## 4.3 Construction Plan and Cost Estimate

### 4.3.1 Construction Plan

For construction planning and scheduling, the following basic conditions are taken into consideration.

(1) Outline of Work

(a) River Improvement

River improvement lengths in the four cities are given below.

| Item No. | Particulars | Unit | Iloilo (2 rivers) | Cebu (5 rivers) | Ormoc (2 rivers) |
|---|---|---|---|---|---|
| 1. | Excavation | 1,000 $m^3$ | 3,144 | 1,176 | 391 |
| 2. | Embankment | 1,000 $m^3$ | 598 | 30 | 45 |
| 3. | Dredging | 1,000 $m^3$ | 1,265 | - | - |
| 4. | Revetment | 1,000 m | 17 | 1 | 10 |
| 5. | Retaining Wall | m | - | 42,400 | 2,190 |
| 6. | Backfill Concrete | 1,000 $m^3$ | 43 | 9 | 105 |
| 7. | Sodding | 1,000 $m^2$ | 275 | 39 | 22 |
| 8. | Gravel Pavement | 1,000 $m^2$ | 183 | 16 | 22 |
| 9. | Drops | m | - | 528 | 219 |
| 10. | Bridge | $m^2$ | 5,100 | 6,665 | 2,080 |
| 11 | Slit Dam | No. | - | - | 3 |

(b) Drainage Improvement

Lengths of drainage channel improvement in the four cities are summarized in the following table.

| Item No. | Particulars | Unit | Iloilo (3 channels) | Cebu (9 channels) | Ormoc (2 channels) | Tacloban (7 channels) |
|---|---|---|---|---|---|---|
| 1. | Excavation | 1,000 $m^3$ | 178 | 85 | 6 | 183 |
| 2. | Revetment | 1,000 m | 17 | 14 | 3 | 25 |
| 3. | Bridge | $m^2$ | 1,100 | 285 | 174 | 480 |

(2) Workable Days

River improvement works should be carried out only in the dry season because they consist mostly of earthworks such as excavation and embankment which are not expected to have good performance under the rain; besides, it is a risky job to undertake such works at the threat of flooding. Based on the rainfall data, the annual workable days are given in the following table.

| City | Mean Annual Rainfall (mm) | No. of Rainy Days | Assumed Workable Day |
|---|---|---|---|
| Iloilo | 2,055 | 65 | 215 |
| Cebu | 1,634 | 57 | 229 |
| Ormoc | 2,279 | 65 | 215 |
| Tacloban | 2,913 | 94 | 223 |

Source: PAGASA and EDC

(3) Standard Construction Method

Construction is to be carried out by conventional construction methods using standard types of equipment.

(4) Work Plan and Construction Materials

The work plan must be safely and economically established with consideration given to the scale of the works and site conditions. The standard construction method for main work items are described as follows:

Excavation for on-land works is to be carried out by a combination of 15-ton bulldozers, 0.6 $m^3$ backhoe and 11-ton truck. Excavation works for submerged portions lower than the tidal water level, EL. 0.0 m, are to be carried out by a 0.6 $m^3$ backhoe and 11-ton truck.

Excavation materials above water level in the project area are mostly usable as embankment materials. Embankment works including moisture control, spreading and compacting of materials are planned to be carried out by a combination of 15-ton bulldozers, 8-ton tire roller and 0.8 $m^3$ wheel loader.

In general, construction materials such as cement, steel bars and aggregates for concrete can be procured from local suppliers with some difference in availability among the four cities.

(5) Construction Period

Based on the construction capability and budget availability, river and drainage improvement works are carried out for periods of three and two years, respectively.

### 4.3.2 Cost Estimate

**Conditions for Cost Estimate**

The conditions for cost estimate are as follows:

(1) Project Cost

Project cost is estimated on the following assumptions:

(a) Construction works are to be executed by the contract system.

(b) Unit cost of each construction work item is estimated on the unit price basis, except for some work items which are estimated on lump sum/percentage basis.

(c) Unit prices are based on the price level of June 1994.

(d) Local currency is used for the cost estimate.

(2) Constitution of Project Cost

The financial project cost consists of the main construction cost, compensation cost, administration cost, engineering cost, and contingencies.

(3) Main Construction Cost

The main construction cost consists of the cost of preparatory works, main works and miscellaneous works.

(a) Preparatory Works

The cost of preparatory works for river improvement is usually ranging 5 to 10% of the cost of main construction works depending on the project study status. At a master plan stage, 10% which is in the higher side of the range is applied.

(b) Main Works

The cost for main works is computed by multiplying the unit cost with the work quantity. The unit cost of each item consists of direct cost and indirect cost. The direct cost in unit cost consists of materials cost, equipment expenses and labor cost which were estimated according to "1989 Operated ACEL Rental Rates Plus Increase Cost of Fuel as of December 11, 1990"; the Bureau of Construction, DPWH, and similar projects in the study area. Indirect cost consist of four (4) items. The first consists of overhead, contingencies and

miscellaneous (OCM). The second is profit. The third are mobilization and demobilization expenses of the contractor. The fourth is value added tax (VAT). At this stage, the unit cost of each item includes direct cost and indirect cost.

(c) Miscellaneous Works

The cost of miscellaneous works is, in general, to be accounted as a certain percentage of the sum of preparatory works and main works depending on the accuracy of the investigation and design. Since this study is in the master plan stage, 10% is applied to the miscellaneous works.

(4) Compensation Cost

Compensation cost is divided into land acquisition and house evacuation. Land acquisition covers Commercial Area, Residential Area, Agriculture Area, Fishing Area and Other Area. House evacuation includes buildings at an evacuation cost of ₱1,800/$m^2$. The compensation costs regarding land acquisition are given in the following table.

(5) Administration and Engineering Services

Administration cost for the government is computed at 5% of the sum of the main construction cost and compensation cost according to standard criteria of DPWH.

The engineering services cost is to cover the detailed design and construction supervision; therefore, 16% of main construction works is adopted to the rate of the engineering cost.

(6) Project Contingency

Project contingencies consist of physical contingencies and price escalation. Physical contingencies are usually estimated at 10 to 20% depending on the project stage. At this stage, 15% is applied to the sum of main construction cost and compensation cost excluding engineering services cost. Price escalation and value added tax are excluded.

**Unit Cost of Construction Works**

Construction base cost is estimated on the unit cost basis, multiplying the unit cost of work items by the corresponding work quantities. The unit costs of main construction works are given in Table 4.1.

**Project Cost**

The total project costs of the optimum flood control plans are estimated at 7,535 million pesos as given below. The breakdown is shown in Table 4.2 to 4.8.

(Unit: Million Peso)

| City/River | Construction* | Compensation | Total |
|---|---|---|---|
| **Iloilo City** | 1,977.9 | 696.6 | 2,674.5 |
| Jaro | 1,257.8 | 526.2 | 1,784.0 |
| Iloilo | 567.7 | 138.1 | 714.8 |
| Drainage | 143.4 | 32.3 | 175.7 |
| **Cebu City** | 1,655.3 | 2,416.2 | 4,071.5 |
| Bulacao | 128.9 | 127.2 | 256.1 |
| Kinalumsan | 243.7 | 321.1 | 564.8 |
| Guadalupe | 253.4 | 422.3 | 675.7 |
| Lahug | 321.8 | 488.4 | 810.2 |
| Subang Daku | 366.7 | 629.9 | 996.6 |
| Drainage | 340.8 | 427.3 | 768.1 |
| **Ormoc City** | 377.8 | 65.6 | 443.4 |
| Anilao | 212.9 | 33.5 | 246.4 |
| Malbasag | 144.0 | 29.1 | 173.1 |
| Drainage | 20.9 | 3.0 | 23.9 |
| **Tacloban City** | 274.4 | 98.2 | 345.6 |
| Drainage | 274.4 | 98.2 | 345.6 |
| Grand Total | 4,258.4 | 3,276.6 | 7,535.0 |

* This consists of Main Construction Cost, Administration Cost, Physical Contingency and Engineering Services Cost.

## 4.4 Project Evaluation

### 4.4.1 Economic Evaluation

**Basic Conditions for Economic Evaluation**

Economic evaluation of the proposed flood control projects based on economic benefit and cost is a guideline of assessing their economic viability. Economic benefit is given as the effect of reduction in annual mean flood damage to assets in and around the flood protection area under present socio-economic conditions. Economic cost differs from financial cost in the sense of value judgment since the former is valued at real resource cost and the latter is resource cost valued at market prices. Thus, to estimate the economic costs of the proposed project, the financial costs have to be converted by using conceivable adjustment.

Economic evaluation is carried out to ascertain the economic viability by comparing the economic benefit and the economic cost. As a method of project evaluation, economic internal rate of return (EIRR) is utilized as a tool of assessing economic viability on whether the proposed projects are to be worth being invested.

In estimating the economic cost and benefit, the economic values are estimated applying the following conditions and assumptions.

(1) Conversion Factor

All the costs involved in every project have to be measured as economic costs, i.e., the real costs or "opportunity costs" incurred from the viewpoint of the national economy. The measurement of economic cost of a commodity, for instance, depends on how likely it is to be procured - whether by increasing import, decreasing export, expanding domestic production or diverting. It is clearly impracticable to trace procurement sources for all the project inputs. Thus, the local currency portion of economic costs was estimated to be approximately 82% of the financial costs.

(2) Economic Life

The economic life of the proposed projects is considered as 50 years after completion of the construction.

(3) Price Level

The basic price level for estimates is set at the end of June 1994. Foreign exchange rate is set at 26.92 pesos per US$ in obedience to the official exchange rate at the same time.

(4) Land Enhancement

Economic benefit accruing from land enhancement in the future within the basin areas is discussed as the conceivable benefit of the projects in this study. The land enhancement benefit is estimated on the basis of population increase and improvement of both people's living standard and economic activity of industries in the basis areas.

**Economic Cost**

The financial construction costs consist of the following items:

(a) Main Construction Cost;

(b) Compensation Cost;

(c) Government Administration Cost;

(d) Physical Contingency Cost; and

(e) Engineering Service Cost.

After going through the conversion procedure to the financial costs, the respective economic costs are estimated as presented in Table 4.9. They are summarized as follows.

(Unit: Million Pesos in Economic Terms)

| City | River Improvement | Drainage | Total |
|---|---|---|---|
| Iloilo | 2,073 | 147 | 2,220 |
| Cebu | 2,705 | 637 | 3,342 |
| Ormoc | 345 | 20 | 365 |
| Tacloban | - | 191 | 191 |

The operation and maintenance (O&M) cost is annually required during the economic life of the project after completion. The O&M cost is assumed at 0.3% of the total direct construction cost.

In order to compare economic efficiency, the construction schedule is standardized as follows:

(1) The first year: Engineering Services

(2) The second year: Land Acquisition and Compensation

(3) The succeeding years:

- Three years: Construction Works for Flood Control
- Two years: Construction Works for Drainage Rehabilitation

**Economic Benefit**

Flood control benefit is defined as the damage reduction by the designed works as mentioned before. The benefit is also converted from financial value to economic value by means of a conversion factor.

Annual average benefit is a key factor to identify the economic viability of proposed projects. In calculating the annual average benefit, reference is made to probability or frequency of flooding on the basis of flood occurrence intervals discussed in Hydrology. The annual average benefit is calculated using the following formula:

$$B = \sum_{i=1}^{n} \frac{1}{2}\left[D(Q_{i-1}) + D(Q_i)\right] \cdot \left[P(Q_{i-1}) - P(Q_i)\right]$$

where;

| | | |
|---|---|---|
| $B$ | : | annual average benefit |
| $D(Q_{i-1}), D(Q_i)$ | : | flood damage caused by flood with $Q_{i-1}$ and $Q_i$ discharge, respectively |
| $P(Q_{i-1}), P(Q_i)$ | : | probabilities of occurrence of $Q_{i-1}$ and $Q_i$ discharge, respectively. |
| $n$ | : | number of flood applied |

The annual average benefits derived from the respective projects are calculated both under present conditions and under future conditions. Table 4.10 summarizes the annual benefit of the respective projects. The annual benefit of the total projects in the four cities are summarized as follows.

(Unit: Million Pesos per Annum in Economic Terms)

| City | River Improvement | Drainage | Total |
|---|---|---|---|
| **Under Present Conditions** | | | |
| Iloilo | 400 | 12 | 412 |
| Cebu | 378 | 121 | 499 |
| Ormoc | 108 | 2 | 110 |
| Tacloban | - | 77 | 77 |
| **Under Future Conditions in the year 2020** | | | |
| Iloilo | 1,102 | 30 | 1,132 |
| Cebu | 1,569 | 541 | 2,110 |
| Ormoc | 241 | 4 | 245 |
| Tacloban | - | 191 | 191 |

The benefit is assumed to accrue just after completion of the construction works. Although the annual benefit is constant during the economic life under present conditions, the benefit under the future conditions is expected to increase annually in proportion to the land enhancement.

**Economic Evaluation**

The project sites are located in urbanized areas of the four cities. The four cities are representative cites in the regions and are growing rapidly. Thus, projects are evaluated under future conditions rather than the present conditions.

Table 4.11 summarizes EIRRs of the projects. Among flood control projects in the cities under future conditions, the most effective is the project in Ormoc City with an EIRR 28.6%. Next in rank are those in Iloilo City with 21.9% and Cebu City with 19.8%. All the projects are viable from the economic point of view, because the EIRRs exceed the 15% of opportunity cost of capital in the Philippines.

Regarding drainage improvement projects, the proposed schemes in Tacloban City are the most economically effective with the EIRR of 27.8%. The schemes in Cebu City are viable as well.. On the other hand, the EIRRs of other schemes in Iloilo and Ormoc cities are 12.7% and 11.9% ,respectively; not so high compared with other projects.

Regarding total integrated projects including flood control and drainage improvement projects in the four cities, the project in Ormoc City has the most effective from the economic point of view, with the highest EIRR of 27.8%. Next are the integrated projects in Tacloban City which showthe same EIRR of 27.8% as Ormoc City but with a lower NPV and B/C; besides, Tacloban City projects do not include river improvement schemes. Those in Iloilo City and Cebu City show the EIRR of 21.3% and 21.2%, respectively, however, EIRR under present conditions is estimated to be 13.5% for Iloilo City and 11.2% for Cebu City. From the economic viewpoint, the projects in Iloilo City have a more urgent priority than the projects in Cebu City.

### 4.4.2 Environmental Impact Assessment

**Future Environment without the Master Plan**

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

| City | Project Site | Affected Population (persons) | Area Inundated ($km^2$) | Value of Damageable Properly (million pesos as of 1993) |
|---|---|---|---|---|
| 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 Basins | 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 basin is urbanized and densely populated. If measures such as alignment of river or drainage channel are not taken, garbage and sewage from the squatters along the channels

will continue to deteriorate water quality. If measures such as revetment, retaining wall and drops are not be taken, channel erosion and siltation problems will also increase.

If the flooding problems are not be settled, economic dislocations will continue to affect the areas and the regional economy will hardly grow. Furthermore, the value of properties in the areas will not increase due to the recurrent flood damage. Inhabitants in the areas will never be relieved from unsanitary health conditions caused by the recurrent inundation.

**Prediction and Assessment of Impacts**

The prediction and assessment of impacts was made through the use of interaction matrices filled in for each specific site and project stage. The matrices for the cities of Iloilo, Cebu, Ormoc and Tacloban are given in Table 4.12 to 4.15. Referring to these matrices, the evaluation for environmental impacts is summarized below.

(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 fish ponds;
- 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 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 disruption of the traffic for construction work in the crowded areas of commercial and industrial districts.

With the high level of awareness of the population on the extent of destruction a flood can inflict on a community, soliciting their cooperation would not be difficult in Ormoc.

(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;
- 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;

Relocation of squatters from Mangonbangon river banks may prove difficult, as gleaned from a recent experience of the city government.

## 4.5 Implementation of Master Plan

### 4.5.1 Implementation Schedule

The implementation schedule of the Master Plan for the four cities is prepared by placing higher priority on flood control works that could satisfy the following conditions:

(1) Urgency in implementation to mitigate flood damage, especially the menace to human life;

(2) Higher economic efficiency is expected with the implementation;

(3) Less adverse effects and promotion of better environmental conditions are expected with the implementation; and

(4) Less obstacles and social problems on implementation due to land acquisition and house evacuation.

Among the flood control works, those in Ormoc City are evaluated to have the highest EIRR as well as the most urgent for implementation. The city suffered from a disastrous flood in November 1991 and is still under the menace of the same tragedy.

From economic efficiency, Iloilo and Tacloban cities are superior to Cebu City, while Cebu and Iloilo cities have more urgency for implementation of flood control works on account of

the destructive floods in these cities. On the other hand, flood control works in Tacloban City are only the improvement works on urban drainage channels.

From the social aspect, however, Cebu City is expected to have more problems in implementation due to land acquisition and house evacuation; rather small compared to Tacloban City but much compared to Iloilo City.

To summarize, priority of implementation is in the order of: (1) Ormoc, (2) Iloilo, (3) Cebu and (4) Tacloban. Based on this prioritization, the implementation schedule is proposed in consideration of the construction periods and effectiveness of construction works, as presented in Fig. 4.47.

### 4.5.2 Selection of Area for the Urgent Plan

Ormoc City is top priority in the implementation schedule because of economic efficiency and urgency. In consideration of all the conditions mentioned before, Iloilo City and Ormoc City are selected as the areas for the Urgent Plan.

# CHAPTER 5 URGENT PLAN

## 5.1 Planning Conditions

### 5.1.1 Project Scale

The project scale of the urgent project is proposed to be equivalent or smaller than that of the Master Plan on account of the following considerations:

(1) Urgency in implementation to mitigate flood damage; and

(2) Higher economic efficiency of the project.

To implement the project without a lapse of time, a smaller project cost is chosen for easier realization. On the other hand, the past practices of the river improvement works have shown the optimum project scale to be a 20-year or less is the Philippines.

From the above considerations, the scale of urgent projects on rivers is proposed to be a 20-year return period. The design discharges corresponding to a 20-year return period are shown below as illustrated in Fig. 5.1.

| River Name | Design Discharge ($m^3/s$) (20-year Return Period) |
|---|---|
| Jaro River | 1,000 |
| - Tigum River | 450 |
| - Aganan River | 550 |
| Iloilo River | 400 |
| - Mandurriao River | 70 |
| Anilao River | 460 |
| Malbasag River | 250 |

As proposed in the Master Plan, a 5-year return period is adopted for the design scale of drainage improvement in major drainage systems with an area of more than 50 ha and a 3-year return period is adopted for those with less than 50 ha. The basins have been affected by rapid urbanization in recent years, and it would be difficult to enlarge the drainage channel in the near future. Furthermore, the cost comparison study of drainage improvement shows that the construction costs are little sensitive to the design scale. It is, therefore, proposed that the drainage improvement to cope with the design scale as proposed in the Master Plan, be implemented.

### 5.1.2 Project Area

**River Improvement Plan**

The project area of the urgent plan is delineated, based on a phased implementation program formulated in coordination with the implementation schedule of river improvement works in the Master Plan.

The phased implementation plan for each river is prepared where the Urgent Plan is firstly implemented and the flood control works successively undertaken and upgraded to the scale of the Master Plan.

(1) Jaro River

To confine a 20-year return period flood to the Iloilo Strait, a combination of construction of Jaro Floodway and partial improvement of Jaro River is implemented in the Urgent Plan, since Jaro Floodway is proposed to carry the discharge of 850 $m^3/s$ and the existing channel of Jaro River has the flow capacity of 250 $m^3/s$ except at a few narrow sections in low-lying areas at the river mouth. The implementation of the Master Plan is, therefore, divided into two (2) phases, as mentioned below. The area of the Urgent Plan is shown in Fig. 5.2.

First Phase (Urgent Plan): The works consisting of the construction of Jaro Floodway and improvement of the narrow sections of Jaro River to secure a flow capacity of 150 $m^3/s$.

Second Phase (Master Plan): The works consisting of river improvement and construction of La Paz Floodway for a 50-year return period flood as in the Master Plan.

(2) Iloilo River

Since the elevation of existing river banks of Iloilo River is about EL. 2 m above mean sea level (MSL) and the tolerance from MSHHWL is only 90 cm which is less than the required freeboard, the heightening of river bank is required to assure the freeboard. On the other hand, the water level of a 20-year return period flood under the existing condition is almost the same as the design high-water level corresponding to a 50-year return period flood. Therefore, the area for the Urgent Plan is delineated as shown in Fig. 5.3. The works are divided into two (2) phases, as follows:

First Phase (Urgent Plan): The works consisting of the construction of concrete and earth dikes, demolition of the abandoned railway bridge to assure the flow capacity for the flood of a 20-year return period.

Second Phase (Master Plan): The works consisting of dredging and bridge protection works for the flood of a 50-year return period as in the Master Plan.

The Urgent Plan of the Mandurriao river improvement works is prepared for a 20-year return period flood, which is the same as the Master Plan. Therefore, a phased implementation plan for Mandurriao River is not considered.

(3) Anilao River

To secure the channel improvement area for the Urgent Plan, the same channel width as the Master Plan is adopted. A compound cross-section channel with high water channel revetments is employed. The Urgent Plan of Anilao river improvement works is implemented as given below. The cross-sections are shown in Fig. 5.4.

First Phase (Urgent Plan): The works consisting of the construction of compound cross-section channel with high water channel revetment, and construction of two (2) slit dams on the upstream reaches.

Second Phase (Master Plan): The works consisting of excavation works of high water channel to increase the flow capacity for a 50-year return period flood and construction of revetments for low water channel as in the Master Plan.

(4) Malbasag River

The present land use along the channel improvement section for approx. 2 km is classified as below:

(a) Urbanized Area : Right bank, the river mouth to STA. 1+400
Left bank, the river mouth to STA. 0+400

(b) Rural Area : Right bank, the upstream from STA. 1+400

(c) Mountain Slope : Left bank, the upstream from STA. 0+400

From the above land use condition, the river improvement works in the Urgent Plan is limited to the widening of right bank for the river section in urbanized area from the river mouth to STA. 1+200. The phased implementation plan is formulated as below. The cross-sections are shown in Fig. 5.5.

First Phase (Urgent Plan): The works for the STA. 0+000 to STA. 1+200 section consisting of the construction of retaining wall at the right bank, compound cross-section channel works with high water channel revetment at the left bank and construction of maintenance water channel; and, for the section upstream of STA. 1+200, construction of compound cross-section channel with high water channel revetments at the right bank and low water channel excavation at the left bank and construction of a slit dam on the upstream reaches.

Second Phase (Master Plan): The Master Plan for the STA. 0+000 to STA. 1+200 section consisting of the excavation works of high water channel and construction of retaining wall at the left bank; and, for the section upstream of STA. 1+200, excavation work of high water channels, construction of low water channel revetment at the both banks and high water channel revetment at the left bank.

**Drainage Improvement**

(1) Objective Stretch

As the priority stretches of four (4) drainage basins, the following main channel sections are proposed to be improved. Figs. 5.6 and 5.7 show the location of these stretches.

| City/Creek | | Objective Stretch |
|---|---|---|
| **Iloilo City** | | |
| Ingore Creek | 4,870 m | (Jaro-Lebanes Road Bridge to Jaro River) |
| Bo. Obrero Creek | 4,220 m | (Burgos St. to Iloilo Strait) |
| Rizal Creek | 560 m | (Luna St. to Iloilo River) |
| **Ormoc City** | | |
| Lotao Creek | 1,200 m | (Osmeña Ext. to Ormoc Bay) |
| Total | 10,850 m | |

Aiming at the mitigation of a larger scale of drainage inundation damage in the basins, the improvement of primary channels including some secondary drains is proposed in the Urgent Plan. The improvement of other secondary and tertiary drains causing localized and confined inundation is not included.

(2) Channel Improvement

The drainage channel improvement basically involves widening and deepening rather than diking, to allow flood discharge by gravity in the objective areas. The improvement works will remove acute bends and constrictions, bottleneck culverts and bridges, thereby increasing the discharge capacity of the channels. In addition, to establish an efficient improvement plan, construction of a new diversion channel is proposed for Ingore Creek and Bo. Obrero Creek in Iloilo.

(3) Open Channel and Inspection Road

Considering the ease of operation and maintenance of drainage systems, the existing channels are principally to remain as open watercourses, except those under roads and sidewalks where channels require to be enclosed by a box culvert. In addition, provided that there is no existing access road to the channel for operation and maintenance, the construction of an inspection road is proposed with a width of 3 m on one side of the channel as shown in Fig. 5.8.

## 5.2 Urgent Flood Control Plan

### 5.2.1 River Improvement

Delineating the area of the Urgent Plan, the river improvement works are proposed as follows:

Iloilo City

(1) Jaro River

The Urgent Plan of Jaro river improvement works is limited to the construction of Jaro Floodway, the partial improvement of Jaro River and the improvement works of Tigum and Aganan rivers in the upstream of the diversion works. The related river structures included in the works are as follows:

| River Structure | Dimension/Site | Remarks |
|---|---|---|
| Earth Dike | 14,440 m | |
| Revetment | 3,250 m | |
| Diversion Works | 66 m | |
| | 12 m | |
| Groundsill | 50 m | Outlet of Jaro Floodway |
| Sluice | 7 sites | |
| Invert Siphon | 3 sites | Along Jaro Floodway |
| Bridge | 2 sites | Along Jaro Floodway |

(2) Iloilo River

The Urgent Plan of Iloilo river improvement works is mainly composed of heightening of the river banks for the whole stretch from the river mouth to Molo Bridge. The related structures included in the works are as follows:

| River Structure | Dimension/Site | Remarks |
|---|---|---|
| Earth Dike | 12,830 m | |
| Concrete Dike | 4,780 m | |
| Revetment | 2,050 m | |
| Sluice | 9 sites | |
| Bridge | 4 sites | 3 to be reconstructed |

**Ormoc City**

(1) Anilao River

In the Urgent Plan, the whole stretches mentioned in the Master Plan is improved, and the construction of two (2) slit dams are carried out to stop drift logs and boulders. The other river structures included in the improvement works are as follows:

| River Structure | Dimension/Site | Remarks |
|---|---|---|
| Earth Dike | 1,800 m | |
| Revetment | 3,600 m | |
| Sluice | 3 sites | |
| Drop | 3 sites | |
| Bridge | 3 sites | One is under construction |

(2) Malbasag River

As in the Anilao river improvement works, the works in the Urgent Plan include the river improvement for the whole stretch mentioned in the Master Plan and construction of slit dam on the upstream reaches. The other river structures included are as follows:

| River Structure | Dimension/Site | Remarks |
|---|---|---|
| Earth Dike | 1,250 m | |
| Retaining Wall | 1,095 m | |
| Revetment | 2,505 m | |
| Sluice | 4 sites | |
| Drop | 4 sites | |
| Bridge | 2 sites | Reconstruction |

### 5.2.2 Urban Drainage Improvement

**Iloilo**

The study on alternatives (refer to Supporting Report on Urban Drainage Plan, Section 5.3), a diversion channel to cutoff the stormwater runoff is employed for both Ingore and Bo. Obrero creeks in Iloilo City.

The drainage improvement of Ingore Creek is composed of the channel improvement for 4,870 m and the construction of diversion channel of 580 m. The alignment, profile and cross-section are shown in Figs. 5.9 and 5.10.

The improvement of Bo. Obrero Creek is composed of the channel improvement of 4,220 m and the construction of diversion channel of 200 m. The alignment, profile and cross-section are shown in Figs. 5.11 and 5.12.

Only widening and deepening of channel are employed for the improvement of Rizal Creek. The alignment, profile and cross-section are shown in Figs. 5.13 and 5.14.

The related structures included in the improvement works are summarized as follows:

| Structures | Ingore Creek | Bo. Obrero Creek | Rizal Creek |
|---|---|---|---|
| Slope Lining (m) | 1,320 | 750 | 180 |
| Full Lining (m) | - | 1,450 | - |
| Box Culvert (m) | - | 55 | 437 |
| Bridge (No.) | 10 | 8 | 1 |

**Ormoc**

The improvement for Lotao Creek is only the widening and deepening of 1,200 m of the existing channel. The alignment, profile and cross-sections are shown in Figs. 5.15 and 5.16. The related structures are summarized as follows:

| Structure | Dimension (m) |
|---|---|
| Slope Lining | 600 |
| Box Culvert | 75 |

### 5.2.3 Preliminary Design

**River Improvement**

(1) Design High Water Level (DHWL)

The DHWL is set equal to or lower than the existing ground level except the low-lying area so as not to create drainage problems inside the embankment. The following freeboard corresponding to the design discharge is applied to the structural design:

| Discharge ($m^3/s$) | Freeboard (m) |
|---|---|
| Less than 200 | 0.6 |
| 200 to 500 | 0.8 |
| More than 500 | 1.0 |

If the DHWL is lower than the elevation of the existing bank, the freeboard of 0.6 m is employed for all design discharges. General clearance between DHWL and the bottom of the lowest member of the superstructures shall not be less than 1.0 m.

(2) Alignment of River Channel

The alignment of the river course is proposed along the existing river channel to minimize land acquisition and house evacuation. The existing river course at the meandering portion shall be smoothened and widened. For the river stretches with a sufficient width such as Iloilo River and the river mouths of Jaro River and Mandurriao River, the width is maintained and dredging works is conducted mainly to increase the flow capacity and decrease the flood water level.

(3) Longitudinal Profile

The design riverbed principally follows the existing average riverbed. The riverbed slope between upper and lower stretches is set within the ratio of less than 1 : 2 to assure the stability of the river channel. For steep rivers such as those in Ormoc City, drop structures are provided to control the flow velocity. The design riverbed slope between drops is set to one-half of the existing riverbed slope.

(4) Cross Section

A single cross-section channel is applied to all rivers in view of the following reasons:

(a) To minimize land acquisition and house evacuation, especially in the urbanized area; and

(b) A compound cross-section channel for small rivers like the rivers in Ormoc City is uneconomical.

The bank slope for embankment and excavated slope is designed as 1 : 2.0 and protected by sodding in general. The retaining wall or concrete wall, however, shall be applied along Iloilo River and the lower reaches of Malbasag River to minimize land acquisition and house evacuation.

**Drainage Channel**

(1) Design High Water Level

Design high water level along the main channel is, in principle, set below ground level taking the freeboard of 0.30 to 0.50 m into consideration to allow gravity

drainage and to minimize inundation damage potential in secondary drainage areas. In partial low-lying areas along the channel, however, the design water level employed is to be higher than the ground level of the hinterland, due to unavoidable topographic conditions.

(2) Alignment

The proposed alignment of channel improvement is to be as smooth as possible with minimal land acquisition and house evacuation. The provision for a smooth curve alignment in an urbanized area is deemed to be difficult due to the right-of-way; thus, the alignment is proposed to follow the existing one, with revetment to avoid erosion damage and to fix the watercourse. As practically as possible, receding the inside alignment of the curve is also proposed. The alignment of diversion channel is also set as smooth as possible with less meandering and avoiding congested residential areas.

(3) Longitudinal Profile

The channel profile is principally planned to be nearly the same as the existing bed slope or the ground slope, changing gradually from steep to gentle toward downstream to maintain the channel. In the stretch connected to the diversions of Ingore Creek and Bo. Obrero Creek, the channel bed upstream of the diversion point is to be steeper than the existing one.

(4) Cross Section

Single trapezoidal section with slope protection is generally employed for under-urbanized areas, while rectangular section formed by box culvert is employed in stretches under roads and sidewalks.

### 5.2.4 Design with Environmental Consideration

Inasmuch as a river contributes to the preservation of the environment, provides water and functions for flood mitigation as well, many people, particularly those in urban areas, have come to realize the importance of caring for and preserving rivers. Therefore, environmental concerns are taken into consideration in the preliminary design.

The environmental requirements may be classified into two categories as mentioned below:

(1) Maintenance of River Channel and Water Quality

To provide the amenity of river environment, the following items shall be included in this category:

- Water quality control
- Safe utility of river
- Enjoyment of river scenery

The image perspective of the environmental design is shown in Fig. 5.17.

(2) Social Activity at River

To accelerate local/regional activity, the following items shall be considered:

- Water usage at riverside
- Usage of river flow
- Utility of river space

In the planning and designing of river control works, the following designs and structures are employed in this Plan:

(a) Drops

Aside from the functions as hydraulic requirement, drops, which are to be provided along Anilao and Malbasag rivers, should also have the following functions related to the environmental aspect:

- Effect of aeration to preserve water quality;
- Provide a variety of water flow; and
- Improvement of river scenery.

Natural stones will be used for the main structure of the drops. A drop is divided into three steps to accelerate aeration and to give variety to the river flow.

(b) Low Water Channel for Maintenance Flow

A low water channel for maintenance flow is proposed for river water use such as washing and bathing. The depth of channel is set from 0.5 m to 1.0 m and the capacity of the channel corresponds to the specific discharge of 0.01 $m^3/s/km^2$ for Jaro River and 0.1 $m^3/s/km^2$ for rivers in Ormoc City. Meandering like a natural stream is given to the improvement alignment. Riverbanks of the low water channel with a gentle slope are fixed with log

piles or boulders. The flood water channel is sodded with grass or covered with boulders.

(c) Maintenance Road along River

Maintenance roads are provided along both banks or on the earth dike, which may be used for strolling along rivers. If there is a space behind the road, tree planting is recommended for improvement of the scenery. Riverside trees clearly show the boundary of the river and private properties.

(d) Approach Steps to Waterfront

The river water is used by inhabitants near the river for domestic purposes. Therefore, approach steps to the waterfront are provided on the earth dike/retaining wall to ease access to the river water. Additionally, these steps will also help people become intimate with rivers.

(e) Materials for Structural Design

Natural construction materials such as wood or stone/boulder are used for the structures as much as possible. The use of natural materials for the river structures provide a refreshing view to the onlooker.

(f) Drainage Channel

The drainage channel in the project area performs the combined functions of sewage mainly in the dry season and storm water collection in the rainy season. Stagnant wastewater in the uneven bed of an open channel spreads nasty smells in the vicinity. To minimize these unhealthy and unfavorable environmental situations, the construction of a maintenance water ditch is proposed in the middle of the channel bed as shown in Fig. 5.18. The ditch will be located in the upstream stretch of Bo. Obrero Creek where the channel bed is lined with concrete and will be dried up in the dry season since it is not affected by the tidal compartment.

## 5.3 Project Cost and Evaluation

### 5.3.1 Project Cost

**Condition of Cost Estimate**

The conditions of cost estimates are the same as those employed in the Master Plan (refer to Subsection 4.3.2).

**Project Cost**

The project costs of the Urgent Plan for Iloilo and Ormoc cities are as follows:

(Unit: Million Pesos)

| City/River | Main Construction | Compensation | Total |
|---|---|---|---|
| **Iloilo City** | 1,194.4 | 293.0 | 1,487.4 |
| Jaro | 602.8 | 128.7 | 731.5 |
| Iloilo | 452.1 | 138.1 | 590.2 |
| Drainage | 139.5 | 26.2 | 165.7 |
| **Ormoc City** | 318.0 | 63.4 | 381.4 |
| Anilao | 179.8 | 33.5 | 213.3 |
| Malbasag | 128.9 | 29.1 | 158.0 |
| Drainage | 9.3 | 0.8 | 10.1 |
| Grand Total | 1,512.4 | 356.4 | 1,868.8 |

### 5.3.2 Economic Evaluation

**Basic Conditions for Economic Evaluation**

The conditions for economic evaluation are almost the same as the Master Plan. Only the disbursement schedule is different. The implementation period of the projects is assumed as follows: (a) one year for detailed engineering service; (b) two years for expropriation of project sites and preparation of construction; and (c) three years for construction works in Iloilo City and two years in Ormoc City. Accordingly, six years are needed for Iloilo City and five years for Ormoc City.

**Economic Cost**

After going through the conversion procedure to the financial costs, the respective economic costs are obtained as follows.

(Unit: Million Pesos)

| Cost/City | River Improvement | Drainage | Total |
|---|---|---|---|
| **Financial Cost** | | | |
| Iloilo | 1,322 | 166 | 1,488 |
| Ormoc | 371 | 10 | 381 |
| **Economic Cost** | | | |
| Iloilo | 1,106 | 139 | 1,245 |
| Ormoc | 311 | 8 | 319 |

The operation and maintenance (O&M) cost is annually required during the economic life of the project after completion. The O&M cost is assumed at 0.3% of the total direct construction cost.

**Economic Benefit**

Flood control benefit is defined as the damage reduction by the designed works as mentioned before. The urgent projects of river improvement works are expected to control a 20-year flood discharge. The project benefit under present conditions is summarized below.

(Unit: Million Pesos in Economic Terms)

| City | River Improvement | Drainage | Total |
|---|---|---|---|
| Iloilo | 528 | 12 | 540 |
| Ormoc | 101 | 2 | 103 |

In the case of future economic benefit, the value of assets in the flood-prone areas is expected to increase in proportion to population increase and economic growth in the future. Accordingly, benefit will increase under future conditions more than the present conditions. These benefits are summarized as follows:

(Unit: Million Pesos in Economic Terms)

| Year | Iloilo City | | | Ormoc City | | |
|---|---|---|---|---|---|---|
| | River Project | Drainage | Total | River Project | Drainage | Total |
| 2000 | 768 | 17 | 785 | 137 | 2 | 139 |
| 2010 | 1,037 | 26 | 1,063 | 176 | 3 | 179 |
| 2020 | 1,402 | 37 | 1,439 | 225 | 4 | 229 |

**Economic Evaluation**

The economic indices of EIRR for the respective projects are summarized in the following table.

| Year | Iloilo City | | | Ormoc City | | |
|---|---|---|---|---|---|---|
| | River Project | Drainage | Total | River Project | Drainage | Total |
| **Under Present Conditions** | | | | | | |
| EIRR (%) | 27.8 | 5.9 | 26.3 | 23.5 | 16.5 | 23.2 |
| NPV (Million Pesos) | 4,396 | 14 | 4,410 | 748 | 10 | 758 |
| B/C | 6.2 | 1.1 | 5.7 | 4.1 | 2.6 | 3.9 |
| **Under Future Conditions** | | | | | | |
| EIRR (%) | 38.6 | 13.9 | 37.0 | 32.6 | 26.2 | 32.3 |
| NPV (Million Pesos) | 10,450 | 184 | 10,634 | 1,572 | 27 | 1,599 |
| B/C | 13.3 | 2.8 | 12.2 | 7.3 | 5.2 | 7.2 |

(Note) : Discount rate is 10% for computation of NPV and B/C.

The whole integrated project in Iloilo City gives an EIRR of 26.3%, which shows that the projects are viable even under present conditions. The projects in Ormoc City are also viable with the EIRR of 23.2%.

Sensitivity Test

The sensitivity test was carried out for only the variation in total discounted costs and benefits. The test was made for a variation of 10% of the cost and benefit with the respective EIRRs of the proposed schemes in the cities for the urgent projects under present conditions, and the results are given in the following table.

| | Iloilo City | | Ormoc City | |
|---|---|---|---|---|
| | Benefit | | Benefit | |
| Cost | Base Case | 10% Down | Base Case | 10% Down |
| Base Case | 26.3% | 24.4% | 23.2% | 21.2% |
| 10% Up | 24.6% | 22.8% | 21.4% | 19.6% |

Even in the worst case such as 10% decrease in benefit and 10% increase in cost, EIRR still holds a higher rate than the opportunity cost of capital of 15%, and this is identified to be economically viable.

### 5.3.3 Environmental Impact Assessment

Future Environment without the Urgent Plan

Without implementing the Urgent Plan the environmental conditions at the sites are expected to remain the same as the present, or deteriorate. The flood-prone areas in Iloilo and Ormoc will continue to be subjected to flooding during the rainy season. Probable damage without the Urgent Plan is estimated as follows:

| Area | Project Site | Affected Population (persons) | Area Inundated ($km^2$) | Value of Damageable Property (million pesos; as of 1993) |
|---|---|---|---|---|
| Iloilo | Jaro River Basin | 98,003 | 28.0 | 751.1 |
| | Iloilo River Basin | 18,128 | 6.0 | 373.5 |
| | Drainage Rehabilitation Area | 2,997 | 0.6 | 16.4 |
| Ormoc | Anilao and Malbasag River Basin | 21,570 | 2.4 | 228.5 |
| | Drainage Rehabilitation Area | 346 | 0.2 | 2.5 |

Water quality in Iloilo and Ormoc will deteriorate especially in rivers and drainage channels where the basin is urbanized and densely populated. If the measures such as alignment of river/drainage will not be implemented, garbage and sewage from the squatters along the channels will continue to deteriorate water quality.

If measures such as revetment, retaining wall and drops will not be implemented, 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, the value of properties in these areas will not increase due to the recurrent flooding damage. Inhabitants in these areas will never be relieved of unsanitary health conditions caused by the recurrent inundation.

**Prediction and Assessment of Impacts**

(1) Iloilo

(a) Physico-chemical Aspects

(i) Surface Water

Garbage dumped in the river/drainage channels will be removed by the initial site clearing during the pre-construction stage. The work will be done during the dry season, therefore, grabbing of garbage piled in the channels will not discharge water polluting load or deteriorate the water quality of the channels. On the contrary, the removal of garbage will improve the water quality of the channels.

Excavation and dredging will increase the turbidity of channels during the construction stage. Therefore, appropriate works and necessary management of the works will be adopted referring to the monitoring results to avoid water pollution during the construction stage.

(ii) Ground Water

It is estimated that seawater will intrude to 1.0 km upstream of the outlet of Jaro Floodway during spring tide and that salinity of ground water along the floodway will increase. However, the intrusion of seawater is already affecting the salinity of ground water along the river due to the existing small rivers running almost parallel to the proposed Jaro Floodway,. As for La Paz Floodway, the area along the proposed course is utilized for fishponds. Saline water is used for fishponds and the groundwater around the fishponds also has high salinity.

As for Iloilo River and Mandurriao River, seawater is already intruding deeply into the middle reach.

To summarize, therefore, the Plan will not affect the ground water quality in these areas.

(iii) Topography

Jaro Floodway will carry the sediment into the Iloilo Strait with flood flow. However, a strong tidal current in the center of the strait will disperse the discharged sediments. Furthermore, the sediment deposited in or around the waterway will be easily flushed away by flood flows.

As for the La Paz Floodway, the conditions are the same as the Jaro Floodway. The proposed discharge of Jaro River is the same as the present one. Therefore, the coastal topography will not change.

(iv) Air, Noise and Offensive Odor

Air quality will be affected in the construction stage because of the emission of exhaust gas from various construction equipment and facilities and the production of dust from the spoils. Unwanted noise and vibration caused by the construction equipment will be experienced.

The optimum construction work schedule will be considered not to concentrate the equipment on a certain point close to the houses.

(b) Ecological Aspects

(i) Terrestrial Species

Corn, coconuts, bamboo, bananas, and fruit trees along the river bank will be displaced by the dikes on a limited scale. However, the soil stabilizing effect

of the flood control structures will be favorable for future cultivation of such species after the Plan is implemented.

(ii) Aquatic Species

It was noted previously that the deposition process supplies the substrate for the developing mangrove community of the river mouth. On the other hand, the proposed construction of Jaro Floodway, with its discharge of silt, might contribute to the delta formation. Judging from the fact that the newly formed delta is now being colonized by mangrove species at the mouth of Jaro River, mangrove will rather grow than diminish. A similar situation is likewise expected at the outlet of La Paz Floodway.

The relocation of squatters currently living along the rivers to suitable resettlement sites might improve overall water quality after the Plan is completed, possibly improving diversity and productivity conditions of the aquatic coastal and marine ecosystem.

(c) Aesthetic Aspects

A significant factor that might affect the physical appearance of both the land and water systems will be the manner in which the spoil from the river/drainage channel widening and deepening is utilized. Spoils will be utilized for embankment, and surplus spoil will be dumped into the borrow pit excavated for embankment materials.

No significant degree of negative impact is anticipated on the aesthetic character of the affected terrestrial and aquatic ecosystem. Rather, it is likely that river bank stabilization, as a result of river improvement works, will facilitate the adoption of practical beautification measures such as approach steps to the waterfront, low water channel and tree planting along the river banks.

(d) Socio-economic Aspects

Beneficial impacts such as appreciation of land value in the existing flood-prone areas will be realized as a result of reduction of flood damage on persons and properties.

According to the socio-economic questionnaire survey among a population of 128 households, around 54% of the inhabitants stated that the Plan will improve the quality of life in the community, while 44% anticipate that

conditions will be more peaceful, safe and convenient as a result of the implementation of the Plan. Only 3% indicated that the Plan will have no effect. As for the question about the negative impacts, a slight majority of the respondents stated that there are no negative effects, with 29% still uncertain about the effects of the Plan.

The relocation of squatters still constitutes a significant socio-economic impact as evidenced by these perceptions. This is also aggravated by the fact that more than 50% of the respondents to the questionnaire survey have been staying in their present location for more than 15 years. This lends a relatively permanent character to these communities which is further reflected in established social relationships and lifestyles. However, 65% of the respondents recognize that the riverbank is a dangerous area, and 72% expressed willingness to relocate provided that the relocation site is within the immediate vicinity or in other accessible parts of the city.

Socio-economic effects associated with the Plan include generation of short-term employment opportunities to unemployed semi-skilled and unskilled laborers in the city, increase of economic activities as a result of increased demand for goods and services among these temporary workers.

(2) Ormoc

(a) Physico-chemical Aspects

(i) Surface Water

Construction work, especially excavation work will affect the water quality of the rivers. Therefore, appropriate works and necessary management of the works will be adopted referring to the monitoring results to avoid water pollution during the construction stage.

(ii) Air, Noise and Offensive Odor

Air quality will be affected during the construction stage because of the emission of gases from construction equipment and production of dust. Noise and vibration will also be experienced.

(b) Ecological Aspects

(i) Terrestrial Species

Initial site clearing operation will destroy and displace many lifeforms, specially along the river banks. However, the existing species could be reestablished in the immediate vicinity outside the work site. Ipomoea sp. (kangkong) will be disrupted but it will regain its habitat within a short time after the construction.

(ii) Aquatic Species

Channel erosion is expected to be reduced by the river improvement, therefore, the adverse effects on the aquatic ecosystem is reduced.

(c) Aesthetic Aspects

A significant factor that might affect the physical appearance of both the land and water systems will be the manner in which the spoil from the river/drainage channel widening and deepening is utilized. Spoils will be utilized for embankment, and surplus spoil will be dumped into the borrow pit excavated for embankment materials.

No significant degree of negative impact is anticipated from the aesthetic point of view. Rather, it is likely that river bank stabilization, as a result of flood control works, will facilitate the adoption of practical beautification measures such as approach steps to the waterfront, low water channel, utilization of natural materials for the structures and tree planting along the river banks.

(d) Socio-economic Aspects

The major socio-economic impacts of the proposed Urgent Plan are viewed as positive or beneficial in nature. The Plan is expected to bring significant reduction in flood damage to inhabitants, private properties, infrastructure, crops, livestock and fisheries.

A socio-economic study (using a questionnaire survey form) was conducted among a population of 47 households in the same manner as the study in Iloilo City.

Around 63% of the inhabitants interviewed said that the Plan will promote safety and protection for the community while 20% expect that the Plan will improve their living conditions. Based on the answers to the perception

questionnaire survey, the positive and beneficial effects of the Plan outweigh its negative impacts. Majority (74 %) of the respondents stated that there will be no negative effects.

**Mitigation Measures**

On the basis of the prediction and assessment of possible impacts, mitigation measures against serious or major impacts are proposed as follows:

(1) Pre-Construction Stage

During the pre-construction stage, the main concern would be the right-of-way acquisition. As for the proper compensation of private lands that will be displaced, the acceptable basis for land value assessments will be mutually agreed upon between the project proponent and the property owners. As for the relocation and resettlement of squatters, the local government, in coordination with the National Housing Authority (NHA) and other institutions, will provide relocation or resettlement sites with basic services and facilities and access to employment and livelihood opportunities sufficient to meet the basic needs of the affected families.

(2) Construction Stage

(a) Spoil (Excavated Soil)

Excavated soils will be used basically for embankment, and the remaining soils will be dumped into spoil banks provided along the channels. If the excavated soils are not enough for embankment, materials will be taken from the borrow pit along the channels. Thus, not only dumping sites but also borrow pits are very close to the project site, therefore, traffic problems will not be caused by transporting trucks.

(b) Monitoring

During the construction period, monitoring of water quality and traffic condition will be periodically carried out to ensure the mitigation measures.

## 5.4 Implementation of Urgent Project

### 5.4.1 Implementation Schedule

The implementation schedule of the Urgent Plan is prepared taking two considerations into account, as follows:

(1) The construction period is three (3) years for river improvement works and two (2) years for drainage improvement in Iloilo, while it is two (2) years for river improvement works and one (1) year for drainage improvement in Ormoc; and,

(2) Some investment from foreign sources are expected for the execution of detailed design and construction of the works.

The required period for the detailed design work is estimated to be about one (1) year and compensation work is assumed to take two (2) years following the standard procedure. Based on these considerations, the Urgent Plan for Iloilo City is proposed to be completed in 2001 while that in Ormoc City, in 2000, as illustrated in Fig. 5.19.

The disbursement schedule of project cost is prepared in accordance with the proposed implementation schedule, as given in Table 5.1.

### 5.4.2 Completion of the Study

The feasibility study on the Urgent Plan will be completed in January 1995. Since disastrous floods have devastated Ormoc City in November 1991 and Iloilo City in July 1994, the proposed projects under the Urgent Plan should be implemented without further delay. Besides, the flood in Ormoc caused by Typhoon Uring in November 5 has brought tremendous damage accounting for approximately 8,000 casualties, therefore the implementation of flood control works for Ormoc City is considered more urgent than Iloilo City.

Iloilo City

Aiming at the target year 2001 for the Urgent Plan of flood control works in Iloilo City, the detailed design work should be carried out in 1996 to 1997 and the compensation works are to be completed in 1998. Since the acquisition of right-of-way usually impedes the smooth implementation of projects, allocation of funds and execution body for the compensation works should be started soon after the completion of detailed engineering.

Ormoc City

The urgency of flood control works in Ormoc City requires expeditious implementation. The required cost is small and compensation works are also easier compared to Iloilo City because a city zoning ordinance concerning the flood-prone areas along rivers was enacted after the flood in November 1991. Therefore, the flood control works in Ormoc City can be implemented earlier than the proposed schedule with the allocation of special funds and manpower.

# *ANNEX*

# MINUTES OF DISCUSSION

## INITIAL JOINT MEETING AMONG THE DPWH STEERING COMMITTEE, JICA ADVISORY COMMITTEE MISSION AND JICA STUDY TEAM REGARDING THE INCEPTION REPORT OF THE STUDY ON FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS.

1.0 The JICA Advisory Committee Mission (hereinafter called as the Mission) headed by Mr. Yuichi Kato visited the Philippines from January 06 to January 12, 1993 for the purpose of coordinating and to initiate the actual conduct of the Study on Flood Control for Rivers in the Selected Urban Centers.

2.0 For the above purpose, a joint meeting among the DPWH Steering Committee, the JICA Advisory Mission and the JICA Study Team was held on January 11, 1993. The agenda of the meeting is shown in Annex A, while the list of the participants is shown in Annex B.

3.0 After a series of discussions, the following points were agreed upon between the DPWH Steering Committee and the JICA Study Team, with the concurrence of the Mission, viz:

3.1 The Inception Report (30 copies) submitted by the JICA Study Team for the abovementioned Study was generally accepted.

3.2 In so far as inputs of the Government of the Philippines to the Study as indicated in the agreed Implementing Arrangement are concerned, the DPWH Steering Committee assured the Mission that the DPWH will endeavor to provide all the services and support as may be required in the conduct of the Study.

3.3 The DPWH Steering Committee requested that a supplemental seminar will be conducted after the formulation of the Master Plan. The JICA Study Team will convey the request to the head office of JICA.

Signed on January 11, 1993 in Manila, Philippines.

KATSUHISA ABE
Team Leader of the
JICA Study Team

TEODORO T. ENCARNACION
Undersecretary
As Chairman of the DPWH
Steering Committee

CONCURRED:

YUICHI KATO
Chairman of the JICA
Advisory Committee

WITNESSED:

MANUEL M. BONOAN
Asst. Secretary of
Planning, Member of
DPWH Steering Committee

Annex A

THE STUDY ON

FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

AGENDA FOR THE INITIAL JOINT MEETING AMONG

DPWH STEERING COMMITTEE, JICA ADVISORY COMMITTEE MISSION

AND JICA STUDY TEAM

January 11, 1993 2:00 P.M.

Conference Room, Office of Asst. Secretary M. Bonoan
DPWH, Bonifacio Drive, Port Area, Manila

| | | |
|---|---|---|
| 1. | Opening Remarks and Introduction of DPWH Steering Committee Member | : Acting Chairman of the DPWH Steering Committee |
| 2. | Response and Introduction of JICA Advisory Committee Mission Members and Study Team Members | : Chairman of the JICA Advisory Committee & Team Leader of the JICA Study Team |
| 3. | Explanation on the Inception Report | : Team Leader of the JICA Study Team |
| 4. | Discussion of the Inception Report | |
| 5. | Other Matters | |

Annex B

## LIST OF ATTENDANTS

### DPWH STEERING COMMITTEE

| | | |
|---|---|---|
| 1. | Mr. Teodoro T. Encaranacion | Chairman, Undersecretary |
| 2. | Mr. Manuel M. Bonoan | Member, Asst.Secretary for Planning |
| 3. | Mr. Antonio A. Alpasan | Member, Project Director, PMO |
| 4. | Mr. Gregorio Carillo | Member, Assistant Director, Bureau of Design |
| 5. | Mr. Manuel S. Alconis | Member, Engineer V, PED, Planning Service |
| 6. | Ms. Sofia T. Santiago | Member, Engineer V, Bureau of Design |
| 7. | Mr. Carlos P. Zaamora | Member, Engineer II, PED, Planning Service |

### JICA EXPERT TO DPWH

1. Mr. Tetsuaki IWAKIRI

### JICA ADVISORY COMMITTEE MISSION

| | | |
|---|---|---|
| 1. | Mr. Yuichi KATO | Chairman |
| 2. | Mr. Kunihiro YAMADA | Member |

### JICA Coordinator

| | | |
|---|---|---|
| 1. | Mr. Kojiro MATSUMOTO | Coordinator |

### JICA STUDY TEAM

| | | |
|---|---|---|
| 1. | Mr. Katsuhisa ABE | Team Leader |
| 2. | Mr. Hitoshi KIN | Assist. Team Leader (Flood Control/river Engineer) |
| 3. | Mr. Toshinori OSHITA | Member, Urban Drainage Planner |
| 4. | Mr. Shinichiro MATSUMOTO | Member, Hydrologist |
| 5. | Mr. Hiroshi SHIMIZU | Member, Structural Engineer |
| 6. | Mr. Tatsuro TASHINO | Member, Socio-Economist |
| 7. | Mr. Tsuyoshi YUNO | Member, Coordinator |

# MINUTES OF DISCUSSION

## MEETING BETWEEN DPWH STEERING COMMITTEE AND JICA STUDY TEAM REGARDING THE PROGRESS REPORT (I) OF THE STUDY ON THE FLOOD CONTROL FOR RIVERS IN THE SELECTED URBAN CENTERS

1.0 The JICA Study Team (hereinafter referred to as "the Study Team") headed by Mr. Katsuhisa Abe has commenced the First Stage Study: Inventory Study upon their arrival in the Philippines on January 6, 1993.

2.0 Through the field reconnaissance and data collection as well as a sub-contracting with a local consulting firm for the detailed field survey, the inventory was carried out for 13 urban centers and their related rivers.

3.0 Compiling all results of the Inventory Study, the Progress Report (I) with 30 copies was submitted to the DPWH on February 12, 1993. Consecutively, the meeting on the report was held on February 15, 1993, with the attendant list shown in Annex A. The following points were agreed upon between the DPWH Steering Committee and the Study Team, viz:

3.1 The Progress Report (I) in general was found acceptable by the Steering Committee with some minor corrections.

3.2 Ormoc, Tacloban, Cebu and Iloilo were selected as the four (4) urban centers for the Master Plan Study through the justification in the Inventory Study.

3.3 For the continuation of establishing the Data-Base of other medium and small-scale rivers in the Philippines, the data input works will be undertaken by the DPWH.

Signed on February 15, 1993 in Manila, Philippines.

HITOSHI KIN
Asst. Team Leader
JICA Study Team

TEODORO T. ENCARNACION
Undersecretary,
Chairman of the
DPWH Steering Committee

WITNESSED:

TOSHINORI OSHITA
Urban Drainage Planner
JICA Study Team

ANTONIO A. ALPASAN
Member of the
DPWH Steering Committee

Annex A

**LIST OF ATTENDANTS**

DPWH Steering Committee

| | | |
|---|---|---|
| 1. | Mr. Teodoro T. Encarnacion | : Chairman, Undersecretary |
| 2. | Mr. Antonio A. Alpasan | : Member, Steering Committee |
| 3. | Mr. Gregorio O. Carrillo | : Member, Asst. Director, BOD<br>: (in lieu of Mr. B. C. Leuterio, Director, BOD) |

DPWH Technical Working Group

| | | |
|---|---|---|
| 1. | Mr. Trino-Trinidad G. Meris | : Chairman, Director III, Planning Service |
| 2. | Mr. Jose C. Guanzon | : Co-Chairman, Project Manager II, Central Labor Base Unit |
| 3. | Mr. Jose P. Gloria | : Member, Project Manager III, PMO-Feasibility Studies |
| 4. | Mr. Manuel S. Alconis | : Member, Engineer V, PED-Planning Service |
| 5. | Ms. Sofia T. Santiago | : Member, Engineer V, BOD |
| 6. | Mr. Jaime Magnaye | : Member, DPD-Planning Service |
| 7. | Mr. Resito V. David | : Member, Engineer III, PMO-Major Flood Control Projects |

JICA STUDY TEAM

| | | |
|---|---|---|
| 1. | Mr. Hitoshi KIN | : Asst. Team Leader (Flood Control/River Engineer) |
| 2. | Mr. Toshinori OSHITA | : Member, Urban Drainage Planner |
| 3. | Mr. Shinichiro MATSUMOTO | : Member, Hydrologist |
| 4. | Mr. Hiroshi SHIMIZU | : Member, Structural Engineer |
| 5. | Mr. Tsuyoshi YUNO | : Member, Coordinator |

**MEMORANDUM OF MEETING**

**ON**

**THE PROGRESS REPORT (II)**

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

**BETWEEN**
**DPWH STEERING COMMITTEE AND JICA STUDY TEAM**

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JULY 29, 1993 2:00 P.M.

AT CONFERENCE ROOM, OFFICE OF ASST. SECRETARY FOR PLANNING
DPWH, BONIFACIO DRIVE, PORT AREA, MANILA

The meeting on the Progress Report (II) of the captioned study was held between the DPWH Steering Committee and the JICA Study Team on July 29, 1993 with attendants as shown in Annex A.

After explanation on the report by the Study Team, the following comments were given by the Steering Committee to the Study Team:

- In compliance with the request from DPWH, the Study Team will make necessary arrangement for a supplemental seminar on the Master Plan of the Study in November, 1993.
- The environmental aspect shall be carefully considered, in the selection of the area for the Feasibility Study,
- The Feasibility Study shall be conducted in cooperation with the local government unit with the coordination of the DPWH, aiming at a smooth implementation of the project.
- The Interim Report should be submitted to the DPWH upon the preparation in Japan before the meeting on the report with Steering Committee scheduled in November, 1993.

## LIST OF ATTENDANTS

### DPWH STEERING COMMITTEE

| | | |
|---|---|---|
| 1. | Mr. Manuel M. BONOAN | Member, Asst. Secretary for Planning |
| 2. | Mr. Antonio A. ALPASAN | Member, Project Director, PMO |
| 3. | Mr. Bienvenido C. LEUTERIO | Director, Bureau of Design |
| 4. | Mr. Tetsuaki IWAKIRI | JICA Expert for Rivers |

### DPWH TECHNICAL WORKING GROUP

| | | |
|---|---|---|
| 1. | Mr. Manuel S. ALCONIS | Member, Engineer V, PED, Planning Service |
| 2. | Mr. Gerardi S. REYES | Engineer IV, Bureau of Design |

### JICA STUDY TEAM

| | | |
|---|---|---|
| 1. | Mr. Katsuhisa ABE | Team Leader |
| 2. | Mr. Hitoshi KIN | Asst. Team Leader (Flood Control/River Engineer) |
| 3. | Mr. Toshinori OSHITA | Member, Urban Drainage Planner |
| 4. | Mr. Hiroshi SHIMIZU | Member, Structural Engineer |
| 5. | Mr. Shuji KAKU | Member, Construction Plan and Cost Estimate Engineer |
| 6. | Mr. Tsuyoshi YUNO | Member, Coordinator |

MINUTES OF DISCUSSION

MEETING BETWEEN
DPWH STEERING COMMITTEE AND JICA STUDY TEAM
REGARDING THE INTERIM REPORT OF
THE STUDY ON THE FLOOD CONTROL FOR RIVERS
IN THE SELECTED URBAN CENTERS

1.0 The JICA Study Team ( hereinafter referred to as "the Study Team" headed by Mr. Katsuhisa Abe has completed the Second Stage Study: Master Plan Study and arrived in Manila, Philippines on November 4, 1993.

2.0 Through the detailed analyses on the flood control plans for the selected four cities, namely Iloilo, Cebu, Ormoc and Tacloban, the Master Plan has been formulated and compiled into the Interim Report in Japan.

3.0 The Interim Report with 30 copies was submitted to the Department of Public Works and Highways (hereinafter referred to as "the DPWH") on November 5, 1993. The meetings on the report were held with the DPWH Technical Working Group on November 8 and the DPWH Steering Committee on November 9, 1993, as the list of attendants is shown in Annex A. The following points were agreed upon between the DPWH Steering Committee and the Study Team, viz:

3.1 The Interim Report was in principle found acceptable by the Steering Committee.

3.2 Iloilo City was selected as the urban center for the Feasibility Study through the evaluation on the projects of the four cities, which were formulated in the Master Plan Study.

4.0 The JICA Study Team will convey the requests of the DPWH to the head office of JICA, viz:

4.1 The DPWH Steering Committee requested that Ormoc and Cebu cities be included in the said Feasibility Study in consideration of urgency and high economic efficiency of the flood control project for the cities.

4.2 The DPWH Steering Committee further requested that inventory and master plan studies be conducted for other urban centers which have seriously suffered flood damages, such as General Santos City, and Laoag and Davao cities.

Signed on November 10, 1993 in Manila, Philippines.

KATSUHISA ABE
Team Leader of the
JICA Study Team

TEODORO T. ENCARNACION
Undersecretary
As Chairman of the DPWH
Steering Committee

WITNESSED:

HITOSHI KIN
Asst. Team Leader
of the JICA Study Team

JOSE C. GUANZON
Project Manager
As Co-Chairman of the DPWH
Technical Working Group

ANNEX A

# LIST OF ATTENDANTS

## DPWH STEERING COMMITTEE

| | | |
|---|---|---|
| 1. | Mr. Teodoro T. Encarnacion | : Chairman, Undersecretary |
| 2. | Mr. Antonio A. Alpasan | : Member, Director, PMO-MFCD |
| 3. | Mr. Bienvenido C. Leuterio | : Member, Director, BOD |
| 4. | Mr. Tetsuaki Iwakiri | : Member, JICA River Expert |

## DPWH TECHNICAL WORKING GROUP

| | | |
|---|---|---|
| 1. | Mr. Jose C. Guanzon | : Co-Chairman, Project Manager II, Central Labor Base Unit |
| 2. | Mr. Jose P. Gloria | : Member, Project Manager III, PMO Feasibility Studies |
| 3. | Mr. Manuel S. Alconis | : Member, Engineer V, Planning Service |
| 4. | Ms. Sofia T. Santiago | : Member, Engineer V, BOD |
| 5. | Mr. Resito V. David | : Member, PMO-MFCD |

## JICA STUDY TEAM

| | | |
|---|---|---|
| 1. | Mr. Katsuhisa Abe | : Team Leader |
| 2. | Mr. Hitoshi Kin | : Asst. Team Leader (Flood Control/River Engineer) |
| 3. | Mr. Toshinori Oshita | : Member, Urban Drainage Planner |

## JICA

| | | |
|---|---|---|
| 1. | Mr. Kohjiro Matsumoto | : JICA Coordinator |
| 2. | Mr. Yukihiko Ejiri | : JICA Philippine Office |

**MINUTES OF DISCUSSION**
**ON**
**THE PROGRESS REPORT (III),**
**THE STUDY ON FLOOD CONTROL FOR RIVERS**
**IN THE SELECTED URBAN CENTERS**

**BETWEEN**
**DPWH TECHNICAL WORKING GROUP AND JICA STUDY TEAM**

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AUGUST 18, 1994 1:30 PM
AT CONFERENCE ROOM, OFFICE OF ASST. SECRETARY FOR PLANNING
DPWH, BONIFACIO DRIVE, PORT AREA, MANILA

1.0 The JICA Study Team (hereinafter referred to as "the Study Team") headed by Mr. Katsuhisa Abe has commenced the Third Stage Study: Feasibility Study upon their arrival in the Philippines on May 10,1994. Through the field reconnaissance and data collection as well as the subcontracts such as ground survey, geological investigation and environmental study, the Feasibility Study was carried out for the related rivers in Iloilo City and Ormoc City.

2.0 Compiling all results of the field survey in the Feasibility Study, the Progress Report (III) with 30 copies was submitted to the DPWH on August 15, 1994. The meeting on the Progress Report (III) was held between the DPWH Technical Working Group and the Study Team on August 18, 1994 with attendants shown in Annex A.

3.0 The Progress Report (III) was in general found acceptable by the Technical Working Group with some minor correction.

4.0 The schedule of the seminar on flood control plan of medium and small rivers which was prepared by the Study Team basically accepted by the Technical Working Group and the details of the seminar shall be discussed between the DPWH Counterpart Group, the DPWH Regional Office VI and the Study Team.

Signed on August 19, 1994 in Manila, Philippines.

Katsuhisa ABE
Team Leader
JICA Study Team

Manuel M. Bonoan
Chairman,
Asst. Secretary for Planning

# LIST OF ATTENDANCE

## DPWH TECHNICAL WORKING GROUP

| | |
|---|---|
| 1. Mr. Manuel M.Bonoan | Asst. Secretary for Planning |
| 2. Mr. Jose C. Guanzon | Project Manager III, CLBU-CARP-DPWH |
| 3. Mr. Jose P. Gloria | Proj. Mgr. III, PMO-FS |
| 4. Mr. Manuel S. Alconis | Eng.V, PED, PS |
| 5. Ms. Sofia T. Santiago | Eng.V, Bureau of Design, DPWH |
| 6. Mr. Resito V. David | Eng.V, PMO-FCD |

## DPWH REGION VI

| | |
|---|---|
| 1. Mr. Claro C. Moscoso | Chief Engineer, DPWH, Region VI, Iloilo City |

## JICA EXPERT TO DPWH

| | |
|---|---|
| 1. Mr. Tetsuaki Iwakiri | JICA Expert for Rivers |

## JICA PHILIPPINE OFFICE

| | |
|---|---|
| 1. Mr. Yukihiko Ejiri | Asst. Resident Representative |

## JICA STUDY TEAM

| | |
|---|---|
| 1. Mr. Katsuhisa Abe | Team Leader |
| 2. Mr. Hitoshi Kin | Asst. Team Leade (Flood Control/River Engineer) |
| 3. Mr. Toshinori Oshita | Member, Urban Drainage Planner |
| 4. Mr. Hiroshi Shimizu | Member, Structural Engineer |
| 5. Mr. Shuji Kaku | Member, Cost Estimate/Construction Planner |
| 6. Mr. Akira Sasaki | Member, Coordinator |

**MINUTES OF DISCUSSION**
**ON**
**THE DRAFT FINAL REPORT**
**STUDY ON THE FLOOD CONTROL FOR RIVERS**
**IN THE SELECTED URBAN CENTERS**

**BETWEEN**
**DPWH STEERING COMMITTEE AND JICA STUDY TEAM**

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DECEMBER 8, 1994 2:00 PM
AT CONFERENCE ROOM, OFFICE OF UNDERSECRETARY
DPWH, BONIFACIO DRIVE, PORT AREA, MANILA

Conclusive discussion on the Draft Final Report for the Study on the Flood Control for Rivers in the Selected Urban Centers was conducted on the day of 8th December 1994 at the office of DPWH.

On the basis of this discussion, the both parties have confirmed and understood as follows:

1.0 Thirty (30) sets of Draft Final Report consisting of the Summary, Main Report, Supporting Report (9 copies) and Data Book (9 copies) have been duly received from the Study Team and acknowledged by DPWH.

2.0 Contents and description presented in the Draft Final Report were in principle found acceptable by DPWH.

3.0 DPWH expressed that the Final Report shall be kept within JICA for at least 3-years before opened to public in Japan.

4.0 The Study Team accepts further comments of DPWH on the Draft Final Report, if any, by January 31, 1995 in order to finalize the Report within the term.

Signed on December 12, 1994 in Manila, Philippines.

Katsuhisa ABE
Team Leader
JICA Study Team

Teodoro T. Encarnacion
Undersecretary,
Chairman, Steering Committee

# LIST OF ATTENDANCE

## DPWH STEERING COMMITTEE

| | | |
|---|---|---|
| 1. | Mr. Teodoro T. Encarnacion | Chairman, Undersecretary |
| 2. | Mr. Manuel M. Bonoan | Member, Assistant Secretary for Planning |
| 3. | Mr. Antonio A. Alpasan | Member, Project Director, PMO-Major Flood Control and Drainage |
| 4. | Mr. Bienvenido C. Leuterio | Member, Director IV, Bureau of Design |
| 5. | Mr. Tetsuaki Iwakiri | Member, DPWH-JICA River Expert |

## DPWH TECHNICAL WORKING GROUP

| | | |
|---|---|---|
| 1. | Mr. Jose C. Guanzon | Co-chairman, Project Manager II, CLBU-CARP |
| 2. | Mr. Jose Gloria | Member, Project Manager III, PMO-FS |
| 3. | Mr. Manuel S. Alconis | Member, Engineer V, PED, Planning Service |
| 4. | Ms. Sofia T. Santiago | Member, Engineer V, Bureau of Design |
| 5. | Mr. Resito V. David | Member, Engineer V, PMO-Major Flood Control and Drainage |

## JICA EXPERT TO DPWH

| | | |
|---|---|---|
| 1. | Mr. Hiroyuki Ono | JICA Expert for Sabo |

## JICA PHILIPPINE OFFICE

| | | |
|---|---|---|
| 1. | Mr. Yukihiko Ejiri | Asst. Resident Representative |

## JICA STUDY TEAM

| | | |
|---|---|---|
| 1. | Mr. Katsuhisa Abe | Team Leader |
| 2. | Mr. Hitoshi Kin | Asst. Team Leader (Flood Control/River Planner) |
| 3. | Mr. Toshinori Oshita | Urban Drainage Planner |