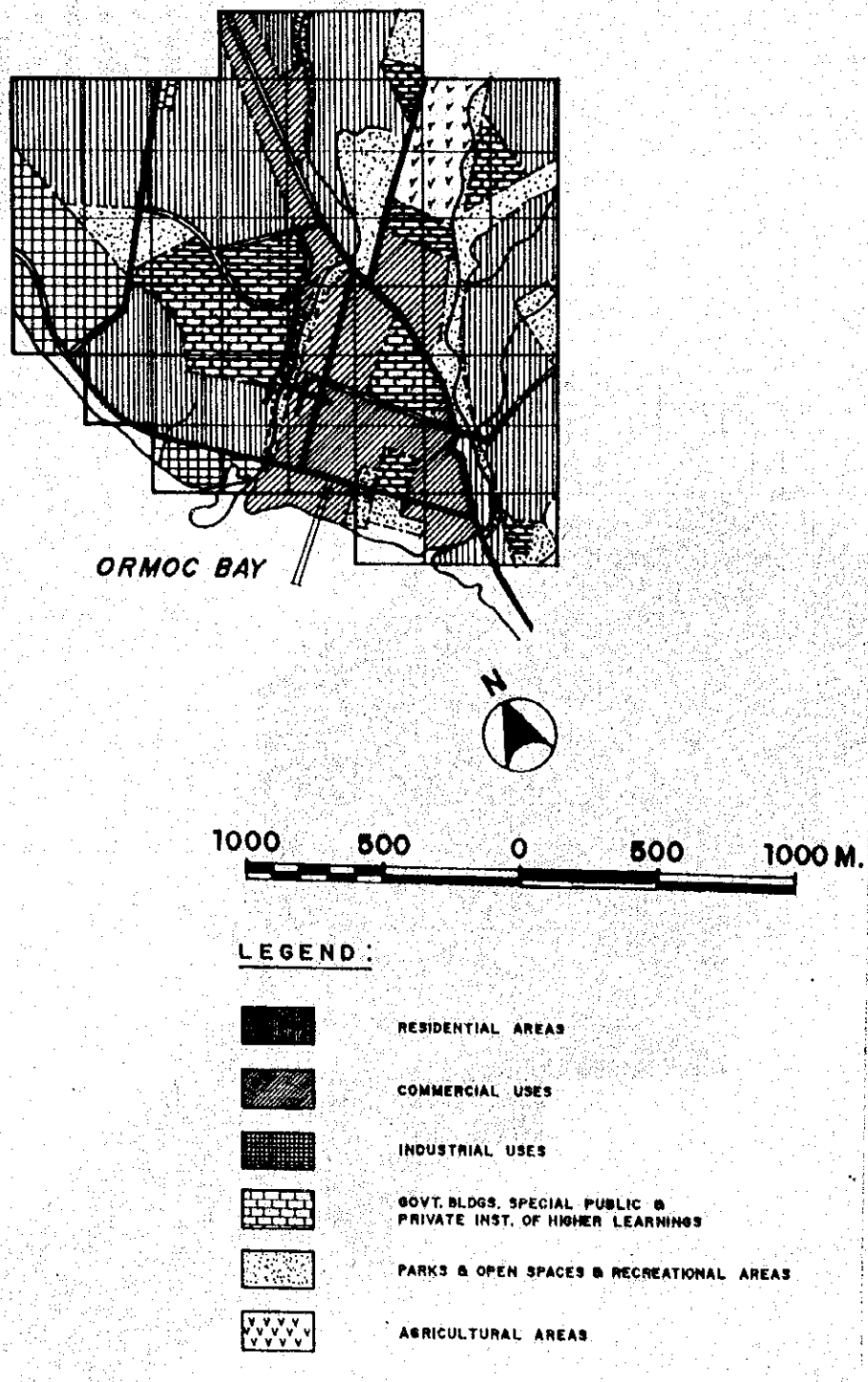
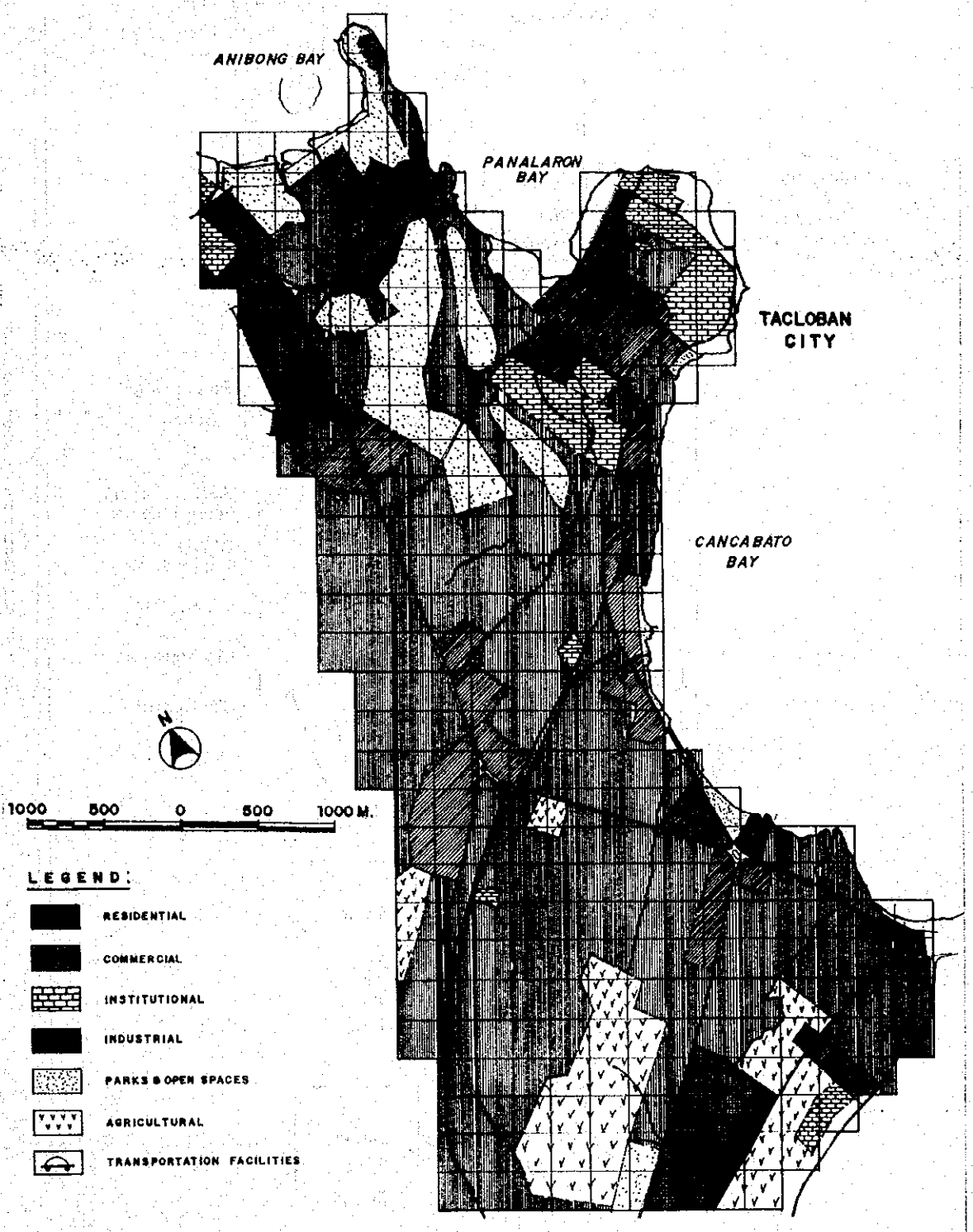
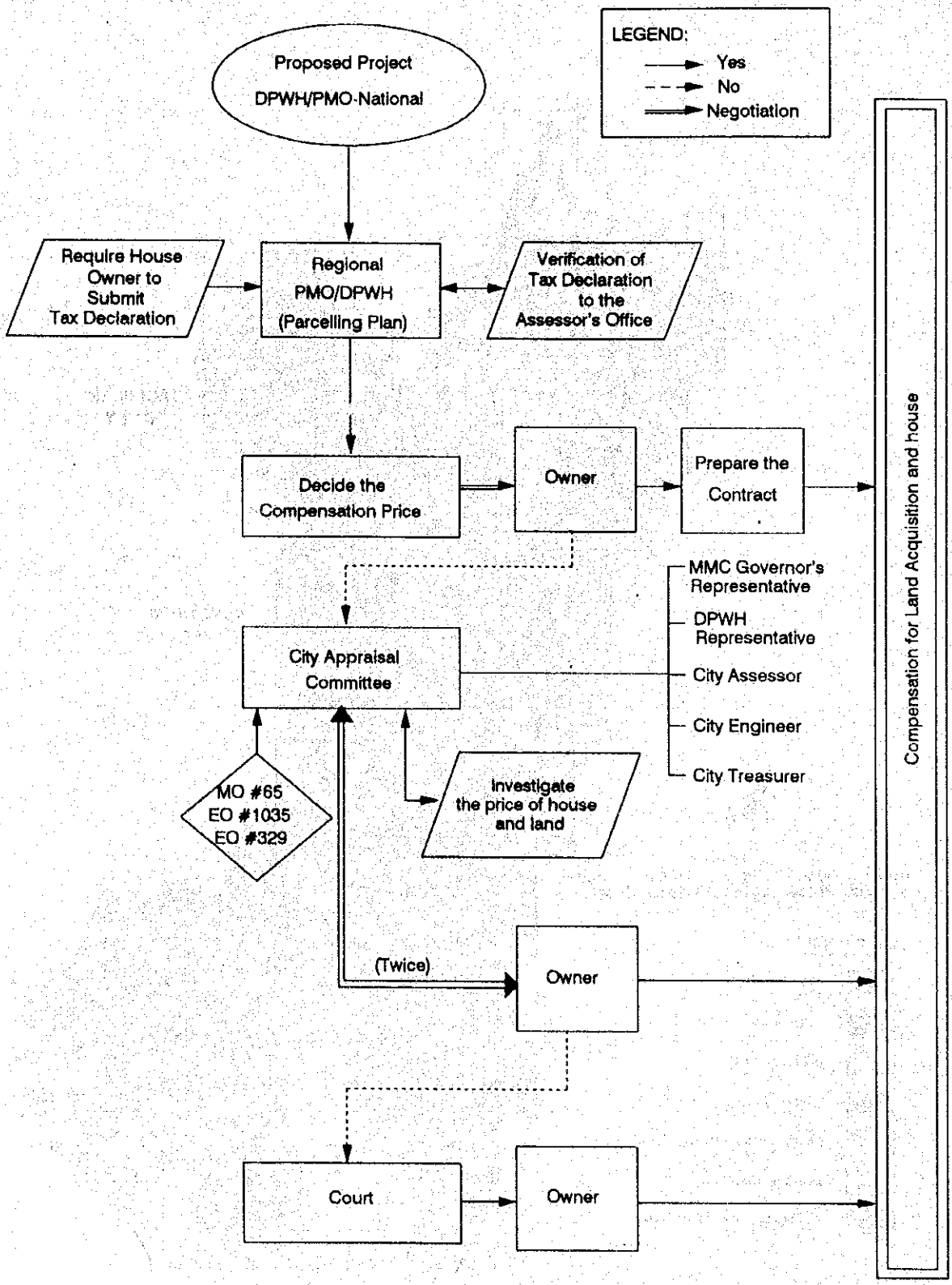


THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 3.3 Land Use Plan, Ormoc

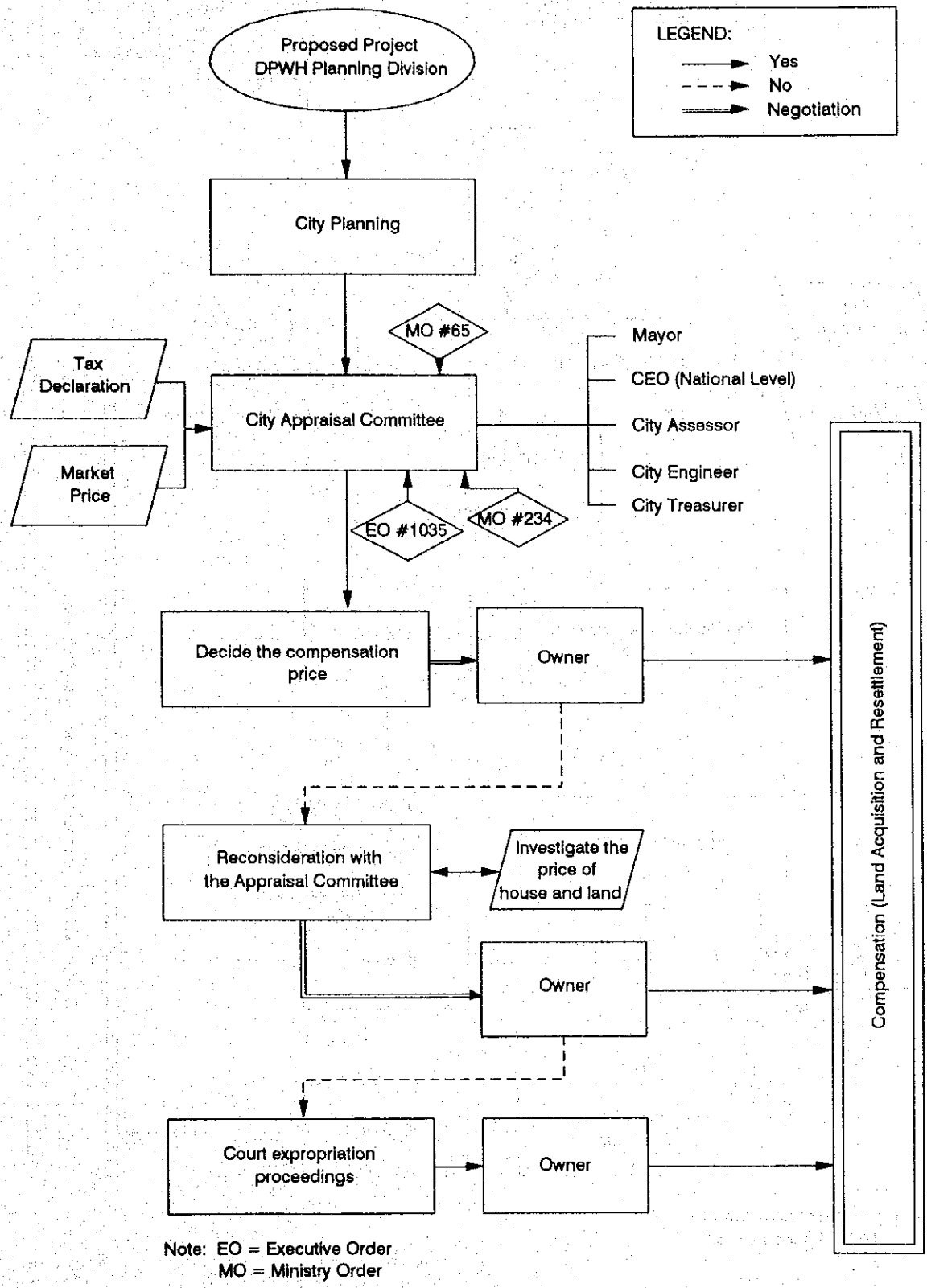


THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 3.4 Land Use Plan, Tacloban

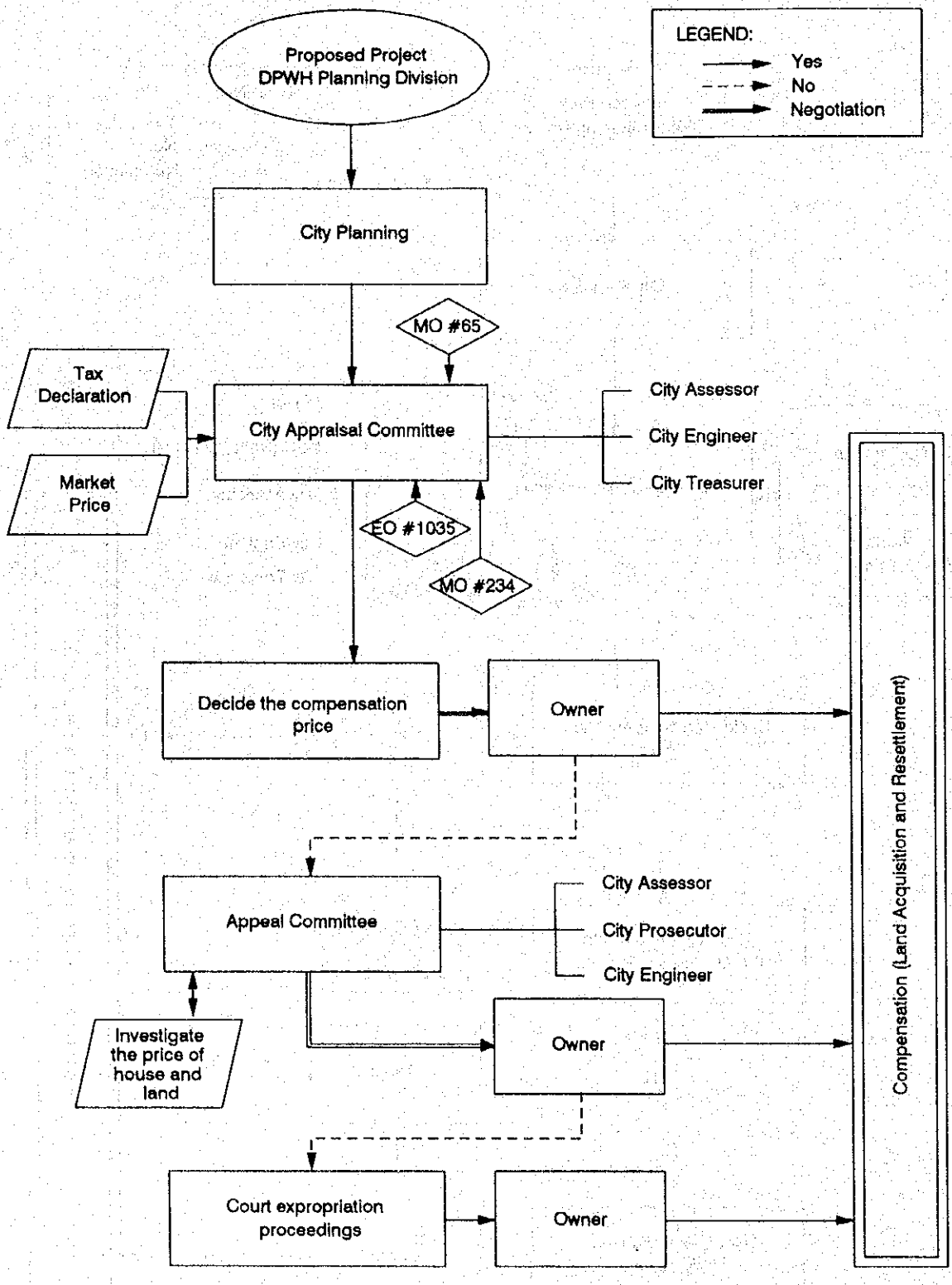


Note: MMC = Metropolitan Manila Commission
EO = Executive Order
MO = Ministry Order

THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 7.1 Processing Chart for Compensation of Private House Owner (Manila)

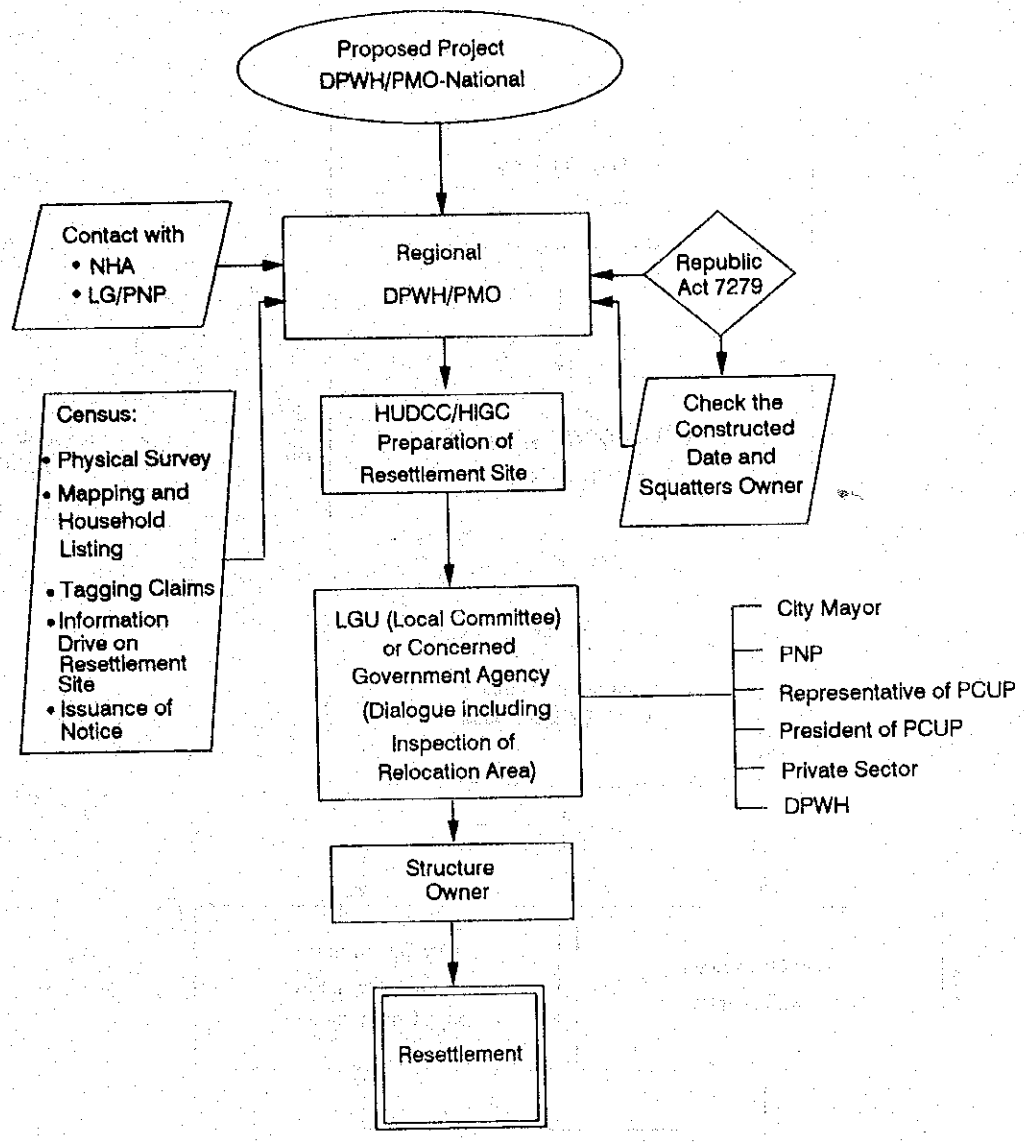


THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 7.2 Processing Chart for Compensation of Private House Owner (Iloilo City)



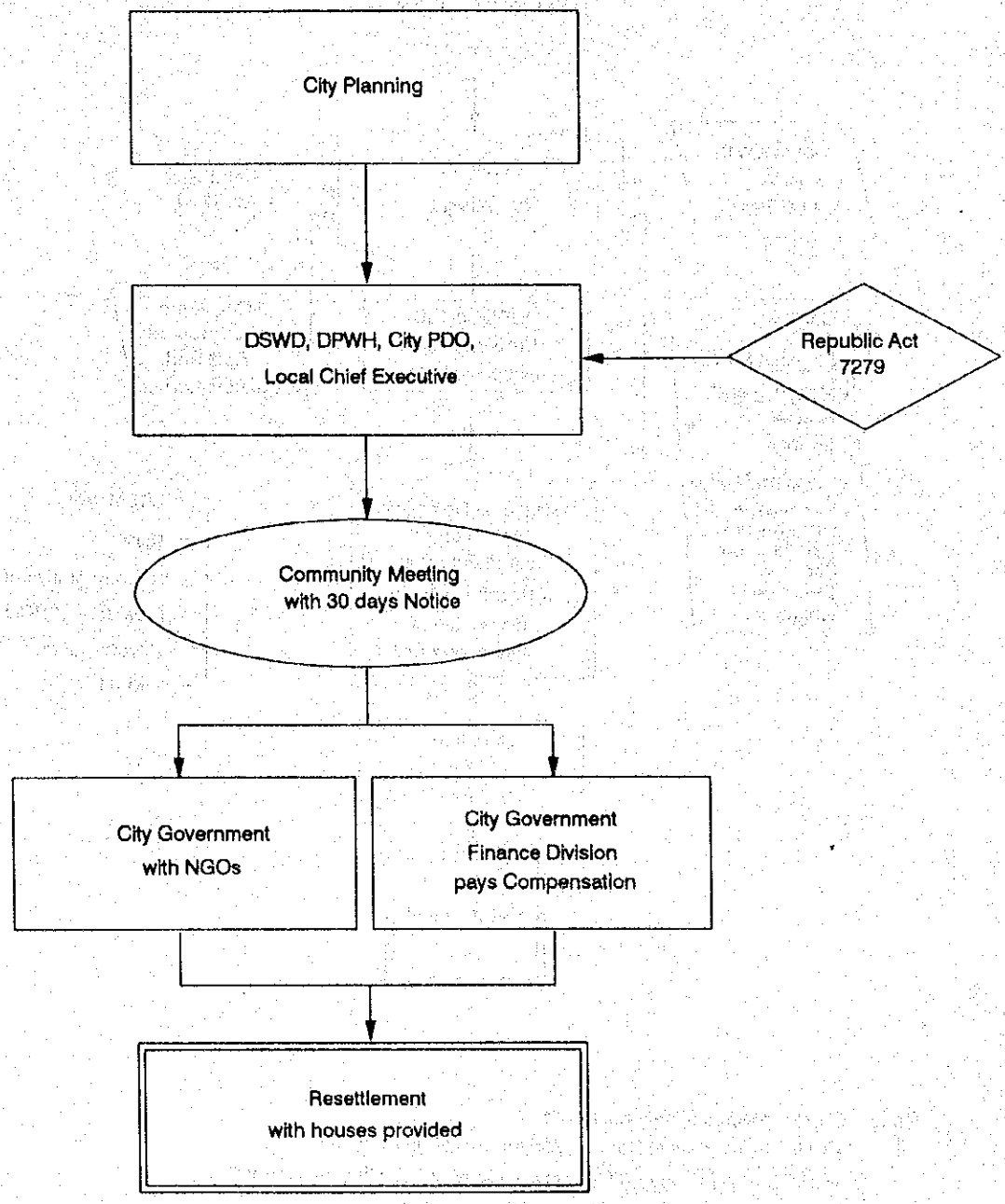
Note: EO = Executive Order
MO = Ministry Order

THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 7.3 Processing Chart for Compensation of Private House Owner (Ormoc City)



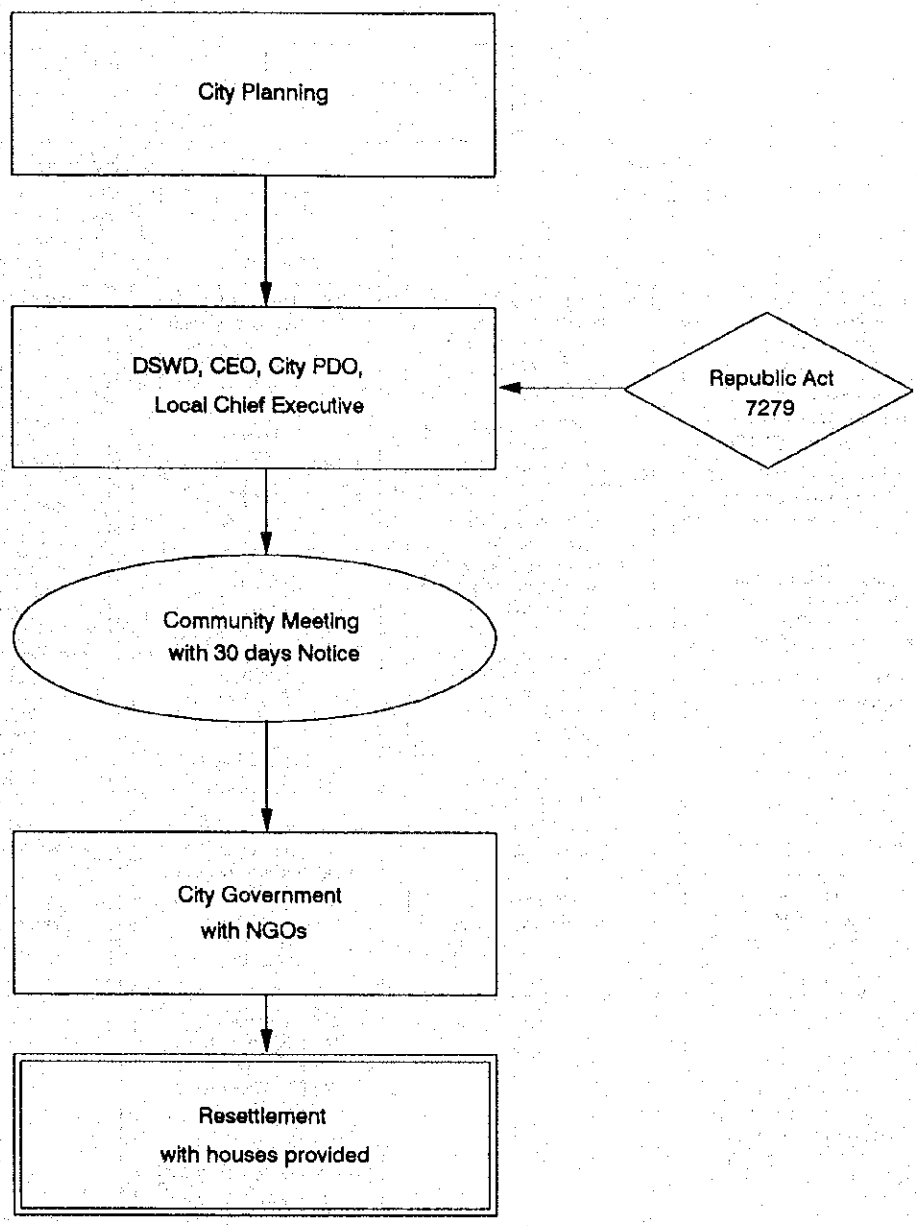
Note: PNP = Philippine National Police
PCUP = Presidential Commission for the Urban Poor
HUDCC = Housing and Urban Development Coordinating Council
HIGC = Home Insurance Guaranty Cooperation
NHA = National Housing Authority

THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 7.4 Processing Chart for Compensation of Squatter (Manila)



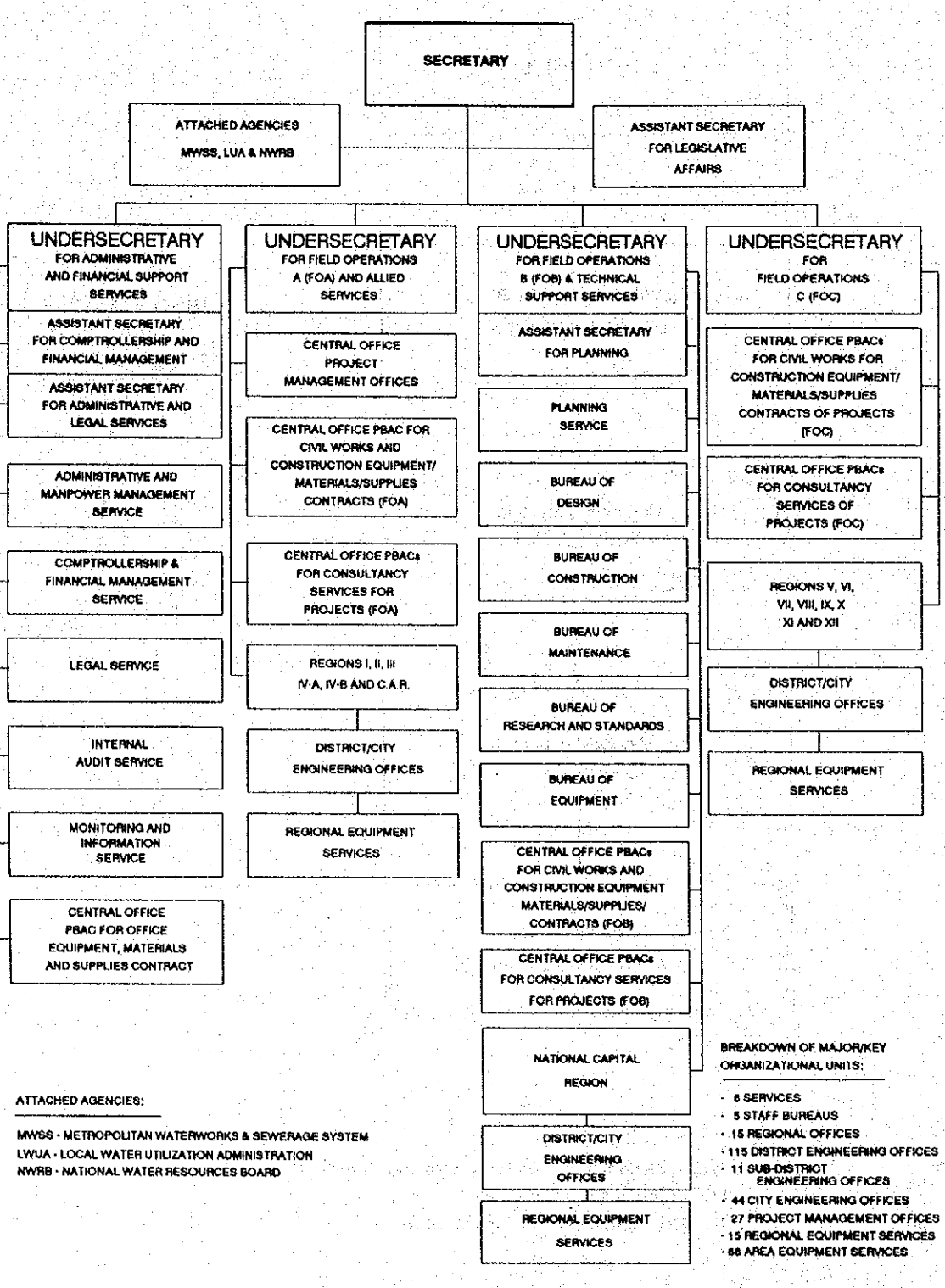
Note: DSWD = Department of Social Welfare and Development
CEO = City Engineer Office
PDO = Planning and Development Office

THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 7.5 Processing Chart for Compensation of Squatter (Iloilo City)



Note: DSWD = Department of Social Welfare and Development
CEO = City Engineer Office
PDO = Planning and Development Office

THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 7.6 Processing Chart for Compensation of Squatter (Ormoc City)



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

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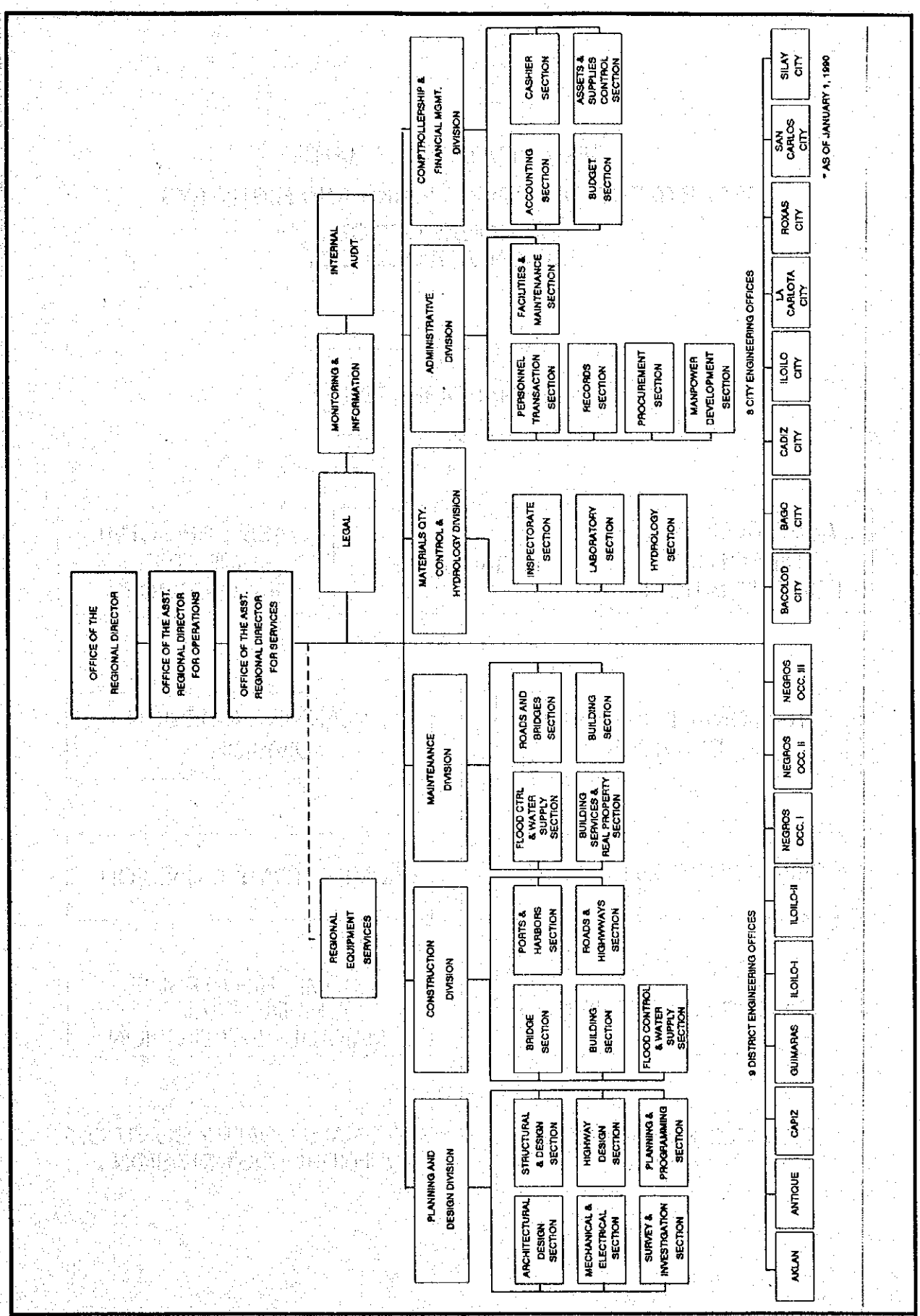
Fig. 7.7
Organization Chart of DPWH, Central Office



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

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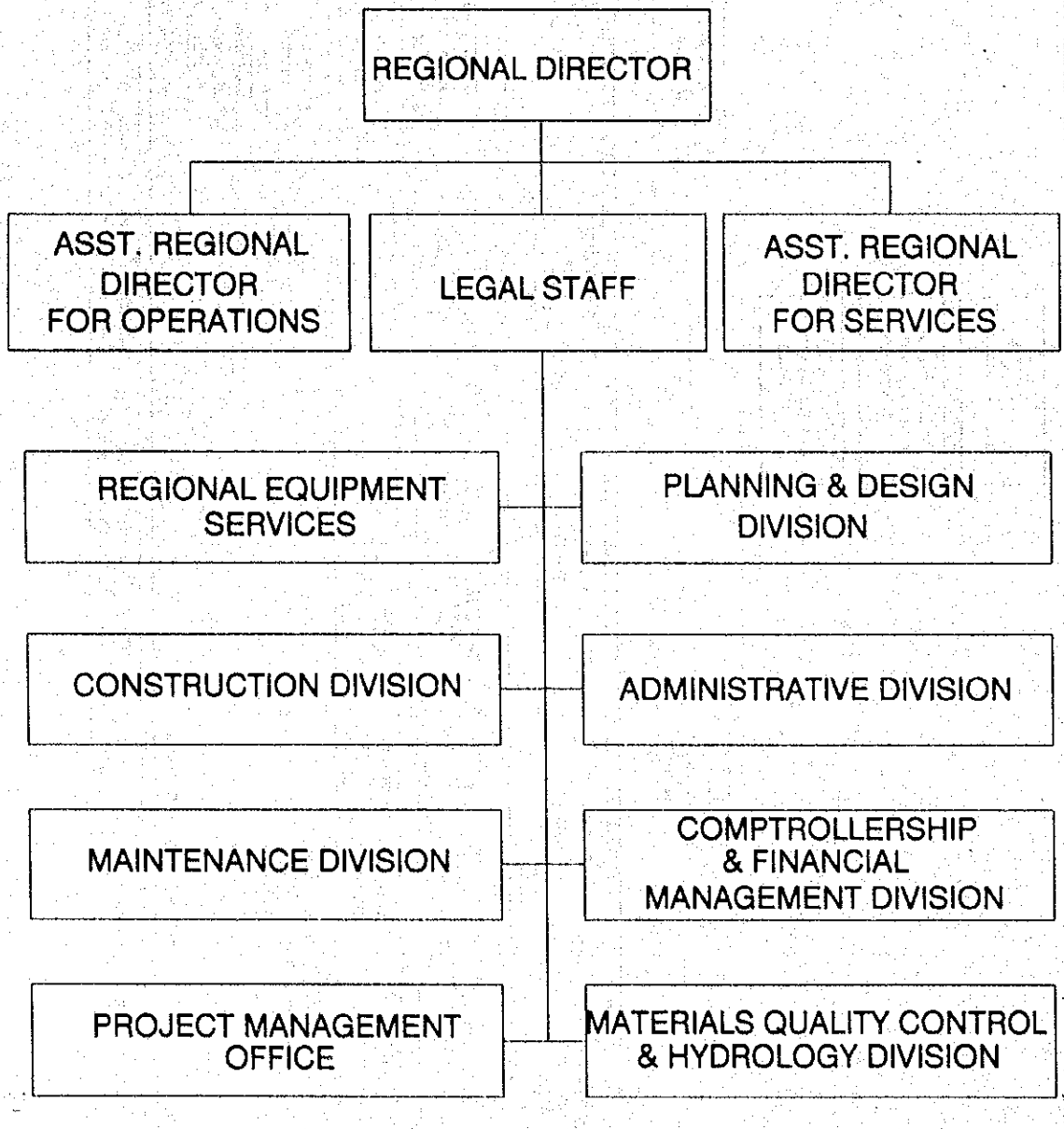
Fig. 7.8
Organization Chart of DPWH, Region VI

ORGANIZATIONAL CHART

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

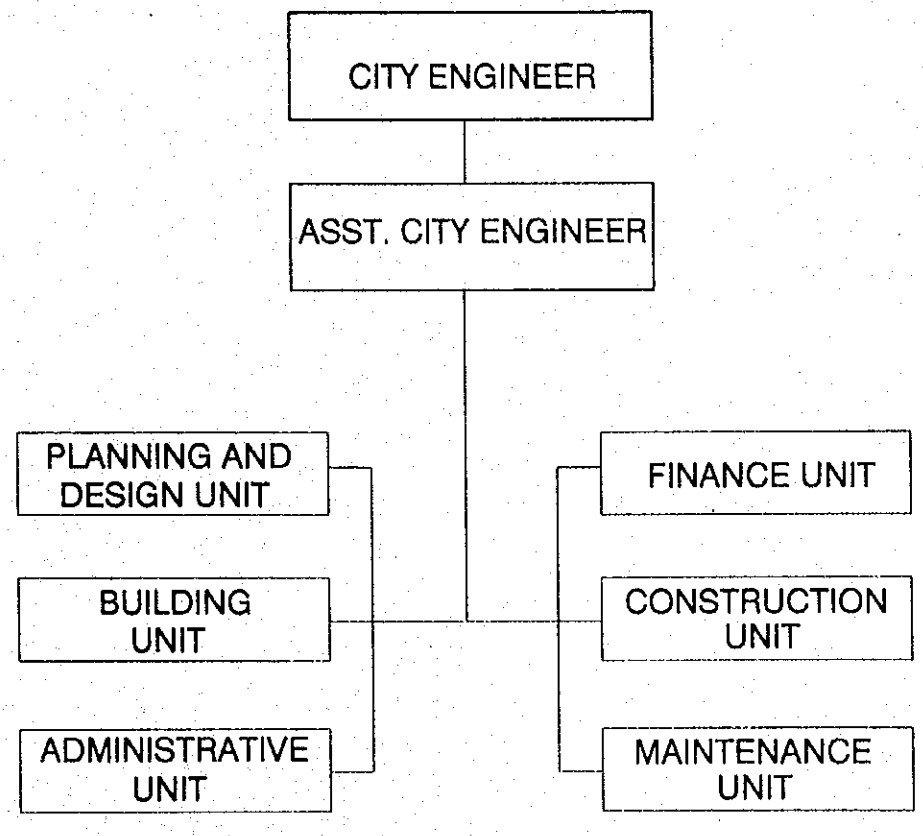
REGIONAL OFFICE
REGION VI ILOILO CITY



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 7.9 Organization Chart of Iloilo City

ORGANIZATION CHART

CITY ENGINEER'S OFFICE
ORMOC CITY



THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. 7.10 Organization Chart of Ormoc City

SUPPORTING REPORT

ON

ENVIRONMENT

(5)

SUPPORTING REPORT
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1. INITIAL ENVIRONMENT EXAMINATION

1.1 Legal and Institutional Framework

Laws, Regulations and Institutions on Environmental Protection

The main environmental legislation was formulated in the late seventies and were made operational in the eighties. Among these were Presidential Decree No. 1151, otherwise known as the Philippine Environmental Policy, and Presidential Decree No. 1152 or the Philippine Environment Code.

Presidential Decree No. 1151 states that "it shall be the policy of the state (a) to create conditions under which man and nature can thrive in productive and enjoyable harmony with each other; (b) to fulfill the social, economic and other requirements of present and future generations of Filipinos; and, (c) to insure the attainment of an environmental quality that is conducive to a life of dignity and well being." P.D. No. 1152 tried to address the total environment by requiring the establishment of standards for air and waste quality, and prescribing guidelines for land use management, natural resources management, natural resources management and conservation, utilization of surface and groundwater and waste management.

One of the most important provisions of P.D. No. 1151 (Section 4) is the requirement for "all agencies and instrumentalities of the national government, including government-owned or controlled corporations, as well as, private corporations, firms and entities, to prepare an environmental impact statement (EIS) on their every action, project or undertaking which significantly affects the quality of the environment." The requirement was formally administered with the establishment of the Philippine EIS system through Presidential Decree No. 1586. The decree was actually based on the environmental impact assessment requirement of Section 4 of P.D. No. 1151. The system's scope was also delimited to "environmentally critical projects or projects to be located in environmentally critical areas" (identified in Proclamation No. 2146).

Prior to this, the system underwent transition from a decentralized process to a centralized one, starting December 23, 1979 by virtue of an NEPC Council Special Memorandum. From the lead agencies, processing of EIS documents and issuance of Environmental Compliance Certificates (ECCs) for projects which have satisfactorily complied with the EIA requirement, was centralized in the NEPC which was under the Ministry of Human Settlements. Various other ministries, including the Ministry of Public Works and Highways (MPWH), were designated under Letter of Instruction (LOI) No. 1179 as lead agencies for various sectors. Thus the MPWH was the lead agency for major infrastructure projects, such as major roads and bridges.

With the change of government in 1986 came the reorganization of environmentally related agencies. The Department of Environment and Natural Resources (DENR) was established out of the Ministry of Natural Resources, and the Environmental Management Bureau (EMB) was organized out of the NEPC and the National Pollution Control Commission (NPCC). EMB also became the main implementing body of the Philippine EIS System.

Recently, DENR started to branch out its field operations to respective regions, such that in 1992, part of the EIA function of EMB was devolved to the newly formed regional offices of DENR (DENR-ROs), particularly the Environmental Management and Protected Areas Services (EMPAS) headed by a Regional Technical Director (RTD). Based on Department Administrative Order (DAO) 21 (series of 1992), the DENR-ROs shall be responsible for projects located in environmentally critical areas (ECAs), exemptible projects and all other applications that do not fall under environmentally critical projects (ECPs). DAO 21 also

underlined the importance of public participation in processing and review of EIA documents as well as in compliance monitoring.

Standards for Water Quality

DENR Administrative Order No. 34 shows the current water quality criteria by classification of water usage. This administrative order is the revision and the amendment of Section No. 68 and 69, Chapter III of the 1978 NPCC Rules and Regulations.

(1) Water Usage and Classification

The quality of Philippine waters shall be maintained in a safe and satisfactory condition according to their best usage. For this purpose all waters shall be classified according to the beneficial usage as shown in Table 1.1.

(2) Water Quality Criteria (for Fresh Water)

(a) Conventional and Other Pollutants Affecting Aesthetics and Oxygen Demand

The parameters and limits or specifications according to classification and use of the receiving body of water (RBW) are shown in Table 1.2.

(b) Toxic and Other Deleterious Substances

The maximum limits for the pollutants according to classification or use of the receiving body of water are shown in Table 1.3.

EIS System

The EIS System refers to the entire process of organization, administration and procedure institutionalized for the purpose of assessing the significance of the effects of physical developments on the quality of the environment.

Environmental Impact Assessment (EIA) is done during the feasibility stage of the project cycle where inputs from the study can really help in shaping a particular project to be both environmentally sound and economically viable. It should be started as early as possible and in parallel with other studies so that the environmental consequences of the project can be taken into account from the earliest planning stage. Recommendations can also easily be implemented without considerable change in plans and increase capital outlay.

(1) Projects Covered by EIS System

The following Environmentally Critical Projects and Areas fall under the scope of the EIS system. Proponents are required to apply for ECC before these projects can be implemented:

(a) Environmentally Critical Project

(i) Heavy Industries

- Non-ferrous metal industries
- Iron and steel mills
- Petroleum and petro-chemical industries
- Smelting plants

(ii) Resources Extractive Industries

- Major mining and quarrying projects
- Forestry projects
- Fishery projects

(iii) Infrastructure Projects

- Major dams
- Major power plants
- Major reclamation projects
- Major roads and bridges

Department of Public Works and Highways (DPWH) is preparing for a Department Order (DO) to revise Ministry Order (MO) No. 72 proclaiming certain areas and types of projects as environmentally critical and within the scope of the EIS system. New guidelines proposed in the draft DO are to supplement other infrastructure projects as the projects covered by the EIS system in consonance with the Memorandum of Agreement (MOA) entered into by and between Department of Environment and Natural Resources (DENR) and DPWH dated 26 June 1992. The supplemented projects include development, construction and maintenance of national roads, bridges and major flood control infrastructure projects. Major flood control project refers to any large scale activity which will involve river control works, channel widening, dredging and embankment and urban drainage works including cross drainage of diversion highway. The project cost of this type of project shall be at least one hundred million pesos (₱100,000,000) or more. The DO is expected to be signed and to take effect within the year of 1994. Therefore, it is desirable that the projects proposed in this study should follow the EIS procedure.

(b) Environmentally Critical Areas

(i) All areas declared by law as national parks, watershed reserves, wildlife preserve and sanctuaries.

(ii) Areas set aside as aesthetic potential tourist spots

(iii) Areas which constitute the habitat for any endangered or threatened species of indigenous Philippine wildlife (flora and fauna)

(iv) Areas of unique historical, archaeological or scientific interests

(v) Areas traditionally occupied by cultural communities or tribes

(vi) Areas frequently visited and/or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.)

(vii) Areas with critical slopes

(viii) Areas classified as prime agricultural lands

(ix) Recharge areas of aquifers

(x) Water bodies characterized by one or any combination of the following conditions:

- tapped for domestic purposes;
- within the controlled and/or protected areas declared by appropriate authorities; and
- which support wildlife and fishery activities.

(xi) Mangrove areas characterized by one or any combination of the following conditions:

- with primary pristine and dense young growth;
- adjoining mouth of major river systems;
- near or adjacent to traditional productive fry or fishing grounds;

- which act as natural buffers against shore erosion, strong winds and storm floods; and
- on which people are dependent for their livelihood.

(xii) Coral reefs characterized by one or any combination of the following conditions:

- with 50% and above live coral cover;
- spawning and nursery grounds for fish; and
- which act as natural breakwater of coastlines.

Processes in the EIS System

According to the manual on Environmental Impact Assessment (EIA) in the Philippines, EIA is done during the feasibility stage of the project cycle where inputs from the study can really help in shaping a particular project to be both environmentally sound and economically viable. It should be started as early as possible and in parallel with other studies so that the environmental consequences of the project can be taken into account from the earliest planning stage.

Therefore, in this stage of the Study, the following procedures for the EIS system are conducted according to the procedures for the EIS as shown in Fig. 1.1.

(1) The Pre-Study Phase

(a) Pre-screening

Prior to any project implementation, project proponents (PP) are to coordinate with the Environmental Management Bureau (EMB) or the nearest DENR Regional Offices (DENR-RO) to initially determine if the proposed project falls under the purview of the EIS System.

The project proponent, with the assistance of the EMB or the DENR-RO initially determines if a project falls within the EIS System by filling up ENFORM1.

If the project falls under the EIS System, the EMB/DENR-RO determines whether it is an Environmentally Critical Project (ECP) or is located in an Environmentally Critical Area (ECA).

If the project is not an ECP but is located in an ECA the proponent shall submit a Project Description (PD) to the DENR-RO.

(b) Scoping

For projects identified that would need an EIS, scoping sessions with DENR will follow. Scoping is a stage in the process where the information requirements for the EIS is established. This stage is considered to be important as it can provide to the proponent a clear direction for the environmental impact assessment work.

(2) The Study Phase

(a) Site Characterization and Prediction of Impacts

Once the study is scoped, the proponent shall now proceed with the EIS by collecting the necessary data information and predicting the project impacts. The main activities at this stage are Impact Identification and Impact Prediction .

(b) Evaluation of Impacts and Proposal of Alternatives

The identified impacts are compared with pre-defined acceptability criteria or existing environmental standards. The key activity at this stage is the evaluation of the significance of impacts, that is, judgment about which impacts found in the study are considered important and therefore needs to be mitigated.

(c) Identification and Assessment of Mitigating Measures

On the basis of the evaluation of impact, the corresponding mitigation measures are then identified and assessed. This stage also involve re-evaluation of impacts to determine whether the measures lead to acceptable levels of the impacts.

(d) Preparation of the Environmental Impact Statement (EIS)

Having determined the impacts and the corresponding mitigating measures, the next stage involves the preparation of the Environmental Impact Statement (EIS).

(3) The Post Study Phase

(a) Review of the EIS

For EIS, the EMB reviews and evaluates the documents. An ocular inspection may be conducted to check the veracity of the data contained in the EIS.

The EIS may be referred to the EIS Review Committee for further review and evaluation. The Committee may require the holding of a public hearing to be conducted by DENR.

After thorough evaluation of all inputs the Review Committee recommends for the approval or denial of the ECC.

(b) Granting of the Environmental Compliance Certificate (ECC)

Upon satisfaction of the process as prescribed by law, the DENR now grants an ECC to the proponent. The ECC shall contain several conditions that will specifically address the identified problems in the EIS. Once a proponent has obtained an ECC, he/she can now proceed with the establishment and construction of the proposed plant.

Scoping Session

For the above-mentioned purpose, DPWH, as a proponent of the Project, held the scoping sessions on June 21 in Ormoc City and on June 24 in Iloilo City. JICA Study Team assisted the Counterpart Team of DPWH with the preparation for the sessions and also participated in both sessions as observer.

(1) Iloilo

The persons invited to the scoping session were barangay captains, representatives of subdivisions and officials within the area which would be affected by the proposed flood control project, city elective and appointive government officials, and other private sector representatives.

First of all the regional director of DPWH asked the participants to understand the purpose of the project and to cooperate with the central/local government offices which are concerned in the project. Successively, the Counterpart Team of DPWH head office explained the EIS system and the outline of the project. After the

explanation, the participants freely expressed their opinion and asked some questions about the project.

Most of all speakers in the session seemed to understand the importance of the project, because they never made a denial of the project. Some of them advised technical adjustment of the structures according to their own experience, and the others requested to include their barangays in the project area.

(2) Ormoc

The persons invited to the scoping session were barangay captains and officials within the affected area, elective and appointive government officials, representatives of NGO and other private sectors.

First of all, the vice mayor of Ormoc City eagerly asked the participants to help realize the flood control project. Successively, the Counterpart Team of DPWH head office explained the EIS system and the outline of the project. After the explanation, the participants freely expressed their opinions and asked some questions about the project.

Most participants seemed to agree with the proposed flood control project. However, some of them requested not to take their lands away for river improvement, even if they understand the importance of the project in principle. A representative of NGO asked to take their reforestation project conducted in the upper reaches of both rivers into consideration for the EIA study.

1.2 Existing Environmental Conditions

Judging from the results of the field reconnaissance, the data/information obtained and the results of the preliminary environmental survey, environmental profiles of the four (4) cities and the river basins are described as follows, and also are characterized by the items defined in Environmentally Critical Areas (ECA) as shown in Table 1.4.

Iloilo City

(1) Physico-chemical Aspects

(a) Surface Water

Iloilo City is situated on a river delta. Flooding has been a perennial problem especially in the Jaro area near the banks of the Jaro River and other low areas within the city proper. Iloilo River has no recorded flooding.

Based on the streamflow records of rivers in the surrounding areas, the low flows of Jaro River and Iloilo River are estimated to be less than 0.01 m^3/s. With the distinct rainy and dry seasons, Jaro River is characterized by a regime with poor base flow and comparatively sharp flood peaks. Having rainfall retention in paddy fields, Iloilo River is characterized by a regime with not so sharp flood peaks as Jaro River.

The upper reach of this river, the Tigum River tributary catchment area, is a major source of potable water to the 300,000 inhabitants of Iloilo City and some 2,000 households in adjoining towns. It is also a source of irrigation water for about 2,900 hectares of agricultural lands benefiting some 1,276 farmers. A reservoir is located at Barangay Daja in the town of Maasin which is a major water source of the Metro Iloilo Water District (MIWD). However, due to heavy siltation of the reservoir storage area, which has not been rehabilitated for quite a time now, capacity has been diminished drastically. The catchment basin covering the Tigum River at Maasin has been declared as

the Iloilo Watershed Reservation otherwise known as the Maasin Critical Watershed Area.

Another reservoir, operated by the National Irrigation Administration (NIA), is located at Sta. Barbara and provides the irrigation water supply of the agricultural lands of the municipalities of Sta. Barbara, New Lucena, Pavia, Leganes and Jaro district of Iloilo City.

(b) River Water Quality

There are many ships anchoring along the riverside, but some of them are scrapped ships. The same is the recipient of domestic wastes from Iloilo City sewage drainage system and from industries such as piggeries and poultry farms, a slaughterhouse, a power plant, a beverage and a coconut oil factory. Iloilo river is classified as Class "C" and is regularly monitored at three sampling stations; Parola Bridge, Quirino Bridge and Carpenter's Bridge, to check its water quality and extent of pollution. The monitoring results show that the river still conforms with the water quality standard of Class "C".

Jaro River is regularly monitored at four sampling stations; Ticud Bridge, Ungka Pumping Station, Aganan Bridge (Pavia) and Maasin Dam, to check its water quality and extent of pollution. The upper reach of the river is still within the Class "A" water quality, except for the Total Suspended Solids (TSS) concentration which is slightly above the standard. Some of other stations at lower reach classified as Class "B" are not within Class "B" water quality, however, all of them conform with Class "C" water standard. The station downstream of the piggery farms has a slight increase in BOD.

Water quality survey was carried out to evaluate the existing environmental condition of Jaro and Iloilo rivers. River water samples were taken from center and bank side of the channel in the middle and the lower reach of each river. The location of sampling points is shown in Fig. 1.2. . Sampling was carried out three times; once each month of June to August in 1994. The following water quality parameters were analyzed using the indicated standard methods:

Parameter	Unit	Method of Analysis
Color	PCU	Visual Comparison Method (Platinum Cobalt Scale)
Water Temperature	°C	Mercury-filled Thermometer
pH	pH range	Glass Electrode Method
Dissolved Oxygen	mg/l, % saturation	Azide Modification (Winker Method)
BOD_5	mg/l	Azide Modification (Dilution Method)
Total Suspended Solids	mg/l	Gravimetric Method
Total Dissolved Solids	mg/l	Gravimetric Method
Phenolic Substances as Phenols	mg/l	4-aminoantipyrene method
Total Coliform	MPN/100ml	Membrane Filter
Chloride as Cl	mg/l	Gas Chromatography

Results of the survey are shown in Table 1.5. In the middle reach of Jaro river, BOD fluctuates a little and shows the values of class A to C, though DO satisfies a water quality criteria of class AA. This shows that river water in the middle reach is not so polluted with an organic substance such as sewage. T -SS

and Total Coliform shows higher concentration than water quality criteria. Phenol is detected with a level of class B or C, which shows river water seems to be slightly polluted with industrial wastewater. In the lower reach of Jaro River, river water seems to be affected by the effluents from the urban area, therefore DO shows lower concentration corresponding to class A than that of the middle reach, and BOD shows higher concentration corresponding to class A to D. T-SS and Total Coliform shows higher concentration than water quality criteria, especially Total Coliform is higher than that of the middle reach. Phenol is detected with a level of class B or C as shown in the middle reach.

As for Iloilo River, BOD shows higher concentration of the level of class C or D than that of Jaro River in the Middle reach. On the contrary, T-SS and Total Coliform are lower than those of Jaro River. High values of T-DS and Chloride seem to show an effect of sea water intrusion. Phenol is detected with a level of class A or B, which shows river water seems to be slightly polluted with industrial wastewater even if it is less polluted than Jaro River. In the lower reach, BOD, T-SS and Total Coliform show almost the same concentration as those of the middle reach. T-DS and Chloride are higher than those of the middle reach, which shows an effect of sea water intrusion. Phenol is detected with a level of class A or B even in the lower reach.

(c) Ground Water

The alluvial character of Iloilo City makes possible the tapping of shallow wells with very defined water levels. To meet the ever-increasing demands of the areas being supplied, wells have been constructed by the MIWD at San Miguel, Pavia and Oton. Water levels of dug wells vary from 3 m below the ground level near the coast to 10 m below the ground level just outside the city limit. Shallow wells with artesian aquifers are also found. Most of the deep wells coming from other municipalities supply the water demand of Iloilo City. Recharge of wells in Iloilo City and other areas come from precipitation and infiltration through an alluvial soil. Iloilo City has a relatively constant ground water level. Based on ground water quality studies, the water is highly mineralized and does not meet the criteria set by the Philippine National Standard for Drinking Water.

(2) Ecological Aspects

(a) Terrestrial Species

In the areas near the confluence of Tigum River and Aganan River forming Jaro River, rice is cultivated and coconut and clumps of bamboo are observed along the river banks. Going down the river, banana and coconut are cultivated at Tabuc-Suba area. Relatively strong species of grass and a few species of shrub, dominates the vegetation cover of the river banks. Corn is cultivated near the banks of Jaro River in Bo. Ingore. Coconut is likewise commonly found in those areas.

No significant vegetation is observed along the lower reach of Iloilo River except for a few *Avicennia* sp. and members of *Rhizoporaceae* family in the vicinity of the Molo Bridge.

No wildlife is observed in the vicinities of Iloilo River and Jaro River since the areas are highly urbanized. Bird life consists of weavers (associated with rice paddies) and kingfishers (associated with rivers and mangrove areas). Grand

scale conversion of mangrove areas to fishponds has also significantly reduced the habitat for a myriad of vertebrate wildlife associated with it.

One of the endangered species is "tibig". Another is the "Ayu" or mountain agoho. In the lowland area, vegetation consisted of the following: cotton, rice, corn, and cutflowers. The forest is found on mountain tops, ridges, steep slopes and gullies at the upper portion of the watershed. The brushland is usually composed of patches of bamboo stands mixed with few trees found on ridges, hillsides and gullies at the lower portion of the watershed. The grassland/openland is the dominant vegetation at the lower and the middle portions of the watershed. The vegetation is mostly cogon and Themeda.

(b) Aquatic Species

Iloilo River and Jaro River flow out into the water body surrounding Guimaras Island known as Iloilo Strait. Extensive coral reef used to cover the southwestern part of the island as well as other smaller islands close to it. Although a condition of the coral reef in Guimaras Island seemed to be the best of all other areas in 1970 s, destruction of the reef in Guimaras Island and its vicinities had already begun due to siltation, dynamite blasting and strong wave action. Currently, the coral cover is very sparse and a fish catch has dramatically declined according to a fisherman informant. No commercial fishing activity is observed in the Iloilo Strait, except for a few fish corral near the mouth of Jaro River that catch mainly estuarine species.

In Bo. Jinactacan where Jaro River exits to Iloilo Strait, the extensive juvenile growth of mangrove tree species belonging to the family *Rhizoporaceae* and genus *Avicennia* is observed. This mangrove vegetation serves to stabilize the delta. Young forest covers an area of approximately 65 hectares of the advancing delta formation on both sides of the river mouth. The mangrove community also serves as a sediment and nutrient trap of terrigenous origin carried by the river and the sea. During high tides, a large area of the delta is submerged, serving as a good feeding and spawning ground for estuarine and marine fauna. At the site of the proposed La Paz Floodway, adjacent to the sea, young mangrove tree species grow in the small inter-tidal area.

Ophicephalus sp. (mudfish), Gobiid species, fresh water eel, Tilapia, Gourami, *Clarias* sp.(catfish), *Portunus* sp., Scyllarid crabs and Penaeid shrimps are occasionally found in different parts of Jaro and Iloilo rivers. These are caught in small quantities only for a consumption of fishermen themselves.

(3) Socio-Economic Aspects

(a) Land Use

The main river body of Iloilo serves as a waterway for small water craft while the mouth is used as a wharf for inter-island vessels. Areas along the sides are used extensively as fish/prawn ponds. Salt beds are also found alongside the river, especially near the mouth. Fish traps also dot the main river body.

Almost all basin is the cultivated land for rice paddies.

(b) Demography and Manpower

Only about 7% of the population of five years old and over are migrants to Iloilo City in the past five years according to the 1990 census. Those who move in from other municipalities within the province and those from other provinces accounted for 3.1% and 3.4% respectively. Judging from the

interviews with settlers, the squatters mostly come from Capiz, Guimaras, Panay, Negros and Cebu.

Among the household population 15 years old and over or the economically active population, 46% are not in the labor force. About 29% of those not in the labor force is accounted for by those in the 15-19 years old age group. Among those who are in the labor force, about 91% are employed, namely unemployment rate is low at 9%.

(c) Housing

Significant residential development has occurred and subdivisions have proliferated in the various districts of Iloilo City to meet the growing housing demand. As of 1990, Arevalo had seven subdivisions; Mandurriao has 21; Molo has 10; Jaro has 47; City Proper has one; and La Paz has 12. Most houses are of permanent structures of durable material such as concrete and galvanized roofs. Most of these dwelling units are privately owned.

In the urban area of Iloilo City, squatters are found in the river channel. According to the data of Iloilo City, 242 households or population of 996 persons are estimated as squatters.

(d) Garbage Disposal

The city utilizes an open dump system for its solid wastes. There are two major dump sites for the city's solid wastes, one in Bgy. San Jose in the municipality of San Miguel and another in Santa Barbara which is about 20 km from the city center.

(e) Toilet Facilities

A considerable number of households do not have toilet facilities (6.8%). Without these facilities, this portion of the population tend to use the natural waterways and tributaries of the rivers included in the study. In the municipalities of the watershed, only 3.2% of their total populations do not have toilet facilities.

(f) Health and Social Services

Bronchitis, diarrhea and pneumonia are the three major causes of morbidity. Diarrhea may be due to the lack of safe drinking water and the living near and being exposed to polluted waters in the waterways.

Cebu City

(1) Physico-Chemical Aspects

(a) Surface Water

Cebu City and the five related river basins are characterized with evenly distributed rainfall throughout the year. Having a prevailing impervious clay loam soil cover, lack of forest cover, steepness of topography, and rather small rainfall, the rivers in Cebu City are characterized by a regime with no sustained base flow and extremely sharp flood peaks. The specific base flows of rivers in Cebu City are estimated to be less than 0.005 m^3/s.

No overflow was reported in the middle reaches of these five rivers in the last several decades, while in every lower reaches a narrow belt along the seashore is suffering from overflow. Flood hazard and flood prone areas are found in the low, flat lying areas, natural basins, areas near river banks and river constrictions and tidal flats. The major causes of floods are overbank flow,

stagnant water at several spots due to inadequate drainage and obstruction of solid waste and tidal floods in low lying areas. Overbank flows occur at Lahug River. Inadequate drainage and stagnant spots as well as tidal floods occur at areas near the mouth of Guadalupe River and Colon area.

These five major rivers in Cebu City serve mainly as urban drainage channels, as receiving bodies of sewage and domestic wastewater, and as dumping sites of solid domestic wastes. All of these rivers, except Bulacao, carry polluted, foul-smelling waters due to heavy garbage disposal, especially along the downstream sections in the urban and heavily populated areas.

(b) River Water Quality

According to the existing water quality data measured at several points of the rivers of Lahug, Guadalupe and Subang Daku, DO level (5.4 mg/l) at Busay of Lahug River passed the standard for Class "C" waters but those for Guadalupe and Subang Daku failed. All the rivers, however, do not pass the standard for the coliform count as well as BOD concentration indicating that these rivers are unfit even for irrigation or aquaculture use. Concentration of heavy metals was also detected in the three rivers.

Five rivers in Cebu City serve mainly as urban drainage channels as receiving bodies of sewage and domestic wastewater, and as dumping sites of solid domestic wastes. All of these rivers, except Bulacao, carry polluted, foul-smelling waters due to heavy garbage disposal, especially along the downstream sections in the urban and heavily populated areas.

Water running in Bulacao River is relatively of better quality than the others. It is still being used for washing clothes and bathing by residents near the river especially at the downstream section.

Guadalupe River is wide and deep in comparison with other rivers in the city, however, it looks like a sewer channel at the lower reach, especially in a dry season.

(c) Ground Water

Groundwater is the main source of potable water in Cebu City. It is being extracted from several hundred wells. The capacity and recharge possibilities of this aquifer are limited. Wells in these areas are therefore experiencing increasing salinization and contamination problems.

(2) Ecological Aspects

(a) Terrestrial Species

The forest lands in Cebu City have been categorized as follows: i) upland; ii) mangrove; iii) fishpond; and iv) reservation. The upland area is approximately 17,227 ha. Mangrove is almost sparse and fishpond development is nil. The reservation area is about 4.0 ha.

There are on-going reforestation projects implemented throughout the region but is not consistent with the concept of a watershed as a planning and management unit.

The upper stream basin of Bulacao River has been developed for housing; therefore, vegetation is quite thin.

As for Kinalumsan River, the upper stream basin above the Buhisan Reservoir is a watershed reservation area, therefore, deforestation is prohibited and "the

Cebu City Reforestation Project" is found. The Project has a total area of 7,236 ha. It was established in September 9, 1966. The vegetation of the Project exhibits some denudation but scattered patches of second growth forest of dipterocarp species can still be found in the area. In the basin below the reservoir, vegetation is mainly comprised of shrubs and coconut trees. Shrubs are used for firewood and charcoal.

Vegetation in the upper stream basin of Guadalupe River is mainly comprised of shrubs, bamboo and mangoes, and that in the upper stream basin of Subang Daku River is grassy.. Vegetation in the upper stream of Lahug River seems to be comparatively thick.

(b) Aquatic Species

The lower stream basin of Bulacao River is muddy plain and a mangrove swamp is slightly found around the river mouth. A coast line is a coral reef, however, it has been seriously damaged by human activities.

(3) Socio-Economic Aspects

(a) Land Use

A big portion of the watershed divide separating Bulacao River catchment area from Kinalumsan River watershed is currently being developed into a big residential area. An area of about 300 ha has been cleared and is already being developed and more portions are still being excavated. The basin of Linao River which is one tributary of Kinalumsan River system has been developed for housing, however, there must be some problems in drainage system and the river often flooded. The upper stream basin of Subang Daku River has been developed for a residential zone for upper income group.

(b) Housing

Squatter shanties abound especially along the waterways. Housing in Cebu is increasingly getting to be difficult due to limited availability of units and high rental rates. Residential development has proceeded at a fast pace as is true for other progressive urban centers around the country. Development was noted even in very critical areas such as within natural river channels, in naturally reclaimed areas along the river banks, and in steep hillside slopes.

Some squatters are found along the mid and the lower reaches basin of Bulacao River. Furthermore, many squatters are found along the lower reach of Kinalumsan River, are found along the whole reaches; from the river mouth to the upper reach of Guadalupe River, are found along the upper and mid reaches and around the river mouth of Lahug River, and are found along the Subang Daku River below the new residential zone and around the river mouth.

(c) Toilet Facilities

A considerable number of households do not have toilet facilities (10.2%). The households account largely for those who use natural waterways and tributaries of the rivers included in the Study for human waste disposal.

(d) Garbage Disposal

Almost half of the total number of households have their garbage collected while about 35% of the households burn their garbage. But even with the city government providing garbage collection services for much of the city, some members of the community still insist on throwing their domestic wastes into rivers and tributaries which are accessible to them.

(e) Health Status

Heart and circulatory ailments is the number one killer disease. Diarrhea may be due to the lack of safe drinking water and living near and being exposed to polluted waters in the waterways.

Ormoc City

(1) Physico-Chemical Aspects

(a) Surface Water

Anilao and Malbasag river basins in Ormoc City are characterized with evenly distributed rainfall throughout the year. Though the river basins are very steep, the base flows are rather big for their catchment area due to rich springs in the upper stream areas. On the other hand, river flood flow is quite fast and sharp as evidenced by the flood on November 5, 1991.

(b) River Water Quality

Water quality survey was carried out to evaluate the existing environmental condition of Anilao and Malbasag rivers. River water samples were taken from center and bank side of the channel in the middle and the lower reach of each river. The location of sampling points is shown in Fig. 1.3. Sampling was carried out three times; once each month of June to August in 1994. The same water quality parameters were analyzed using the same methods as those of the survey in Iloilo.

Results of the survey are shown in Table 1.6. In the middle reach of Anilao River, BOD and DO satisfies a water quality criteria of class A. This shows that river water in the middle reach is not so polluted with an organic substance such as sewage. Total Coliform shows rather high concentration, however the content of Fecal Coliform seems to be low judging from concentration of BOD. BOD in the lower reach satisfies only the level of class D. Total Coliform shows as high concentration as that of the middle reach. Phenol is detected with a level of class AA not only in the middle reach but also in the lower reach, which shows river water seems to be slightly polluted with industrial wastewater. T-SS is rather low in both reaches.

As for Malbasag River, BOD and DO satisfies a water quality criteria of class A in the middle reach. Total Coliform shows rather high concentration like that of Anilao River. In the lower reach, BOD only satisfies a water quality criteria of class D, which shows the river water is affected by the effluent from urban area. . Total Coliform shows high concentration like that of the middle reach. T-SS is rather low in both reaches. However, Phenol is not detected in both reaches.

(c) Ground Water

The local water district extensively uses ground water for its commercial and domestic needs. The existing water supply, which was constructed some 30 to 40 years ago, is capable of supplying water of about 8,300 m^3/day to the city. The water source comes from two groups of springs located along Anilao and Malbasag rivers plus pipe production wells. Presently, these sources are still in good condition in terms of their production and pumping capacities. Ground water recharge comes from precipitation and infiltration from Lake Danao.

(2) Ecological Aspects

(a) Terrestrial Species

Banks of Anilao and Malbasag rivers are covered with small shrubs and grasses of several species. Significant species that contribute to the stability of the banks are *Imperata cylindrica* (cogon) and *Saccarum spontaneum* (talahib). Several trees like *Coco nucifera* (coconut), *Leucaena glauca* (ipil-ipil), *Muntingai calabara* (ratiles) and *Theobroma cacao* also thrive here. *Musa* spp. (bananas), *Manihot utilissinma* (camoteng kahoy) and *Carica papaya* are cultivated along the river banks. *Pistai stratiotes* (quiapo) was also noted near Anilao Bridge. *Ipomoea reptans* (kangkong) is abundant in the river and serves as a means of livelihood for residents of nearby areas.

No wildlife is observed around the project site since it has become urbanized.

(b) Aquatic Species

Part of Ormoc Bay where Anilao River discharges is characterized by shallow and muddy sea floor. Large quantities of coarse and fine particles are present, presumably carried to the sites by the flood during typhoon "Uring". The reef flats and occasional bands of seagrass/algal beds are quite far from the area.

About 8 km from the city is Brgy. Macabug where a fish sanctuary is located. It covers around 20 ha of marine water. A coral rehabilitation project is underway within the zone. The recovering reef system is about 2 ha in area. Fishermen report good coral growth of a few centimeters, after a respite from dynamite fishing, trawling, and other destructive fishing practices. To the west of the city are Brgy. Naungan, Lao, and San Juan, which are noted for extensive mangrove swamps and rich estuaries. Most of the fishery products sold in Ormoc City come from these fishing areas.

Fish species of commercial importance belonging to the general *Siganus*, *Caesio*, *Therapon*, *Leiognathus*, *Chanos*, *Epinephelus*, and *Latjanus* are common. Penaeid shrimps, mud crabs (*Scylla* sp.) and blue crabs (*Portunus*) abound in these areas. *Ophicephalus* sp. (mudfish) is found in Anilao River, according to local residents. A few small halfbeaks (*Hemiramphus* sp.) were observed near the Anilao Bridge.

(3) Socio-Economic Aspects

(a) Demography and Manpower

The same level of population growth between Ormoc and the country suggests that migration was not a factor in population change of Ormoc City. The 1991 flood, however, reduced the population of the city by 5,766 based on official reports; 4,561 persons dead and 1,205 persons missing. Prior to the 1991 disaster in Ormoc, Isla Verde and areas near the mouths of both Malbasag and Anilao rivers were among the most densely populated areas in the city. A large number are squatters who came from the rural hinterland and neighboring towns. Isla Verde alone is said to have had a population of more than 4,000. These settlements were washed out by the flood, with Isla Verde registering the highest number of casualties. The areas are now generally clear of squatters as most of those whose houses were completely damaged have been relocated in various resettlement projects. The remaining houses in the sites are confined in private lands.

About 94% of the population of the city in 1990 have been residing in Ormoc for at least five years. Only the remaining 6% are considered recent migrants,

having transferred to Ormoc within the last five years. They reportedly come from other towns of Leyte, from neighboring provinces and some are from foreign countries. Migration to Ormoc was highest during the period of 1975-1980.

From its economically active population, 55% is in the labor force. This indicates the presence of a large potential labor force. Of its labor force, 93.5% are employed while 6.5% are unemployed. About 48% or almost half of the labor force are employed in agriculture and about 26% .are employed in the fishing sector.

(b) Land Use

Major part (more than 80%) of the river basin is under agricultural land-use. Very small part of the basin comprise built-up areas which include the city proper. Major agricultural crops in the area are sugarcane, coconut and paddy rice. Areas planted to sugarcane comprise more than 60% of the total watershed area, some of which can be found as high as 600 m elevation. Coconut fields cover only about 20% while paddy ricefields constitute a very small portion of the total watershed area. Non-agricultural areas are open grasslands which area used sporadically s pasture or kept under fallow. Second forests and relics of old-growth forest are confined in the higher portions of the river basin.

(c) Housing

Most houses in the city center and in residential subdivisions around the city center are permanent structures. Wooden houses predominate in rural areas and the poor sections of the city while the squatter population used to live in makeshift houses along the rivers. Most of the dwelling units are privately owned. A large percentage of the household are staying in their own houses thus those who are renting houses compose a minority among total households.

The 1991 calamity aggravated the housing situation in the city. The floods affected a total of 39,691 households. It rendered 3,193 families totally homeless while 12,470 more had had their houses partially destroyed. Consequently, six resettlement areas covering a total of 18.5 ha were established for families whose houses were completely destroyed. A total of 1,935 housing units were targeted to be provided in these resettlement areas. It is noted that total housing units made available in resettlement projects are below the total houses destroyed during the flood. This means that there are still families which are without permanent homes and who continue to reside in high risk areas.

(d) Toilet Facilities

A significant number of households (39.2%) that had no toilets at all. In some houses along the Anilao River, improvised toilets which extend to the river can be noted.

(e) Garbage Disposal

The city center has a garbage collection system with a dumpsite located in an open field in Brgy. Macabog, about 7 kilometers away from the city center, however, those residing near rivers and drainage canals conveniently dump their solid wastes into them. This practice is evident along bridges located within the city center although most of the garbage clogging the rivers have been flushed out to the sea during the flood.

Tacloban City

(1) Physico-Chemical Aspects

(a) Surface Water

The Abucay River, defined as an urban drainage channel lying on the northwestern side of the city watershed area, used to be an irrigation water source for some agricultural lands in Barangays Abucay and Naga-Naga. The river drains to the Anibong Bay which is situated west of the Panalaron Bay.

Mangonbangon River runs along the western side of the city proper, carries part of the city's run-off, wastewater and solid domestic wastes and drains to Panalaron Bay.

The catchment areas of Abucay, Mangonbangon and Burayan rivers are small at less than 10 km^2 and flat with poor vegetation. Therefore, low flows of the rivers are very small, while storm rains usually bring sharp and high flood peaks.

(2) Ecological Aspects

(a) Terrestrial Species

None of the rare, threatened and endangered flora and fauna listed for Region VIII are present here.

(b) Aquatic Species

Near the mouth of Abucay River are remnants of both mangroves and littoral forest. The key mangrove species observed were mayapi and nipa. Water from Abucay River is comparatively of better quality than the Mangonbangon River and continuously serves as a habitat for several smaller fish species. Mangonbangon River, although of poor water quality, still plays host to catfish and mudfish. This might be due to negligible amount of industrial waste discharged to the river.

(3) Socio-Economic Aspects

(a) Land Use

In the lower stream basin, some fishponds are found.

(b) Housing

It is estimated that the number of households residing along the two-kilometer stretch of the Mangonbangon River embankment can be as high as 4,000. Most of these households are squatting on private and public lands and on the river right-of-way. The city government has opened three resettlement sites in the Tigbao and Palanog Districts, several kilometers away from the city.

Squatter houses are concentrated on two sections of the Abucay River, one is on a relatively low-lying area while the other one is near the discharge point to the Anibong Bay.

Several esteros and storm sewer lines connect also to the river. Within the city proper, the storm drainage system serves at the same time as the receiver of wastewater effluent since there are no other means of disposing these. Bulk of these wastewater eventually finds its way into the Mangonbangon River which has already become an offensive breeding place for flies, mosquitoes and from which foul odor emanates.

Squatter houses line almost the whole length of the Mangonbangon River, with some of these houses literally built over sections of the main river body.

Majority of the city area are low-lying and relatively flat, allowing only a small difference in elevation between the upstream and the downstream sections and impeding the flow of water by gravity. Constriction of the drainage arteries due to building improvements and construction of structures such as houses, wall fences and causeways on the easements result also to an invariable decrease in the flow of water.

(c) Toilet Facilities

There are some 2,404 households (10%) that had no toilets at all. Many of these households can be found in the esteros and near the seawall. In squatter settlements along Mangonbangon River, improvised toilets extend to the river.

(d) Garbage Disposal

The city center has a garbage collection system with a dumpsite, however, most of those residing near rivers and drainage canals simply dump their solid waste into them. The volume of garbage, particularly plastic materials, that have accumulated at the mouth of Mangonbangon River is considerable. The clogging of the river near its mouth by garbage is one of the causes of flooding during the typhoon season.

(e) Health Status

It will be noted that at least four of the causes of morbidity (diarrhea, dengue fever, typhoid fever and hepatitis) can be directly attributed to unsanitary living conditions. Along the esteros, skin diseases among children, which are also caused by poor hygiene, are reported to be prevalent.

Tacloban is a Schistosomiasis endemic city. Caibaan, Marasbaras, Manlurip, Tagpuro, San Paglaum and Divisoria are positive barangays in the city.

The river basin is considered as one of breeding areas of Schistosomiasis

(f) Community

There are two organizations which draw most of their members from the urban poor in squatter areas. One is an organization of market vendors called NAGBENTA (Nagkaurosa nga Bendors sa Tacloban) while the other is PAGMATA (Pagkakaisa ng mga Maralitang Taga-Lungsod ng Tacloban). The PAGMATA members were the frontliners in opposing the resettlement of the urban poor in Barangay 37 or the Seawall District. They will be a force to contend with in any relocation projects as they can easily mobilize the urban poor.

2. ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

2.1 EIA for Master Plan

Future Environment without the Master Plan

Without the implementation of the Master Plan, the environmental conditions at the sites are expected to remain the same as the present or deteriorate. The flood-prone areas in the selected urban areas will continue to be subjected to flooding during the rainy season. Probable damages without the Plan are estimated as follows:

Area	Project Site	Affected Population (persons)	Area Inundated (km^2)	Value of Damageable Property (mil. pesos)
Iloilo	Jaro River Basin	111,471	32.0	921.0
	Iloilo River Basin	37,864	9.0	456.7
	Drainage Rehabilitation Area	2,997	0.6	16.4
Cebu	Bulacao River Basin	8,036	2.7	102.0
	Kinalumsan River Basin	93,852	4.4	331.9
	Guadalupe River Basin	102,273	3.8	440.7
	Lahug River Basin	58,509	2.4	291.2
	Subang Daku River Basin	6,114	2.6	159.7
	Drainage Rehabilitation Area	18,618	1.0	167.9
Ormoc	Anilao & Malbasag River Basin	21,570	2.4	252.0
	Drainage Rehabilitation Area	346	0.2	2.5
Tacloban	Drainage Rehabilitation Area	11,088	1.3	106.6

Water quality in the four cities will deteriorate especially at rivers and drainage channels where the basins are urbanized and densely populated. If the measures such as alignment of river/drainage will not be taken, garbage and sewage from the squatters along the channels will continue to deteriorate water quality.

If the measures such as revetment, retaining wall and drop will not be taken, channel erosion and siltation problems will increase.

If the flooding problems will not be settled, economic dislocations will continue to affect the areas and the regional economy will hardly grow. Furthermore, values of property in the areas will not increase due to the recurrent flooding damage.

Inhabitants in the areas will never be relieved of unsanitary health conditions caused by the recurrent inundation.

Prediction and Assessment of Impacts

The prediction and assessment of impacts was accomplished through the use of interaction matrices filled up for each specific site and project stage. The matrices for Iloilo, Cebu, Ormoc and Tacloban cities are given in Table 2.1 to 2.4, respectively. Referring to these matrices, evaluation for the environmental impacts are described as follows.

(1) Iloilo

The significant beneficial impacts of the project involve:

- dramatic improvement in hydraulic conditions of Jaro, Iloilo and Mandurriao river systems, and urban drainage systems;

- removal of solid wastes dumped in the river and the drainage channels which will be brought with the channel widening or deepening work;
- improvement of offensive odor and unhealthy environment by the removal of solid wastes dumped in the channels;
- increase of aesthetic potential of waterfronts by the river/drainage channel improvement;
- activation of the regional economy by providing a flood-free urban center;
- increase of land use potential and land values of the existing flood-prone areas;
- reliable transportation system free from stagnant traffic caused by floods;
- a clean and healthful urban community, and a safe and more pleasant living condition in the urban area;
- enhanced environmental health conditions in the flood-alleviated areas;
- local employment generation during construction; and
- activation of trade and industry by the construction and related materials that the project would require.

The significant adverse impacts relate to:

- relocation of the inhabitants that would be forced by right-of-way acquisition for the floodways and channel improvement;
- noise and vibration problem caused by construction work in the crowded areas;
- effect on the river water quality and on the ecological conditions caused by the excavation work;
- a large amount of spoils generated by excavation work, which would disperse as dust or cause offensive odor;
- impacts on the transport of goods and services to/from the city caused by a disruption of the traffic for construction work in the crowded areas of commercial and industrial districts;
- the proposed floodways which would diminish the rice paddies and the fishponds;
- mangrove vegetation around the mouths of the proposed floodways which might be diminished by the diverted flood water;
- transformation of the coastline around the proposed floodways due to a change of sediment yield conditions; and
- the proposed Jaro floodway which might be felt somehow out of place in a flat plain

In Iloilo, the terrain is relatively flat and the population density is still quite low, therefore, residential development for resettlement is comparatively easy. Then, land acquisition is not considered as a serious problem.

(2) Cebu

The significant beneficial impacts of the project involve:

- dramatic improvement in hydraulic conditions of five main river systems, and drainage systems in the urban area;

- removal of solid wastes dumped in the river and the drainage channels which will be brought with the channel widening or deepening work;
- improvement of offensive odor and unhealthy environment by the removal of solid wastes dumped in the channels;
- improvement of channels view by the river/drainage channel improvement;
- activation of the regional economy by providing a flood-free urban center;
- increase of land use potential and land values of the existing flood-prone areas;
- reliable transportation system free from stagnant traffic caused by floods;
- a clean and healthful urban community, and a safe and more pleasant living condition in the urban area;
- improvement of the total public works that the city needs; in other words, lesser damage to other infrastructure and fixtures that would be brought with improvement of drainage
- enhanced environmental health conditions in the flood-alleviated areas;
- local employment generation during construction; and
- activation of trade and industry by the construction and related materials that the project would require.

The significant adverse impacts relate to:

- relocation of the inhabitants that would be forced by right-of-way acquisition for the channel improvement;
- noise and vibration problem caused by construction work in the crowded areas;
- spoils generated by excavation work, which would disperse as dust or cause offensive odor;
- impacts on the transport of goods and services to/from the city caused by a disruption of the traffic for construction work in the crowded areas of commercial and industrial districts; and
- reduction of private property areas where river channels are to be widened.

In Cebu, the beneficial impacts are expected to be many, however, the adverse impacts are also expected to be many.

(3) Ormoc

The significant beneficial impacts of the project involve:

- dramatic improvement in hydraulic conditions of Anilao and Malbasag river systems, and urban drainage system;
- increase of aesthetic potential of waterfronts by the river/drainage channel improvement;
- activation of the regional economy by providing a flood-free urban center;
- increase of land use potential and land values of the existing flood-prone areas;
- reliable transportation system free from stagnant traffic caused by floods;
- a clean and healthful urban community, and a safe and more pleasant living condition in the urban area;

- improvement of the total public works that the city needs; in other words, lesser damage to other infrastructure and fixtures that would be brought with improvement of drainage
- local employment generation during construction; and
- activation of trade and industry by the construction and related materials that the project would require.

The significant adverse impacts relate to:

- relocation of the inhabitants that would be forced by right-of-way acquisition for the channel improvement;
- noise and vibration problem caused by construction work in the crowded areas;
- effect on the river water quality and on the ecological conditions caused by the excavation work;
- spoils generated by excavation work, which would disperse as dust or cause offensive odor; and
- impacts on the transport of goods and services to/from the city caused by a disruption of the traffic for construction work in the crowded areas of commercial and industrial districts.

(4) Tacloban

The significant beneficial impacts of the project involve:

- dramatic improvement in hydraulic conditions of small river systems, and urban drainage systems;
- removal of solid wastes dumped in the river and the drainage channels which will be brought with the channel widening or deepening work;
- improvement of offensive odor and unhealthy environment by the removal of solid wastes dumped in the channels;
- improvement of channels view by the river/drainage channel improvement;
- activation of the regional economy by providing a flood-free urban center;
- increase of land use potential and land values of the existing flood-prone areas;
- reliable transportation system free from stagnant traffic caused by floods;
- a clean and healthful urban community, and a safe and more pleasant living condition in the urban area;
- improvement of the total public works that the city needs; in other words, lesser damage to other infrastructure and fixtures that would be brought with improvement of drainage
- enhanced environmental health conditions in the flood-alleviated areas;
- local employment generation during construction; and
- activation of trade and industry by the construction and related materials that the project would require.

The significant adverse impacts relate to:

- relocation of the inhabitants that would be forced by right-of-way acquisition for the channel improvement;