

Legend : - - - - - Planning Implementation and O&M

Figure 5-2-(4)
MECHANISM OF ARRANGEMENT
IN PLANNING AND IMPLEMENTATION

Gorontalo Province

Water Resources Management Institution: Dinas PU/Kimpraswil (Dinas Pekerjaan Umum/Permukiman dan Prasarana Wilayah), Propinsi Gorontalo has the obligation to implement the decentralization authority and de-concentration in the sector of public works/settlement and regional infrastructure.

Flood Control and Coastal Protection Project Gorontalo Province: Flood Control and Coastal Protection Project (Proyek Pengendalian Banjir dan Pengamanan Pantai Provinsi Gorontalo Tahun Anggaran 2002) of Gorontalo Province has obligation to manage and to carry out a part of jobs of Ministry of Kimpraswil in performing development in water resources sector, especially flood control and coastal protection in Gorontalo Province. The project is under the guidance and responsibility of Directorate General of Water Resources Management and, in the implementation, is supervised and guided by Director of Water Resources East Region, and moreover is under coordination of the Head of Dinas PU/Kimpraswil Gorontalo Province. The project is financed by Central Budget (APBN).

Flood Control Project Region I Dinas PU/Kimpraswil Gorontalo Province: Flood Control Region I Dinas PU/Kimpraswil Gorontalo Province (Proyek Penanggulangan Banjir Wilayah I (PPBWI) Dinas PU/Kimpraswil Provinsi Gorontalo Tahun Anggaran 2002) has obligation to assist Provincial Administration of Gorontalo to carry out:

- 1) Flood control to secure the settlement, agriculture, commercial, government and public facilities in Gorontalo Province from flooding; and
- 2) Operation and maintenance of river.

The project is under the guidance and responsibilities of Governor of Gorontalo Province through Head of Dinas PU/Kimpraswil Gorontalo Province. The project budget is borne by Gorontalo Province (APBD Province).

Kota Gorontalo

Institution: Management of water resources matter in the Kota Gorontalo is done by Dinas Pekerjaan Umum Kota Gorontalo (Dinas PU: Public Works of Gorontalo City). The Dinas PU Kota Gorontalo is an administrative implementation element in the sector

of public works established by Kota Gorontalo Regional Decree No. 19/2000 and Walikota Gorontalo Decree No. 82/2001. The Dinas has an obligation to implement the authority of city autonomy in the framework of decentralization job, especially in the sector of public works.

Sub-Dinas of Water Resources: As to the management of water resources matter in Gorontalo city, Sub-Dinas Pengairan (Sub-Dinas of Water Resources) has the obligation to implement the part of Dinas obligation in the sector of water resources

Flood Control Project in Kota Gorontalo: In Kota Gorontalo, there are two projects for flood control activity as follows:

- 1) Proyek Perbaikan Tebing dan Pembuatan Cekdam (River Bank Improvement and Check dam Construction Project), funded by General Allocation Fund in The Dinas PU Gorontalo City.
- 2) Proyek Tanggap Darurat Bencana Alam Kota Gorontalo (Natural Disaster Mitigation Project), funded by Additional Budget for disaster mitigation.

Kabupaten of Gorontalo

Institution: The Water Management in Kabupaten Gorontalo was formerly done by the Public Work of North Sulawesi through Branch Office of Public Work in Gorontalo. The main job of the Branch office was operation and maintenance of irrigation network in Kabupaten Gorontalo.

The organization and work arrangement of Dinas in Kabupaten Gorontalo are established by Regional Regulation of Kabupaten Gorontalo No. 43/2000. The water resources management in Kabupaten Gorontalo is carried out by Dinas Pekerjaan Umum dan Prasarana Wilayah Kabupaten of Gorontalo (Dinas PU-Praswil: Public Works and Regional Infrastructure). For the implementation, Regional Regulation was issued as Bupati Gorontalo Decree No. 721/2000. The Decision states that the Dinas has an obligation of implementation as a regional autonomous authority in the sector of public work and regional infrastructure.

Flood Control Project in Kabupaten Gorontalo: In the fiscal year of 2002 through Bupati Gorontalo Decree No. 40/2002 in Kabupaten Gorontalo, flood control project were established by the name Proyek Normalisasi Sungai Kabupaten Gorontalo (River Normalization Project Kabupaten Gorontalo), and the project was funded by Region

Budget of Kabupaten.

5.2.(6) Project implementation plan (organization chart, number of staff, budget, task.)

An institution for the requested Project implementation will be established as a special project which is responsible to Directorate General of Water Resources and PU/Kimpraswil Gorontalo Province for its implementation.

Organizational Arrangement: Organizational arrangements for the implementation of the Project are tentatively proposed as shown in Figure 5-2-(6). The organization is composed of mainly three elements, i.e., managerial, staffing and implementation. The unit for the Flood Mitigation Project will be organized mainly with the staff of the Gorontalo Province, Kabupaten and Kota. It is essential to promote capacity building of these relevant agencies in collaboration.

Obligation and Authority: The Project Manager has obligation and authority for managing, regulating and coordinating the implementation of all project works giving direction and guidance, supervising works and controlling the staff and Implementation Element during the project implementation. The Project Manager will be responsible to Director General of Water Resources Development and operation to the chief of Dinas PU/Kimpraswil of Gorontalo Province through Sub-Dinas of Water Resources Development.

5.2.(7) Budget allocation and budget sharing among relative organization to implement the Project by Indonesian Side

Refer to Chapter 1. 1. (5)

5.2.(8) Task sharing among relative organization to implement the Project by Indonesian side

Refer to Chapter 5. 2. (5)

5.2.(9) To clarify the responsible organization for the project operation/maintenance

Refer to Chapter 5. 2. (5)

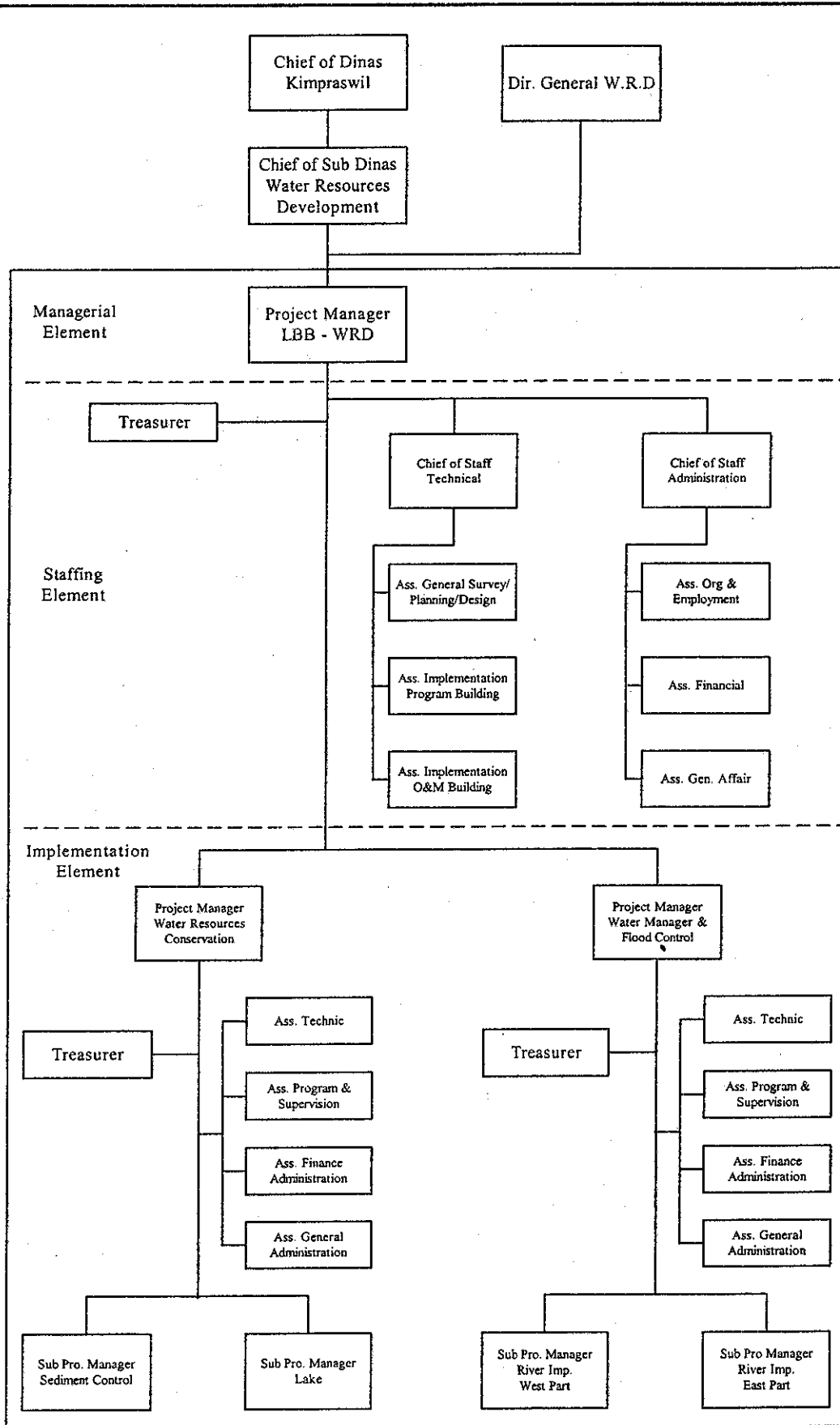


Figure 5-2-(6)
PROPOSED ORGANIZATION FOR
IMPLEMENTATION OF FM-MP

5.2.(10) *Operation and maintenance setup (organization chart, number of staff, budget, task.)*

Alternative I: Operation and Maintenance by Government Institution

As soon as the structure are finished to be implemented by project, the activities of O&M must be carried out. For the first two year period it is suggested that the operation and maintenance works is implemented by project, and than the responsible for managing the structure to be handed over to the related institution. The related institution could Dinas PU Kota Gorontalo or Dinas PU Kimpraswil. Kabupaten Gorontalo according to the location of the structure, or since the flood mitigation facilities of LBB River Basin is located across Kabupaten and Kota Gorontalo the responsible of the structure management should be to Dinas PU / Kimpraswil Gorontalo province.

To implement this job Dinas PU / Kimpraswil Gorontalo province should establish the Technical Implementation Unit. The implementation of O & M of flood mitigation facilities in LBB river basin shown in Table 5-2-(19).

Alternative II: Operation and Maintenance by Management Corporation.

- **River Territory:** According to the Government Regulation No 22/1982 concerning water management, the unit of water resources management to be desire base on the river territory (wilayah sungai). River territory is a territory as outcome development of some river basins, and river basin sometimes located at more than one kabupaten or province. Ministerial of Public Works Regulation No. 39/PRT/189 divided territory of Indonesia into 90 river territories, and in Gorontalo province river territories there are Territory Limboto-Bone (05.02) and Paguyaman-Randangan (05.03)

Recently water resources in LBB - River Basin is in the aggravated condition, and the problems are how to begin the operation and maintenance of the water resources facilities by involving water resources stakeholders.

- In arranging the institution for water resources management (O&M) has to involve local societies or stakeholders, and the regulation should to touch their aspiration.

Table 5-2-(10) IMPLEMENTATION AND O&M OF FLOOD MITIGATION FACILITIES IN LBB BASIN

| No | Flood Mitigation Facilities | Location | | Responsibility | | | Remarks |
|-----|-------------------------------|------------------------|-------------------|----------------|----------|-----------|---|
| | | Kabupaten Gorontalo | Kota Gorontalo | Central | Province | Kabupaten | |
| 1 | RIVER IMPROVEMENT | | | | | | |
| 1.1 | Bone River Improvement | ✓ | ✓ | | | | P = Planning D = Design L = Land Acquisition C = Construction O = Operation M = Maintenance Related Dinas: - River Imp = Dinas PU - Floodway/Dischannel = Dinas PU - Lake Limboto Manag. = Dinas PU - Watershed Mang. = Dinas Kehutanan/Pertanian - Flood Management = Other |
| 1.2 | Tamalate River Improvement | ✓ | ✓ | | | | |
| 1.3 | Bolango River Improvement | ✓ | ✓ | | | | |
| 1.4 | Biyonga River Improvement | ✓ | - | | | | |
| 1.5 | Alo & Pohnu River Improvement | ✓ | - | | | | |
| 1.6 | Meluopo River Improvement | ✓ | - | | | | |
| 1.7 | Marisa River Improvement | ✓ | - | | | | |
| 1.8 | Rintenga River Improvement | ✓ | - | | | | |
| 2 | FLOODWAY/DIVERSION CHANNEL | | | | | | |
| 2.1 | Tamalate River Floodway | ✓ | ✓ | | | | |
| 2.2 | Biyonga Realignment | ✓ | - | | | | |
| 2.3 | Alopohu Realignment | ✓ | - | | | | |
| 3 | LAKE LIMBOTO MANAGEMENT | | | | | | |
| 3.1 | Ring Dike | ✓ | ✓ | | | | |
| 3.2 | Control Gate | - | ✓ | | | | |
| 3.3 | Sand Trap | ✓ | ✓ | | | | |
| 4 | WATERSHED MANAGEMENT | ✓ | ✓ | | | | |
| 5 | FLOOD MANAGEMENT | ✓ | ✓ | | | | |

Note: *) if Province is not capable **) if Kabupaten / Kota is not capable

For implementation this matter a River Basin Management Board which has task to manage water resources in the river territory as Perum Jasa Tirta (PJT).

5.2.(11) Budget allocation and budgeted sharing to carry out operation/maintenance activity for the Project by Indonesian side

Fund

The budget for operation and maintenance is prepared by the related agency based on planning and scheduling. There are two essential items for preparing the budget, which are work schedule and unit rates of activities involved. The operation and maintenance budget consist of the following components:

- General administrative budget
- Operational Budget and
- Maintenance budget

Each of components contains cost estimate for manpower supplies and material, transport and others.

Cost Items for Operation and Maintenance

The required annual budget consisting of:

- 1) General and administrative budget
 - Cost for staff
 - Running cost of office
 - Maintenance cost of office
 - Running cost of equipment
- 2) Operation Cost
 - Monitoring and observation cost
 - Cost for operation of river structure
 - Flood fighting cost
- 3) Maintenance Cost
 - River survey cost
 - Patrol and inspection cost

- Maintenance cost for river structure, water level and rainfall gauging station
- Maintenance of warning system equipment.

5.2.(12) Task sharing among relative organization to carry out operation/maintenance activity for the Project by Indonesian side

(It will be summarized later)

5.2.(13) Experience and ability of related project implementation and operation/maintenance

(It will be summarized later)

5.3 The problem of the river management and its countermeasure plan for the Project

5.3.(1) Present condition and problems concerning with river management and water use

Fundamental Changes in Administration: Current issues of the decentralization are mainly those related to the transition for the centralization to decentralization systems. This administrative renovation from the centralization system to the decentralization requires fundamental changes of the institutions of the central government, local governments, and local communities as well. For the operation of the decentralization, relevant laws and subsequent regulations must be enacted.

Issuance of Regulations and Decrees: The decentralization policy was announced in 1999 mainly by Law No.22/1999 and Law No.25/1999. Since then, Central Government devoted to adjustment of relevant regulations and decrees, and as far as the water resources concerned, most of the regulations and decrees were issued in December 2001. Based on the legal frameworks of the Central Government, regulations and decrees of the provincial and regional governments are now being issued gradually.

Delay of Preparation: Owing to the delay of the announcement of the legal frameworks of the decentralization, it was also delayed to prepare for transfer of authorities from the central and provincial governments to regional governments

(Kabupaten/Kota). The Kabupaten/Kota are also not ready to receive the authorities. Gorontalo Province was newly established in 2000 and the Governor had to establish his own administrative institutions first. Provincial government has established Dinas PU/Kimpraswil, and Kabupaten and Kota Gorontalo also have established Dinas PU-Praswil and Dinas PU, respectively for public work services including water resources management. These Dinas, however, are not yet enough to implement the authorities in staff number and their capability, though the preparedness is progressing day by day.

Empowerment of Local Communities: Under the decentralization administration, the local communities and local organization like Farmer Organization and Water User's Association (WUA) also share important roles in water resources management. Empowerment of local communities with institutional and financial arrangements are necessary, so that they can participate in the water resources management with reasonable contributions.

5.3.(2) Expected problems on river management after the project implementation and its countermeasure plan (water use, inland fisheries, sediment deposition)

Balai PSDA (Pengelolaan Sumber Daya Air): If the transition toward decentralization lasts too long and water management falls in disorder, there would be a possibility of local conflict of interests in the community and territorial ego among the regional governments related to the water resources management. Establishment of Balai PSDA in early stage is expected to direct and manage water resources in LBB basin coordinating the governmental agencies and community organizations.

5.3.(3) Present activities and plan of integrated water resources management in the total basin

(It will be summarized later)

5.3.(4) Has progress of sedimentation in Limboto Lake been remarkable in recent year? If so, what is the reason and what bed effect induced?

It seemed remarkable about sedimentation in Limboto Lake in recent year. Sedimentation of Lake Limboto is recognized as a serious problem by the local governmental agencies and local communities. Water depth of the lake is already shallow and vegetation in the lake encroaches toward the lake center.

Devastation of watershed due to illegal logging or shifting cultivation increases sediment yield in the watershed and causes sediment deposits in the river channels, farmlands and lake in the lower reaches. A large part of sediment flows in the Lake Limboto and decrease its storage volume. Consequently a haul of fish in the lake decreases and flood regulation function of the lake lowers.

In order to estimate the annual sedimentation rate, attempts were made during previous JICA Study using the data as available, i.e., estimate from area and depth data and that from sounding data of the lake. Judging from the estimates by previous JICA Study, annual average sedimentation volume of Lake Limboto would be within the range from 1×10^6 to 2×10^6 m³/year, though it must be confirmed further by sounding survey in future.

Existing Hydraulic Function: During floods of the Bolango River, flood water from Lake Limboto basin cannot be drained due to high water level of the Boango River. On the contrary a part of the floodwater of the Bolango River flows into the lake. The floodwater is retained in the lake until the Bolango flood passes. Due to huge area of the lake, the lake water will not rise so much. This is the primary flood control function of the existing Lake Limboto.

There would be two extreme prospects for the lake, i.e., to be left as it is or to be reclaimed. Preliminary discussions are made in the following paragraphs.

If Lake were Left as It Is: Existing volume of Lake Limboto is 47.4 MCM below 4.0 m, MSL and the volume is reducing at the estimated rate ranging from 1 to 2 MCM per year due to sedimentation. The lake volume is decreasing if it is measured at a fixed elevation. However, this does not mean the disappearance of the lake in near future. Since the lake Limboto is located in the depressed area and the drainage of the lake is difficult during the flood period of the Bolango River, the floodwater of the lake would remain in and around the existing lake areas forming marshes expanding its area. In such conditions, use of lakeside lands and lake water may become uncertain, and the development of the lake and surrounding areas would be constrained.

If Lake were Reclaimed: If the lake were reclaimed, radical channel works of the Bolango River is required in the urban areas of Gorontalo City for the smooth drainage of flood water from the Bolango river and the Lake Limboto.

- 1) The Alo-Pohu and Biyonga rivers would be the primary river channels crossing the reclaimed lands. The rivers should be confined with diking systems.
- 2) The Bolango River should be improved for design discharge of 1600 m³/s even for 10 year flood, which is about 8 times of the existing capacity. Furthermore, the design high water level of the Bolango River should be set lower for the gravity drainage of lake Limboto to be reclaimed. Large volume of excavation for widening and deepening of low water channel would be necessary for the Bolango River.
- 3) These channel works are required for about 5 km of the Bolango River from its confluence of with the Tapodu River to that with the Bone River, and about 1 km of the Bone River until river mouth. The channel takes route in the densely populated urban area of Gorontalo City, which is the areas to be protected from flooding. Such works would not be practically acceptable.
- 4) Existing Lake Limboto plays an important and great role to protect the urban area of Gorontalo City from flooding alleviating flood peak discharge significantly. The storage functions of the existing lake should be maintained.

5.3.(5) *How is the sedimentation at river-mouth of Bone River? Was there any chance of blocking of river-mouth by sedimentation or drift sand? If it was, what countermeasure was taken?*

Sedimentation at river-mouth of Bone River is historically shifted to seawards over a long period. However, it is also estimated as stable condition now in general. A remarkable blocking of river-mouth by sedimentation or drift sand is not reported.

Abrupt drop of riverbed at the mouth of the Bone River

Abrupt drop of riverbed at the mouth of the Bone River was recognized by the aerial photo and site reconnaissance. The drop was also confirmed by the river survey done by JICA Study. The depth of the Bone River of around one meter increases abruptly to more than 70 meters, in front of the oil tank yard of Pertamina.

Cause of the abrupt riverbed drop was initially supposed to be the existence of rock exposed on the riverbed, because the river is sandwiched by hills formed with granite. If so, removal of the rock may contribute to lower the flood water level in the Lower Bone River and accordingly to promote drainage of the southern part of Gorontalo City.

In order to confirm the geological conditions of the Bone estuary, borings were carried out at five holes by the JICA Study. From the investigation, it was disclosed that the riverbed of the Bone estuary was filled with thick sediment of sand and gravel. No rock was found at any boreholes.

Based on the results of geological investigation, the abrupt drop of riverbed was judged to be the front limb of sediment deposit in deep water. Riverbed excavation under such geological condition may be, in general, difficult to be maintained, being filled up again soon. 2001年

5.3.(6) Maintenance condition of river facilities (dredging, flood control and water use etc.)

(It will be summarized later)

5.4 Data and information about the natural condition in the last 10 years

5.4.(1) Meteorological data (including wind speed and direction)

It will be prepared as Data 5-4-(1).

5.4.(2) Rainfall, water level, river discharge in LBB basin up-to latest

It will be prepared as Data 5-4-(2).

5.4.(3) Water quality

Results of investigation of water quality and bottom-sediment (by JICA) are available.

5.4.(4) Tide

Tide record at Bone river-moth manual gage station that has been established by JICA is available. (Data 5-4-(4).)

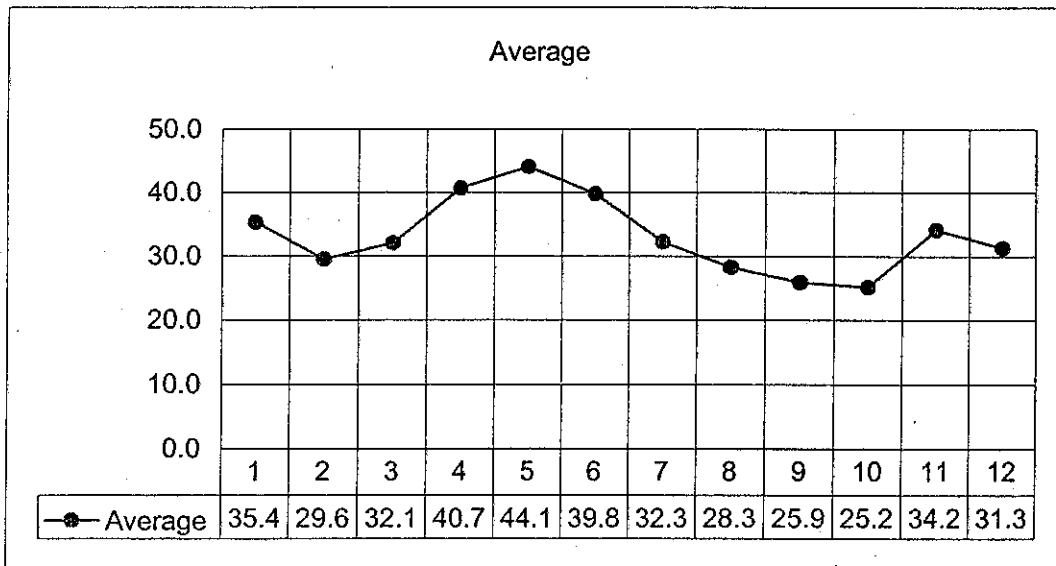
5.4.(5) Bathymetry of Limboto Lake

Bathymetry of Limboto Lake in 2001 by JICA is available. (Data 5-4-(5))

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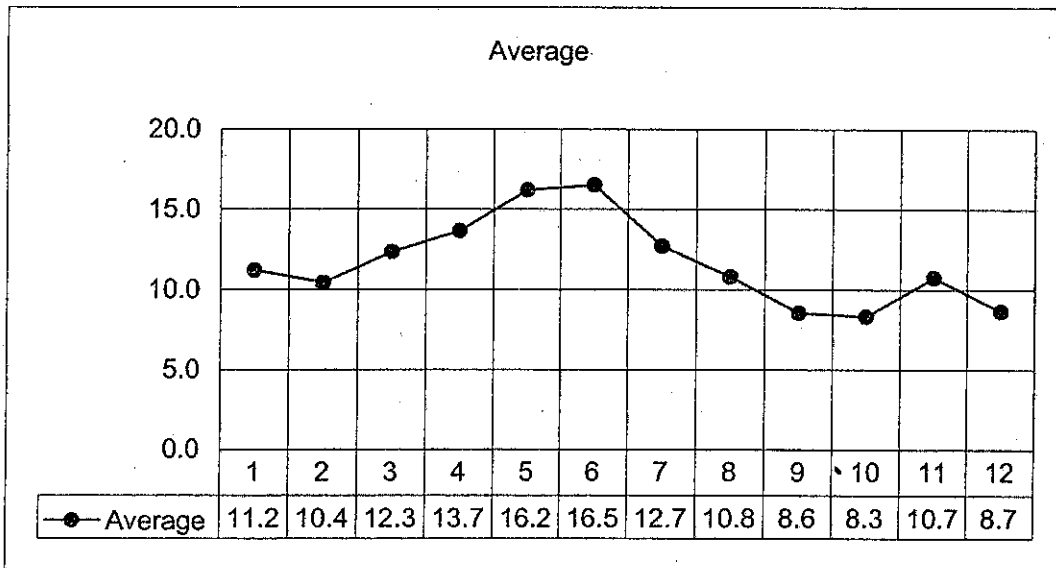
Bone: Lombongo (1,060 km²)

| Year | Month | | | | | | | | | | | |
|---------|-------|------|------|------|------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1985 | | | 28.3 | 29.6 | 38.5 | 34.6 | 33.1 | 42.8 | 40.2 | 42.1 | 62.4 | 48.9 |
| 1986 | 47.6 | 43.2 | 42.9 | 46.9 | 45.3 | 41.9 | 38.6 | 31.1 | 26.6 | 31.0 | 38.3 | 33.3 |
| 1987 | 27.2 | 27.2 | 24.5 | 28.6 | 34.8 | 24.1 | 17.0 | 17.1 | 15.0 | 17.5 | 20.4 | 19.8 |
| 1988 | 34.2 | 35.1 | 44.5 | 38.9 | 65.4 | 50.7 | 52.3 | 57.5 | 49.7 | | | |
| 1989 | | | 38.0 | 73.6 | 25.6 | 28.0 | 52.9 | 41.4 | 57.3 | 42.5 | 44.6 | 27.4 |
| 1990 | 53.7 | 31.3 | 30.4 | 49.0 | 39.5 | 32.7 | 16.5 | 24.1 | 18.5 | 32.6 | 38.3 | 26.4 |
| 1991 | 47.9 | 17.3 | 19.9 | 46.4 | 26.5 | 35.3 | 22.6 | 20.5 | 14.7 | 14.2 | 18.4 | 32.9 |
| 1992 | 23.4 | 17.4 | 14.5 | 14.2 | 51.5 | 39.6 | 26.8 | 15.6 | 11.1 | 19.5 | 25.0 | 36.2 |
| 1993 | 26.1 | 25.4 | 33.1 | 35.7 | 65.9 | 53.0 | 25.5 | 13.5 | 11.3 | 12.5 | 19.6 | 19.4 |
| 1994 | 23.0 | 39.9 | 47.1 | 44.2 | 48.0 | 57.9 | 37.8 | 19.2 | 15.1 | 15.2 | 40.6 | 37.6 |
| Average | 35.4 | 29.6 | 32.1 | 40.7 | 44.1 | 39.8 | 32.3 | 28.3 | 25.9 | 25.2 | 34.2 | 31.3 |



Boidu Tapa (388 km²)

| Year | Month | | | | | | | | | | | |
|---------|-------|------|------|------|------|------|------|------|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1985 | | 9.2 | 8.4 | 5.4 | 24.3 | 19.4 | 6.8 | 5.2 | 6.6 | 8.5 | 19.6 | 11.3 |
| 1986 | 9.4 | 9.2 | 17.3 | 15.2 | 22.8 | 12.7 | 7.8 | 5.2 | 5.7 | 6.5 | 11.3 | 4.0 |
| 1987 | 10.9 | 6.3 | 7.1 | 7.2 | 7.5 | 5.7 | 3.0 | 2.2 | 2.3 | 4.3 | 7.2 | 4.1 |
| 1988 | 4.5 | 11.0 | 10.2 | 16.4 | 21.3 | 10.5 | 8.5 | 17.0 | 15.8 | 13.9 | 14.4 | 10.3 |
| 1989 | 19.1 | 11.6 | 15.5 | 15.9 | 10.8 | 13.8 | 15.9 | 10.2 | 14.2 | 15.2 | 13.4 | 8.7 |
| 1990 | 13.6 | 10.7 | 12.4 | 23.8 | 15.9 | 10.6 | 8.6 | 6.9 | 13.0 | 9.9 | 10.9 | 4.8 |
| 1991 | 13.2 | 7.5 | 6.2 | 12.8 | 16.2 | 15.2 | 6.5 | 4.1 | 2.0 | 1.9 | 3.1 | 7.2 |
| 1992 | 3.8 | 4.5 | 2.6 | 4.3 | 10.7 | 14.8 | 5.0 | 4.0 | 2.1 | 5.4 | 7.4 | 14.2 |
| 1993 | 9.6 | 5.2 | 4.5 | 5.2 | 15.9 | 21.5 | 10.7 | 4.2 | 3.4 | 4.0 | 8.7 | 5.5 |
| 1994 | 8.3 | 14.1 | 26.0 | 14.7 | 18.1 | 25.5 | 11.8 | 4.7 | 2.6 | 2.9 | 7.1 | 7.5 |
| 1995 | 17.0 | 14.0 | 13.1 | 13.1 | 17.8 | 26.4 | 33.9 | 47.7 | 20.2 | 14.6 | 15.0 | 11.7 |
| 1996 | 11.3 | 20.3 | 25.7 | 12.8 | 7.0 | 29.4 | 39.4 | 25.4 | 21.1 | 18.7 | 15.3 | 15.4 |
| 1997 | 13.7 | 11.8 | 11.6 | 30.7 | 22.4 | 9.4 | 7.1 | 3.4 | 2.3 | 2.3 | 6.3 | 7.7 |
| Average | 11.2 | 10.4 | 12.3 | 13.7 | 16.2 | 16.5 | 12.7 | 10.8 | 8.6 | 8.3 | 10.7 | 8.7 |



Tide Level Record

| | | Year Month | | | | | | | | | | Staff reading (m) |
|-----|------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|
| | | 2001 | | 2002 | | | | | | | | |
| Day | Date | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | Daily Max. | 1.380 | 1.560 | 1.520 | 1.800 | 1.800 | 1.360 | 1.600 | 1.700 | 1.200 | 0.980 | 0.780 |
| | Daily Min. | 0.180 | 0.180 | 0.110 | 0.180 | 0.220 | 0.100 | 0.270 | 0.100 | 0.060 | 0.300 | 0.500 |
| | Daily Ave. | 0.745 | 0.751 | 0.769 | 0.775 | 0.887 | 0.755 | 0.817 | 0.728 | 0.607 | 0.680 | 0.613 |
| 2 | Daily Max. | 1.460 | 1.440 | 1.420 | 1.800 | 1.400 | 1.700 | 1.600 | 1.800 | 1.120 | 0.920 | |
| | Daily Min. | 0.010 | 0.010 | 0.040 | 0.190 | 0.350 | 0.260 | 0.100 | 0.300 | 0.100 | 0.260 | |
| | Daily Ave. | 0.727 | 0.662 | 0.656 | 0.760 | 0.930 | 0.731 | 0.760 | 0.763 | 0.567 | 0.635 | |
| 3 | Daily Max. | 1.480 | 1.420 | 1.360 | 1.800 | 1.800 | 1.600 | 1.800 | 0.960 | 0.950 | 0.900 | |
| | Daily Min. | 0.120 | 0.120 | 0.060 | 0.220 | 0.360 | 0.140 | 0.180 | 0.100 | 0.260 | 0.120 | |
| | Daily Ave. | 0.706 | 0.711 | 0.679 | 0.826 | 0.852 | 0.800 | 0.800 | 0.651 | 0.626 | 0.620 | |
| 4 | Daily Max. | 1.560 | 1.460 | 1.220 | 1.200 | 1.800 | 1.200 | 1.900 | 0.900 | 0.880 | 0.980 | |
| | Daily Min. | 0.140 | 0.010 | 0.110 | 0.240 | 0.230 | 0.140 | 0.400 | 0.100 | 0.400 | 0.360 | |
| | Daily Ave. | 0.714 | 0.685 | 0.631 | 0.755 | 0.825 | 0.638 | 0.815 | 0.702 | 0.580 | 0.705 | |
| 5 | Daily Max. | 1.460 | 1.420 | 1.320 | 1.200 | 1.800 | 1.900 | 1.800 | 0.980 | 0.700 | 0.980 | |
| | Daily Min. | 0.080 | 0.160 | 0.020 | 0.360 | 0.200 | 0.260 | 0.380 | 0.400 | 0.300 | 0.120 | |
| | Daily Ave. | 0.715 | 0.707 | 0.618 | 0.750 | 0.775 | 0.741 | 0.681 | 0.701 | 0.544 | 0.557 | |
| 6 | Daily Max. | 1.360 | 1.320 | 1.120 | 0.980 | 1.600 | 0.960 | 0.940 | 0.880 | 0.700 | 0.980 | |
| | Daily Min. | 0.080 | 0.110 | 0.410 | 0.540 | 0.120 | 0.400 | 0.400 | 0.420 | 0.380 | 0.160 | |
| | Daily Ave. | 0.680 | 0.704 | 0.772 | 0.755 | 0.750 | 0.685 | 0.670 | 0.605 | 0.554 | 0.558 | |
| 7 | Daily Max. | 1.320 | 1.120 | 0.980 | 1.600 | 1.300 | 0.980 | 0.960 | 0.980 | 0.900 | 0.960 | |
| | Daily Min. | 0.240 | 0.340 | 0.610 | 0.400 | 0.380 | 0.480 | 0.560 | 0.440 | 0.100 | 0.100 | |
| | Daily Ave. | 0.669 | 0.698 | 0.803 | 0.850 | 0.719 | 0.695 | 0.756 | 0.693 | 0.528 | 0.560 | |
| 8 | Daily Max. | 1.160 | 0.980 | 0.980 | 1.600 | 1.600 | 1.200 | 0.900 | 0.800 | 0.920 | 0.980 | |
| | Daily Min. | 0.360 | 0.310 | 0.510 | 0.340 | 0.260 | 0.300 | 0.120 | 0.330 | 0.160 | 0.100 | |
| | Daily Ave. | 0.713 | 0.685 | 0.715 | 0.767 | 0.748 | 0.623 | 0.636 | 0.561 | 0.487 | 0.503 | |
| 9 | Daily Max. | 1.060 | 0.940 | 1.060 | 1.400 | 1.900 | 1.800 | 1.140 | 1.300 | 1.140 | 1.320 | |
| | Daily Min. | 0.380 | 0.560 | 0.480 | 0.380 | 0.200 | 0.300 | 0.160 | 0.270 | 0.220 | 0.200 | |
| | Daily Ave. | 0.673 | 0.720 | 0.769 | 0.681 | 0.693 | 0.681 | 0.661 | 0.782 | 0.607 | 0.668 | |
| 10 | Daily Max. | 0.940 | 0.810 | 1.360 | 1.300 | 1.600 | 1.200 | 1.200 | 1.100 | 0.930 | 1.400 | |
| | Daily Min. | 0.480 | 0.410 | 0.320 | 0.260 | 0.320 | 0.240 | 0.240 | 0.200 | 0.120 | 0.200 | |
| | Daily Ave. | 0.700 | 0.654 | 0.778 | 0.650 | 0.757 | 0.713 | 0.733 | 0.645 | 0.468 | 0.689 | |
| 11 | Daily Max. | 0.920 | 1.360 | 1.320 | 1.800 | 1.500 | 1.800 | 0.940 | 1.600 | 1.100 | 1.380 | |
| | Daily Min. | 0.510 | 0.410 | 0.210 | 0.260 | 0.400 | 0.250 | 0.280 | 0.160 | 0.200 | 0.220 | |
| | Daily Ave. | 0.715 | 0.810 | 0.692 | 0.727 | 0.737 | 0.675 | 0.763 | 0.630 | 0.498 | 0.779 | |
| 12 | Daily Max. | 1.020 | 1.280 | 1.440 | 1.500 | 1.700 | 1.600 | 1.600 | 1.340 | 1.300 | 1.400 | |
| | Daily Min. | 0.460 | 0.360 | 0.260 | 0.200 | 0.360 | 0.220 | 0.180 | 0.080 | 0.180 | 0.120 | |
| | Daily Ave. | 0.735 | 0.760 | 0.722 | 0.723 | 0.721 | 0.779 | 0.730 | 0.623 | 0.679 | 0.687 | |
| 13 | Daily Max. | 1.240 | 1.310 | 1.460 | 1.600 | 1.800 | 1.600 | 1.800 | 1.430 | 1.360 | 1.460 | |
| | Daily Min. | 0.360 | 0.410 | 0.180 | 0.180 | 0.270 | 0.200 | 0.100 | 0.060 | 0.100 | 0.370 | |
| | Daily Ave. | 0.768 | 0.772 | 0.733 | 0.685 | 0.840 | 0.797 | 0.720 | 0.668 | 0.651 | 0.810 | |
| 14 | Daily Max. | 1.310 | 1.480 | 1.440 | 1.600 | 1.800 | 1.600 | 1.800 | 1.400 | 1.300 | 1.400 | |
| | Daily Min. | 0.260 | 0.110 | 0.180 | 0.240 | 0.250 | 0.180 | 0.150 | 0.060 | 0.100 | 0.180 | |
| | Daily Ave. | 0.726 | 0.686 | 0.674 | 0.738 | 0.708 | 0.734 | 0.708 | 0.673 | 0.643 | 0.833 | |
| 15 | Daily Max. | 1.340 | 1.420 | 1.440 | 1.280 | 1.900 | 1.360 | 1.400 | 1.380 | 1.200 | 1.080 | |
| | Daily Min. | 0.110 | 0.000 | 0.180 | 0.140 | 0.340 | 0.100 | 0.100 | 0.100 | 0.100 | 0.140 | |
| | Daily Ave. | 0.710 | 0.766 | 0.725 | 0.697 | 0.865 | 0.648 | 0.691 | 0.715 | 0.673 | 0.705 | |
| 16 | Daily Max. | 1.520 | 1.420 | 1.460 | 1.360 | 1.800 | 1.500 | 1.800 | 1.300 | 1.120 | 1.180 | |
| | Daily Min. | 0.080 | 0.310 | 0.180 | 0.280 | 0.250 | 0.100 | 0.200 | 0.080 | 0.360 | 0.200 | |
| | Daily Ave. | 0.715 | 0.786 | 0.734 | 0.774 | 0.927 | 0.695 | 0.741 | 0.699 | 0.647 | 0.728 | |
| 17 | Daily Max. | 1.540 | 1.340 | 1.340 | 1.700 | 1.800 | 1.700 | 1.800 | 1.200 | 0.940 | 1.260 | |
| | Daily Min. | 0.020 | 0.010 | 0.220 | 0.180 | 0.300 | 0.100 | 0.120 | 0.060 | 0.080 | 0.260 | |
| | Daily Ave. | 0.720 | 0.614 | 0.749 | 0.794 | 0.862 | 0.733 | 0.719 | 0.702 | 0.603 | 0.701 | |
| 18 | Daily Max. | 1.580 | 1.420 | 1.280 | 1.700 | 1.800 | 1.300 | 1.800 | 1.600 | 0.950 | 0.980 | |
| | Daily Min. | 0.060 | 0.010 | 0.320 | 0.270 | 0.240 | 0.140 | 0.100 | 0.100 | 0.220 | 0.120 | |
| | Daily Ave. | 0.705 | 0.632 | 0.753 | 0.796 | 0.815 | 0.722 | 0.788 | 0.650 | 0.642 | 0.608 | |
| 19 | Daily Max. | 1.540 | 1.280 | 1.240 | 0.980 | 1.600 | 1.900 | 1.160 | 1.060 | 0.900 | 0.980 | |
| | Daily Min. | 0.010 | 0.060 | 0.310 | 0.260 | 0.240 | 0.240 | 0.200 | 0.180 | 0.180 | 0.280 | |
| | Daily Ave. | 0.670 | 0.670 | 0.749 | 0.667 | 0.774 | 0.708 | 0.675 | 0.565 | 0.602 | 0.624 | |
| 20 | Daily Max. | 1.420 | 1.110 | 1.120 | 0.980 | 1.900 | 1.500 | 1.200 | 1.260 | 1.800 | 0.960 | |
| | Daily Min. | 0.110 | 0.110 | 0.320 | 0.300 | 0.270 | 0.290 | 0.140 | 0.020 | 0.120 | 0.260 | |
| | Daily Ave. | 0.675 | 0.644 | 0.750 | 0.670 | 0.823 | 0.811 | 0.724 | 0.683 | 0.699 | 0.583 | |
| 21 | Daily Max. | 1.180 | 1.120 | 0.980 | 1.300 | 1.800 | 0.940 | 1.340 | 0.820 | 1.280 | 1.300 | |
| | Daily Min. | 0.240 | 0.320 | 0.310 | 0.310 | 0.380 | 0.260 | 0.500 | 0.040 | 0.200 | 0.230 | |
| | Daily Ave. | 0.651 | 0.648 | 0.721 | 0.702 | 0.845 | 0.650 | 0.821 | 0.560 | 0.684 | 0.639 | |
| 22 | Daily Max. | 1.190 | 1.040 | 0.900 | 1.340 | 1.400 | 1.100 | 0.960 | 1.400 | 1.240 | 1.280 | |
| | Daily Min. | 0.280 | 0.410 | 0.330 | 0.200 | 0.300 | 0.480 | 0.520 | 0.370 | 0.370 | 0.260 | |
| | Daily Ave. | 0.679 | 0.722 | 0.705 | 0.567 | 0.710 | 0.715 | 0.720 | 0.690 | 0.650 | 0.645 | |
| 23 | Daily Max. | 1.080 | 0.980 | 0.960 | 1.700 | 1.100 | 1.200 | 0.900 | 1.100 | 1.380 | 1.340 | |
| | Daily Min. | 0.310 | 0.510 | 0.460 | 0.210 | 0.380 | 0.260 | 0.200 | 0.060 | 0.420 | 0.180 | |
| | Daily Ave. | 0.679 | 0.733 | 0.763 | 0.743 | 0.737 | 0.658 | 0.647 | 0.623 | 0.788 | 0.668 | |
| 24 | Daily Max. | 0.980 | 0.840 | 1.120 | 1.700 | 1.180 | 0.980 | 0.840 | 1.100 | 1.260 | 1.180 | |
| | Daily Min. | 0.310 | 0.520 | 0.500 | 0.300 | 0.400 | 0.370 | 0.240 | 0.280 | 0.250 | 0.180 | |
| | Daily Ave. | 0.659 | 0.700 | 0.770 | 0.744 | 0.750 | 0.655 | 0.536 | 0.616 | 0.650 | 0.570 | |
| 25 | Daily Max. | 0.860 | 0.880 | 1.160 | 1.800 | 1.800 | 1.600 | 1.260 | 1.600 | 1.340 | 1.320 | |
| | Daily Min. | 0.540 | 0.410 | 0.460 | 0.390 | 0.480 | 0.400 | 0.180 | 0.120 | 0.220 | 0.140 | |
| | Daily Ave. | 0.695 | 0.661 | 0.721 | 0.807 | 0.797 | 0.729 | 0.678 | 0.710 | 0.683 | 0.655 | |
| 26 | Daily Max. | 0.860 | 0.960 | 1.230 | 1.600 | 1.700 | 1.400 | 1.420 | 1.260 | 1.500 | 1.400 | |
| | Daily Min. | 0.460 | 0.310 | 0.380 | 0.300 | 0.380 | 0.220 | 0.230 | 0.080 | 0.180 | 0.100 | |
| | Daily Ave. | 0.702 | 0.697 | 0.767 | 0.786 | 0.784 | 0.742 | 0.688 | 0.613 | 0.722 | 0.648 | |
| 27 | Daily Max. | 0.880 | 1.120 | 1.460 | 1.400 | 1.300 | 1.180 | 1.100 | 1.380 | 1.320 | 1.360 | |
| | Daily Min. | 0.420 | 0.320 | 0.300 | 0.200 | 0.300 | 0.180 | 0.100 | 0.100 | 0.200 | 0.120 | |
| | Daily Ave. | 0.645 | 0.679 | 0.708 | 0.695 | 0.679 | 0.614 | 0.530 | 0.701 | 0.705 | 0.689 | |
| 28 | Daily Max. | 1.220 | 1.320 | 1.430 | 1.400 | 1.800 | 1.800 | 1.400 | 1.400 | 1.400 | 1.180 | |
| | Daily Min. | 0.360 | 0.210 | 0.220 | 0.180 | 0.250 | 0.160 | 0.100 | 0.180 | 0.120 | 0.180 | |
| | Daily Ave. | 0.734 | 0.684 | 0.690 | 0.748 | 0.795 | 0.761 | 0.685 | 0.644 | 0.728 | 0.635 | |
| 29 | Daily Max. | 1.420 | 1.260 | 1.520 | 1.600 | 1.480 | 1.480 | 1.400 | 1.280 | 1.200 | 0.940 | |
| | Daily Min. | 0.240 | 0.260 | 0.150 | 0.160 | 0.100 | 0.100 | 0.200 | 0.100 | 0.180 | 0.200 | |
| | Daily Ave. | 0.732 | 0.698 | 0.689 | 0.770 | 0.709 | 0.680 | 0.672 | 0.675 | 0.675 | 0.577 | |
| 30 | Daily Max. | 1.580 | 1.420 | 1.480 | 1.800 | 1.400 | 1.400 | 1.170 | 1.360 | 0.900 | | |
| | Daily Min. | 0.260 | 0.180 | 0.110 | 0.220 | 0.200 | 0.100 | 0.200 | 0.200 | 0.200 | 0.180 | |
| | Daily Ave. | 0.745 | 0.706 | 0.674 | 0.733 | 0.857 | 0.678 | 0.635 | 0.673 | 0.548 | | |
| 31 | Daily Max. | | 1.520 | 1.430 | | 1.800 | | 1.280 | | 1.340 | 0.980 | |
| | Daily Min. | | 0.110 | 0.190 | | 0.120 | | 0.100 | | 0.200 | 0.100 | |
| | Daily Ave. | | 0.788 | 0.721 | | 0.765 | | 0.673 | | 0.762 | 0.592 | |

Bathymetry of Limboto Lake in 1996 by CIDA is available in Dinas PSDA of North Sulawesi province.

5.4.(6) Earthquake data

It will be prepared as Data 5-4-(6)

5.5 River facilities

5.5.(1) Any information / indicates on changes of flooding situation around Lake Limboto and Gorontalo city area. Any artificial structures such as dike / canal in recent years around the area suffering flooding.

Changes of flooding situation are not clear but it seems getting worse. On the other hand, damages of flooding are increasing due to spreading of urban area in flood plain.

River structures constructed in 2001 and 2002 are summarized below;

Gorontalo Province

(Refer to Data 5-5-(1).)

- Revetment and embankment works in Bolango R. (in 2001)
- Revetment and embankment works in Tamalate R. (in 2001)
- Revetment and embankment works in Bone R. (in 2001)
-
- Stone masonry revetment works at upper stretches of Tamalate R. (in 2002)
- Stone masonry revetment works in Biyonga R. (in 2002)
- Stone masonry revetment works in Bone R. (in 2002)
- Gabion works at separation of Left and Right Bolango R. (in 2002)
- Stone masonry revetment works in Bulota R. (in 2002)
- River training works in Bone R.

Kota Gorontalo

(Refer to data prepared by Dinas PU Kota Gorontalo)

- Revetment works in Bone River (in 2002)
- Construction of check dam in Porous Lotu (in 2002)
-

Kabupaten Gorontalo

(Refer to data prepared by Dinas PU/Praswil Kabupaten Gorontalo)

5.5.(2) *Earthquake damages on river structure in LBB basin*

It was reported that abutments of Talumolo I Bridge subsided by effects of the earthquake in 1988.

5.5.(3) *Tunami damage on river structure in LBB basin*

No damage is reported recently.

5.5.(4) *Seismic design condition in Gorontalo Province*

It will be prepared as Data 5-5-(4)

Chapte 6. Present Condition of Institutional Strengthening and Capacity Building

6.1 Present activity and plan about institutional strengthening.

Gorontalo province and Kabupaten and Kota Gorontalo have just established new Public Works Office. In order to ensure that the flood mitigation works in LBB Basin are executed, operated and maintained by competent, qualified personnel, the regional Dinas for public works will establish a satisfactory organization for it as soon as possible. For this purpose strengthening of the existing institution is needed for Sub-Dinas water resources management at province level, Kabupaten as well as Kota Gorontalo. On the other hand, to fulfill the staff in number and capability, training should be conducted.

Strengthening Sub-Dinas of Province

In the year of 2001 Sub-Dinas Water Resources Development of Gorontalo Province has two sections that are section of Technical Design and Irrigation and Section of River, Swamp and Coast and O&M.

To conduct the decentralization job (Government Regulation No. 25/2000) and deconcentration job (Gov. Regulation No. 39/2001 article 3) of the provincial Dinas in the year 2002, the Sub-Dinas of Water Resources has been expanded (1) Section of Planning, (2) Section of Irrigation and O&M, (3) Section of River, Swamp, Coast and Lake.

For more perfection in implementation, Technical Implementation Unit (TIU) need to be established. The TIU is needed for implementation of water resources management in the river basin covering more than one Kabupaten/Kota like the LBB River Basin. By the Minister of Home Affair Decree No. 179 / 1996, TIU has been established in several provinces under the name Balai Pengelolaan Sumber Daya Air (Balai PSDA). There are 4 in West Java, 1 in Banten, 9 in Central Java, 2 in Lampung, 2 in South Sumatra, 6 in North Sumatra, 2 in NTT and 5 in North Sulawesi respectively.

The obligation of TIU includes:

- 1) Main Job: Management of water resources by activities of water allocation, water quality control, flood management, maintenance of river course and the

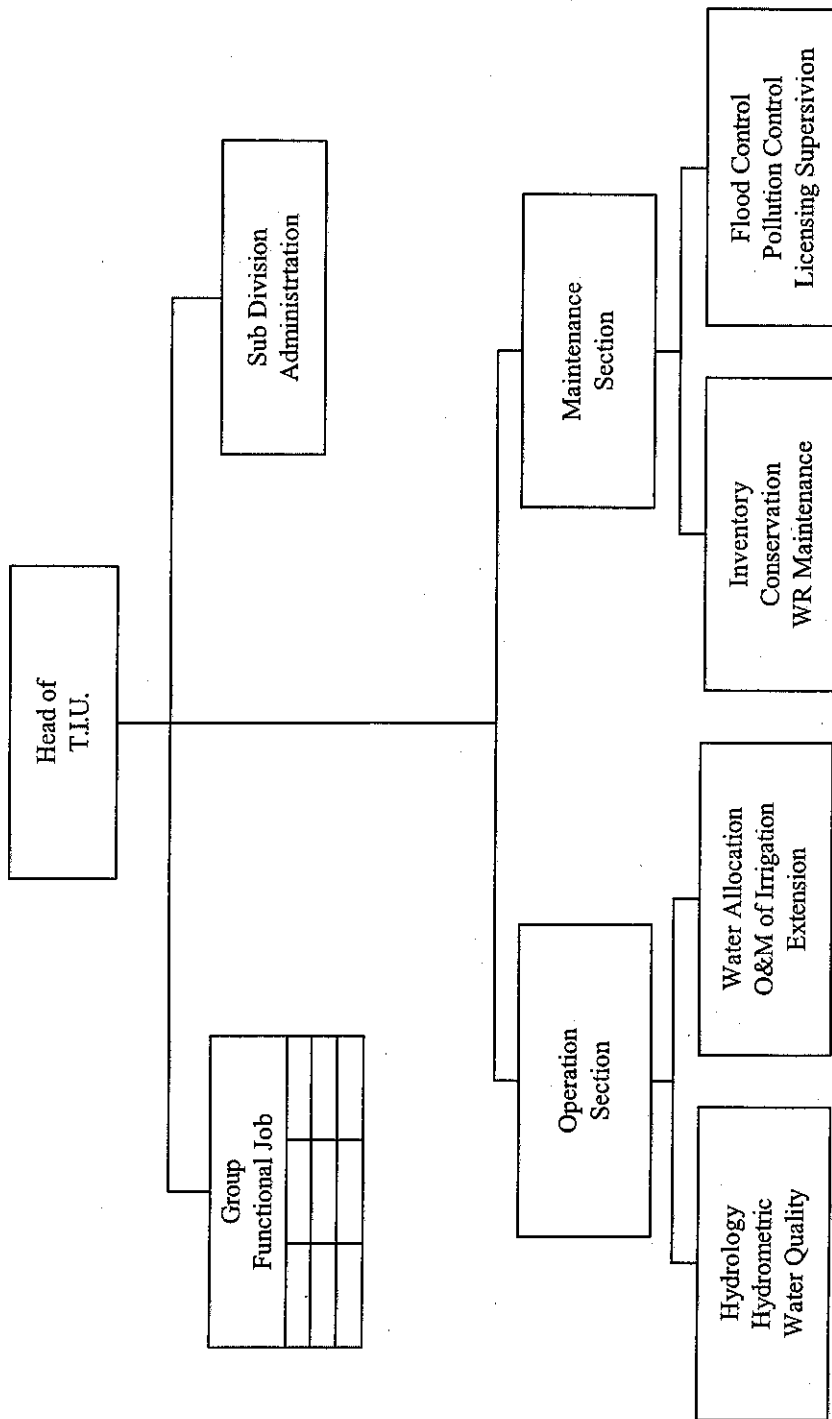


Figure 6-1
SUGGESTED TIU - LBB BASIN, GORONTALO PROVINCE

facilities therein and operation and maintenance of irrigation network inter Kabupaten/Kota.

- 2) Supporting job: Management data of hydrology, hydrometeorology, and database and supporting coordination inter institutions.

For the implementation of the above job, the TIU has following functions:

- 1) Operational services for communities in water resources sector
- 2) Operational services in conservation of water and water resources
- 3) Technical and administrative services covering finance, personnel and equipment.

The organization of TIU is shown in Figure 6-1. For the long-term program, the Sub-Dinas Water Resources Management need to be expanded as "Dinas Water Resources Management".

Strengthening Sub-Dinas of Kabupaten/Kota Gorontalo

Sub-Dinas related to water resources of Kabupaten/Kota Gorontalo is still in transition condition, and the operation and maintenance for the irrigation network located in Kabupaten/Kota Gorontalo and inter-kabupaten/kota are still implemented by the provincial level. In future when the job is transferred to Kabupaten from Province, the functions of Sub-Dinas Kabupaten Gorontalo must be enhanced more in human power, budget and equipment. In implementing the FM-MP, Sub-Dinas will share a part of the flood mitigation facilities. To conduct the job of Sub-Dinas in Water Resources Management, it should be strengthened in two ways in short term and long term measures. Sub-Dinas is needed to be expanded as Dinas of Water Resources.

6.2 Present activity and plan about capacity building.

Training activities should be emphasized on organization, planning, implementation, and management functions. It should cover the technical and management staff, operating personnel and unskilled workers as well. The staff profiles Dinas PU in Gorontalo are summarized below.

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| | PU Province | | PU Kabupaten | | PU City | |
|------------------------|-------------|----------|--------------|----------|---------|----------|
| | Organic | Non Org. | Organic | Non Org. | Organic | Non Org. |
| Total Staff | 99 | 237 | 73 | 29 | 53 | 3 |
| Technical Professional | 18% | 2% | 12.3% | - | 22.7% | - |
| Non-Tech..Professional | 6% | 2% | - | - | 3.8% | - |
| High School | 76% | 96% | 87.7% | 100% | 75.5% | 100% |

The training should also give special attention to recent administrative changes in the direction and responsibility between the central and regional offices. The development and implementation of training program should be recognized as particular needs in developing human resources for operation and maintenance (O&M).

One of the important public works policy is to utilize the existing functions of infrastructure at optimum level. For this operation, maintenance and rehabilitation activities should be done appropriately by all relevant agencies such as central and regional governments public and private organizations, and the other direct beneficiaries. The policy intends to enable that the existing flood mitigation facilities function well during the planed lifetime, and the safety against the flood should be kept.

The scope of training in the field of O&M should cover operation of water use facilities, use and protection of river, and management of sediment. The maintenance activities of river should include river channel, flood plain, river structure and other river related facilities. Monitoring and observation also should be covered by the training. The activity of monitoring includes observation of water level, discharge measurement, and monitoring river conditions with periodical surveys of river channel and lake.

The practical knowledge and know how for patrol and inspection also should be given, since the maintenance activity start from the patrol and inspection of river facilities. These activities clarify the weak point of facilities. The proper repair works in time can elongate the durability of the facilities with lower costs and avoid damages to people's live and properties.

6.3 The contents and objective of the requested Engineering Assistance.

In order to accomplish the objectives/ purposes of the proposed project, the engineering services shall be provided in various fields both in technical and organizational/ institutional aspects.

Engineering Services

- 1) Detailed design of project facilities
- 2) Construction supervision
- 3) Assistance in establishing organization
- 4) Transfer of knowledge

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Chapte 7. Related Development Plan and the Aid Conditions of Donor Countries/Organizations

7.1 Summary of "Limboto-Bolango-Bone Basin Water Management" by CIDA

Limboto-Bolango-Bone Basin Water Management Master Plan (WM-MP), was formulated in March, 1999 by Sub Dinas Pengairan, PU and the Canadian Executing Agency (CEA) through the North Sulawesi Water Resources Institutional Development Project (Proyek Pembinaan Pengairan Sulawesi Utara: P3SU Project:), a project funded by the Canadian International Development Agency (CIDA). The report and the Master Plan are referred to as the CIDA Report and the WM-MP in this report.

Objectives

The WM-MP aims to 1) provide a central planning and coordination instrument for the application of an integrated approach to water management, 2) guide decision makers for the optimal management of the basin in support of the social and economic development, 3) present a group of viable water resources development schemes in support of the National and Provincial plans, and 4) formulate a phased development plan to exploit opportunities for single and multi-purpose water resources projects.

The Plan is addressed to the people of the LBB basin and is intended for the planning agencies and management authorities in the Province of North Sulawesi and the basin.

Studies

Basin-wide studies were undertaken in 1993 and 1994 at the start of the planning process. In 1995/96, a set of water management issues was compiled based on information from initial studies, an analysis of trends, and the outputs of a public consultation meeting.

Plan components addressing the identified issues were prepared. Each component consists of a set of initiatives that are designed to meet the component objective. These components with their respective initiatives make up the WM-MP. National, provincial, and basin level plans were closely studied and referred to at each step of the planning process to ensure that the plan is in keeping with stated Government policy.

Water Management Issues

As a result of studies, the CIDA Report identified nine major water management issues as follows:

- 1) Inadequate institutional capacity,
- 2) Deforestation of Watersheds,
- 3) Water shortage for irrigation in West Limboto,
- 4) Flood hazard in Kota Gorontalo and Limboto,
- 5) Pressure on Lake Limboto,
- 6) Inadequate exploitation of irrigation infrastructure,
- 7) Limited access to safe drinking water of the rural population,
- 8) Unreliable urban water supply systems, and
- 9) Inadequate sanitation measures.

In order to cope with these issues, six objectives were identified and pursued as the components of the WM-MP. The initiatives for WM-MP are listed in Table 7-1 classified into following components:

Component 1: Improve the institutional framework for water management,

Component 2: Protect and conserve the water resources,

Component 3: Improve the use of the Existing water infrastructure

Component 4: Meet water requirement

Component 5: Contribute to meeting energy requirement

Component 6: Reduce urban and agricultural flood damage

A total of 29 initiatives are proposed to attain the component objective. The SDP (Sub Dinas Pengairan) of North Sulawesi Province proposed a five year action plan for Repelita VII from 1999/2000 to 2003/04, and 14 initiative indicated in the said Table were adopted for the five year action plan.

Concerns with the Project requested

The WM-MP covers widely water management issues including flood and sediment issues in its part. Among 6 components of the WM-MP, Component 6 (Reduce Urban Flood Damage) has direct concerns to the Project requested.

Refer to Data 7-1 (Executive Summary of "Limboto-Bolango-Bone Basin Water

Table 7-1 INITIATIVES FOR WATER MANAGEMENT MASTER PLAN(1/2)
(Cost in Million Rupiah)

| Init. No. | Title of Initiative | Rationale | Capital Cost |
|--|--|--|--------------|
| COMPONENT 1: IMPROVE INSTITUTIONAL FRAMEWORK | | | |
| 1 fa | Water Management Institutions | Attention is required at Provincial, Kabupaten and field levels. | 1,000 |
| 2 fa | River Basin Water Resources Committee (PPTPA) | The Committee is urgently needed to guide basin development. Decree needed from Governor for formation of PPTPA committee. PTPA committee already operational. | 200 |
| COMPONENT 2: PROTECT AND CONSERVE WATER RESOURCES | | | |
| 3 f | Environment Management | Immediate attention required to address environmental problems in the upper basin and waste management options in the lowlands. | 2,400 |
| 4 f | Upper and Middle Watershed Rehabilitation | Rehabilitation has started. Attention is needed to speed up reforestation, regreening, and stabilization of agricultural practices. | 45,000 |
| 5 fa | Sediment Monitoring | Work has started. Further work is required to clearly establish rates of sediment deposition in Lake Limboto and irrigation systems. | 4,677 |
| 6 fa | Lake Limboto Management Plan | Updating of the Lake Limboto Management Plan is needed to guide lake development in a sustainable manner. | 975 |
| 7 f | Demarcation of Lake Limboto Buffer Zone | Forming a buffer zone is a high priority of the Local Government to control development around the lake. | 4,130 |
| 8 f | Regulation of Lake Limboto Water Levels | A gated control structure is needed for lake management and flood mitigation. | 10,661 |
| 9 f | Dredging of Lake Limboto | A pilot maintenance dredging program is proposed for two small areas of Lake Limboto. | 175 |
| 10 | Fisheries Development | A fishery management program is required to improve open water fisheries and control cage culture. | 3,445 |
| 11 | Sanitation Measures | Attention is needed to monitor effluents and groundwater quality. Improved sanitation should be a part of urban development | 33,000 |
| COMPONENT 3: IMPROVE USE OF EXISTING WATER RESOURCES INFRASTRUCTURE | | | |
| 12 | O&M Improvement of Rural Water Supply Infrastructure | The creation of user groups is needed as part of the program to improve domestic rural water supply. | 510 |
| 13 | O&M Improvement of Piped Water Supply Systems | Creation of financially autonomous systems are needed as part of the program for essential urban services. | 800 |
| 14 a | O&M Improvement of Irrigation and Drainage Systems | Work to improve the O&M of the irrigation systems is ongoing. Further work is required. | N/A |

Source: Limboto-Bolanbo-Bone Basin Water Management Master Plan, March 1999, CIDA
(Note) f: Initiative concerning FM-MP, a: Initiative selected as 5-year Action Plan by SDP

Table 7-1 INITIATIVES FOR WATER MANAGEMENT MASTER PLAN(2/2)

| COMPONENT 3: IMPROVE USE OF EXISTING WATER RESOURCES INFRASTRUCTURE | | | |
|--|---|--|---------|
| 15 | Agricultural Diversification | There is insufficient water to grow rice on the entire command area in Limboto. The cultivation and marketing of less water consuming crops should be considered. | 1,000 |
| 16 fa | R&U of Irrigation and Drainage Development | Immediate action is required to improve drainage facilities and to protect crops against flood damage | 32,454 |
| 17 a | Development of Village Irrigation Schemes | Work is ongoing to update existing schemes and this program should continue. | 2,267 |
| COMPONENT 4: MEET WATER REQUIREMENTS | | | |
| 18 | Improvement of Rural Water Supply Systems | Much of the rural population does not have access to safe drinking water. New and upgraded water supply systems are needed. | 975 |
| 19 | Gorontalo City Domestic and Industrial Water Supply | An expanded and reliable water supply is an essential service for Gorontalo City. | 31,500 |
| 20 | Limboto City Domestic and Industrial Water Supply | An expanded and reliable water supply is an essential service for Limboto City | 3,150 |
| 21 | Bone River to West Limboto Diversion Canal | Present water supplies are not sufficient for West Limboto irrigation systems. Integrated irrigation/flood control studies (including Toheti-Dehua scheme) are needed as the next step to identify which scheme is most attractive for implementation. | 158,695 |
| 22 f | Kayu Merah Multi-Purpose Reservoir | The project is economically marginal but warrants further study. | 44,528 |
| 23 f | Toheti-Dehua Multi-Purpose Reservoir | The project is economically attractive and helps mitigate Gorontalo city flooding and provide irrigation water. It should be part of integrated irrigation/flood control studies. | 269,925 |
| 24 | Groundwater Development | Further monitoring and assessment is required to make best use of groundwater for domestic purposes. | 768 |
| COMPONENT 5: CONTRIBUTE TO MEETING ENERGY REQUIREMENT | | | |
| 25 | Dumbaya Bulan Hydropower Development | The demand for electric power is increasing in Kotamadya Gorontalo and other areas. PLN have scheduled further studies for 1999/2000. | 356,200 |
| COMPONENT 6: REDUCE URBAN FLOOD DAMAGE | | | |
| 26 fa | Gorontalo City Flood Plan | Immediate action is required to reduce the severe flooding in Kotamadya Gorontalo | 36,276 |
| 27 fa | Limboto City Flood Plan | Flooding occurs frequently but is not severe. The Flood Plan includes drainage improvements. | 6,845 |
| 28 fa | Agricultural Flood Control | Annual flooding causes extensive agricultural damage. Comprehensive studies are initially needed to prepare a Flood Mitigation Plan. | 13,950 |
| OTHER | | | |
| 29 a | Development of Coastal Engineering Works | Protection of Coastal roads and settlements, and monitoring of sediment and harbour improvements are required. | 15,100 |

Source: Limboto-Bolanbo-Bone Basin Water Management Master Plan, March 1999, CIDA
 (Note) f: Initiative concerning FM-MP, a: Initiative selected as 5-year Action Plan by SDP

Management Master Plan, Volume I Main Report, March 1999, CIDA”)

7.2 Progress and results on restructuring of water resources sector by WATSAL “Water Sector Adjustment Loan” (Law and regulation of water resources management and water management manual)

Coping with financial deficit, the Government of Indonesia prepared a structural adjustment program of policy, institutional, regulatory, legal, and organizational reforms in the management of water resources and irrigation sector in 1999. The program was supported by the World Bank with Water Resources Sector Adjustment Loan (WATSAL) financed by Asian Development Bank (ADB) and Japan Bank for International Cooperation (JBIC). The program has four objectives as follows:

- 1) **Facilitating efficient environmentally and socially sustainable water resources development and management** by improving national policy, institutional, regulatory and decision-support frameworks:
- 2) **Strengthening of the institutional and regulatory framework** for integrated and equitable river basin management:
- 3) **Establishing effective regulatory institutions and implementation arrangements** for water pollution abatement and regional water quality management:
- 4) **Improving the performance and sustainability of irrigation systems** by establishing an institutional framework for transparent and accountable delivery of irrigation services and participatory fiscal support to democratic farmer organizations empowered with governance and financial authority to manage irrigation networks under their control:

The WATSAL program is an effort to adjust institutional and regulatory structure through legislative and organizational renovations covering whole water resources issues. The requested plan has strong concern with the outcomes of the WATSAL program, because all the activities related to the water resources should follow them. Among others, major concerns of the Study are decentralizing water resources management and establishing integrated water resources organization in the provincial level. The administration change toward decentralization system is ongoing in the Limboto-Bolango-Bone basin in line with the WATSAL program. The Technical Implementation Unit called as Balai PDSA, which would be the integrated water resources management unit of the Limboto-Bolango-Bone river basin, is being

established over the country as an activity under the WATSAL program.

7.3 Other development plan relating to river management

Drainage Master Plan of Gorontalo City

Drainage Master Plan of Gorontalo City (Penyusunan Master Plan Drainase Kota Gorontalo) was prepared in December 2000, for Planning Board (Bappeda)/Kota Gorontalo, by PT. Palma Sejai, Manado. The study was conducted from September to December 2000.

Objective

The study aims to provide clear guidelines to overcome drainage problems of Gorontalo City, its implementation stages, and cost estimate. The scope of the study covers:

- 1) Preparation such as data collection and problem analysis,
- 2) Formulation of Drainage Master Plan, and
- 3) Installation of survey bench marks at 10 places.

Floods in Gorontalo City

Gorontalo City, especially Gorontalo Bawah is suffering from flood every years located in the flood prone area as shown in figure A8.2.1. The repeated floods happen due to the following reasons:

- 1) Low-lying flat lands almost of sea level;
- 2) Flood plains at the confluence of the Bone, Bolango and Tamalate rivers;
- 3) Area influenced by sea tides;
- 4) Sedimentation and narrow due to sand and others affects toward the Bone, and Bolango and Tamalate rivers; and
- 5) Lack of systematic overall plan for the drainage system of Gorontalo City.

Division of Drainage Blocks

The urban area of Gorontalo City is divided into four major drainage blocks as follows:

- 1) Block I: Area located in the north of the Tamarate River bordered by the Primary Bolango canal (Primer Bolango Bagian Kanal).
- 2) Block II: Area between the Bone and Tamalate rivers
- 3) Block III: Area consisting of a part of Kelurahan Siendeng and Kelurahan Biawu around the Bolango River.
- 4) Block IV: Area consisting of Kelurahans of Talumolo, Leato, Leato Selatan and Botu.

Drainage Master Plan

The drainage master plan proposes the drainage system to cover about 50% of the urban area of Gorontalo City within the time period of 20 years.

Concerns with the Project requested

The urban area of Gorontalo City is a part of the requested Project Area and the drainage system and drained water under the Drainage Master Plan should be taken into account the Project requested.