

CHAPTER 5 FEASIBILITY STUDY

5.1 Outline of Feasibility Study

5.1.1 Necessity of the Project

<Shortage of Municipal Water>

At present, total water demand of Bali southern area, which includes Denpasar City and neighboring regencies of Badung and Gianyar, amounts to 2,360 lit/s(203,900m³/day). Up until the target year of 2025, the demand is estimated to increase and reach 6,050 lit/s(522,700m³/day) which represents 2.6 times as large as present demand. Concerning the northern part of Badung regency and Gianyar regency where consumers scatter and demand increase is estimated small, development of groundwater and spring water with high remaining potentiality for water resources can be expected.

On the other hand, for the area of Denpasar City and the southern part of Badung regency and Gianyar regency (so to speak, metropolitan area of Denpasar) where consumers gather, current demand is quite big and future demand is estimated to grow, urgent development of the effective integrated water supply system is necessary.

<Damage Protection of Flood>

The flood has occurred once in a few years in the Badung river and Mati river which flow through Denpasar City. The big damages occurred that are: 1) in January 1980, more than 200 houses and stores near Kumbasari market were flooded caused by Badung river, and 2) in March 1984, 700 ha of urban area were inundated for two days by Mati river.

Although, after the floods, emergency protection works for the two rivers were done, the level of protection measures has not been sufficient to secure the safety against flood.

Recently, in December 2005 Badung river overflowed and damaged again. Accordingly, the river improvement works are in urgent need to protect against flood of Badung river and Mati river where population and properties intensively gather.

<Shortage of Electricity Supply>

Electricity supply potential of Bali Province is 520MW in 2005, of which 200MW is transmitted through submarine cable of Bali-Jawa System from Jawa island. It is obvious that current supply potential is only 70MW larger than the peak load demand of 450MW, so that the supply is estimated to become short within a few years. The Revised Spatial Plan of Bali Province envisages the demand of 2010 will reach 880MW which is 1.7 times as large as in 2005. As a result, in response to growing demand, still more electricity power generation facilities have to be developed to strengthen the supply potential.

<Instable Supply of Irrigation Water>

A lot of irrigation facilities have been constructed in Ayung river. Most of the paddy fields in the basin area depend on direct intake through the facilities. In the middle and down stream area of Ayung river, about 7,800 ha of paddy fields are now cultivated. Ayung river is deemed as a river of stable water flow. However, the irrigation system is not so much stabilized because of the flow volume decrease during the dry season and drought years. Accordingly, the stable irrigation water supply system is strongly required.

5.1.2 Project Objectives and Component

Considering the necessity of the above projects, the Study Team proposed the following priority projects that are; 1) Multipurpose Ayung Dam Project, 2) Water Supply Project to the Denpasar metropolitan area, and 3) Flood Control Project of Badung River and Mati River. See Table-5.1 and Figure-5.1.

1) Municipal Water Supply:

To solve the shortage of municipal water by developing river water and taking water from Ayung River, Penut River, Petanu River, etc

2) Damage Protection of Flood:

To protect and mitigate the flood damage by river improvement of Badung River and Mati River

3) Electricity Generation by utilizing Ayung Dam:

To generate electricity of 7,980KW by utilizing reservoir water stored in Ayung Dam in response to growing demand

4) Stable Irrigation in dry season and Expansion of Paddy Cultivated Area:

To keep the current crop pattern and expand areas of two crops from one crop in dry season by discharging water stored in Ayung Dam

5) Maintenance and Improvement of River Environment:

To protect and conserve existing habitat of fauna and flora as well as natural landscape by outflow discharge stored in Ayung Dam.

6) Development of Reservoir Area:

As part of development of reservoir area, surrounding area of Ayung Dam shall be developed.

Table-5.1 Project Component, Location and Main Facilities

Project Component/Objectives	Project Location/Main Facilities and Works
<u>Multipurpose Ayung Dam</u> Development of Municipal Water, Hydraulic Power Generation, Irrigation, River Environment Maintenance	About 3km at down stream area from confluence of Ayung River and the tributary Siap Rive (Location name is Buaganga, near the regency boundary between Badung regency and Gianyar regency.): Main Dam, Spillway, Check Dam and Hydraulic Power Generation Facilities
<u>Water Supply (Western System)</u> Supply of Municipal Water (North Kuta district of Badung regency)	Weir and Treatment Plant: about 1km down stream from the confluence of Sungai river and Penet river (about 2km upstream of river mouth) Intake Facilities: between Cemagi and Krobokan
<u>Water Supply (Central System)</u> Supply of Municipal Water (Denpasar City and South Kuta districts of Badung regency)	Weir and Treatment Plant : Existing Ayung River Treatment Plant
<u>Water Supply (Eastern System)</u> Supply of Municipal Water (Southern districts of Gianyar regency, and North Kuta district of Badung regency)	Weir and Treatment Plant: intersection of Petanu river and by-pass road (about 1km from river mouth) Intake Facilities: from Petanu river to Kuta district (Tuban) along the by-pass road
<u>Badung River Improvement for Damage Protection of Flood</u>	Middle stream area of Badung river: Riverbed excavation and bank heightening, etc
<u>Mati River Improvement for Damage Protection of Flood</u>	Middle stream area of Mati river: Banking, widening, etc of non-improved section, and conservation of retarding basin

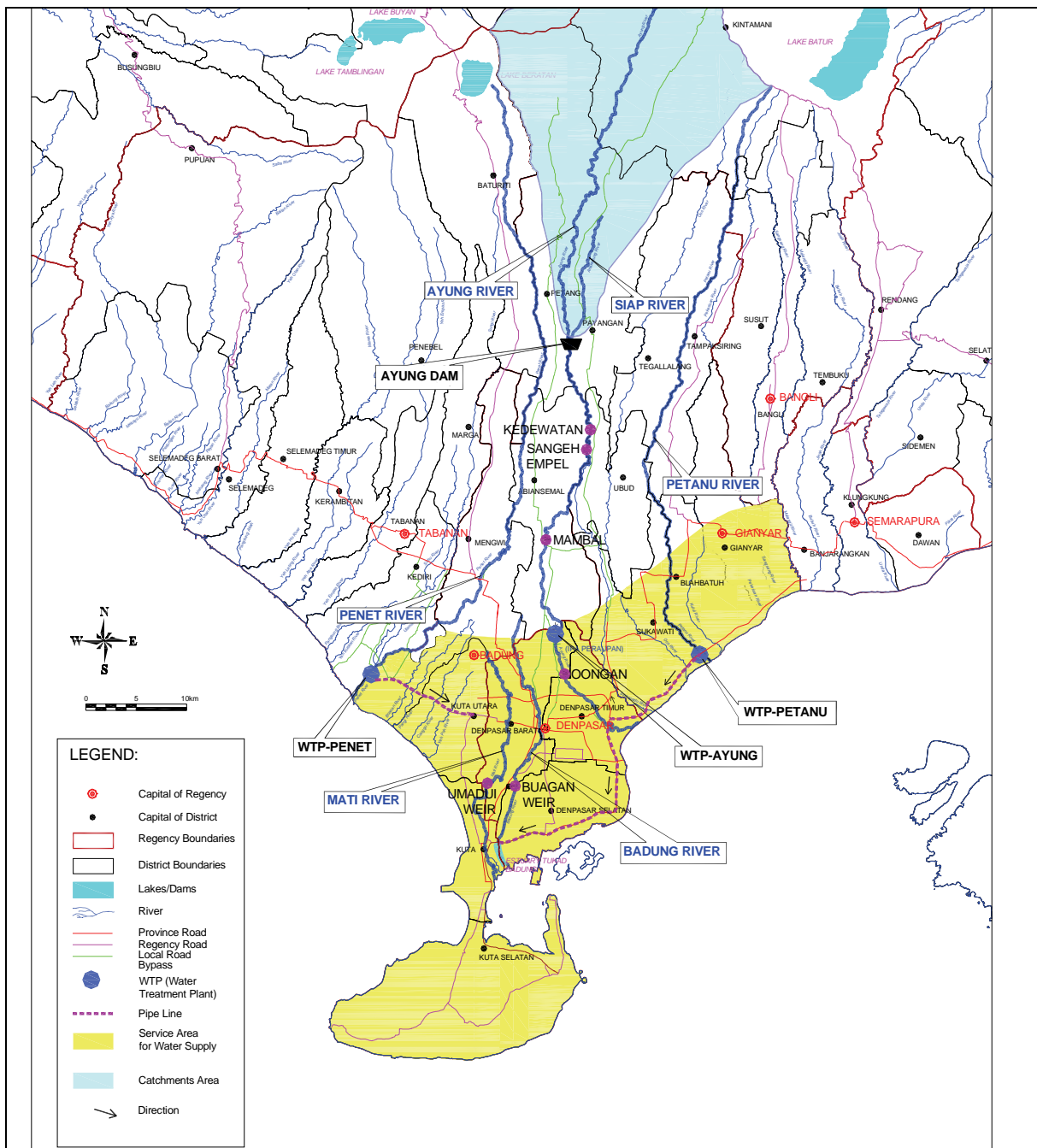


Figure-5.1 Location of the Proposed Projects

5.2 Public Water Supply for Bali Southern Area

Water supplies for Southern Bali area such as Denpasar City, Badung Regency, Gianyar Regency, Tabanan Regency and Klungkung Regency are implemented by developing several Water Treatment Plan/ WTP facilities. In this stage, it is proposed to develop 3 (three) water supply systems using water resources at Penet River (Cemagi Village – Badung regency) for eastern system, Ayung River (Peraupan Village, Denpasar City) for central system, and Petanu River (Saba Village – Gianyar Regency) for eastern system.

5.2.1 Conditions for Design

(1) Location of Weirs and Water Treatment Plant

<Ayung Water Treatment Plant (Central System)>

It is located at Belusung, at downstream next to the existing of WTP Ayung I, II, III with the intake Peraupan Weir's downstream which used the stored water of Ayung Dam as its supply source.

<Penet Water Treatment System (Western System)>

It is located at existing IPA Nyanyi's downstream (PDAM Tabanan) which the river water is not used for irrigation anymore. Current land use for planned water treatment plant (WTP) is paddy field and dry field. New access road for WTP shall be designed.

<Petanu Water Treatment Plant (Eastern system)>

It is located at Tohpati – Kusamba Bridge at Petanu River, approximately 1.5 km from the coast line, where at that section there is no use for irrigation. For the decision on location of intake, salinity intrusion and location of holy place were taken into account.

(2) Water Quality and Processing Capacity

The water quality which produced by each WTP is determined as the qualified water supply consumption with the quality standard which refers to Indonesian Water Supply Quality Standard and WHO standard for those items which are not regulated in Indonesian Standard.

The suggested processing installations capacity is shown as follows:

- ◆ WTP Penet (Western System) = 300 l/sec(25,900m³/day)
- ◆ WTP Petanu (Eastern system) = 300 l/sec(25,900m³/day)
- ◆ WTP Ayung (Central System) = 3 x 600 l/sec(155,000m³/day)

WTP Penet (Western System) and WTP Petanu (Eastern system) processing capacities are built based on the actual condition of the related river discharge, while WTP Ayung (Central System) is based on the assumption of Ayung Dam development at Br. Buangga (Village), Petang (Sub-District).

(3) Weir, Intake, and Pumping

Water flow from the intake to the storage tank/pump house through an open channel with gravitation flow, so that the river water surface must be elevated by developing a weir. This channel can be functioned as the sand trap also. Afterwards, the collected raw water in the storage tank/pump house is elevated to the water treatment plant (WTP) by pumping it through the transmission pipe.

5.2.2 Design of Integrated Water Supply System for Southern Bali Area

(1) Western Water Supply System

The raw water is taken from Penet River downstream, about 1.5 km from the coast line. The Water Treatment Plant (WTP) located in Cemagi Village, Mengwi Sub district in Badung Regency. The planned WTP production is to be 300l/sec.

<Western Water Supply System>

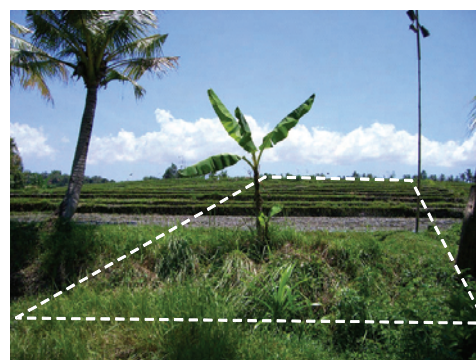
West System Water Treatment Plant (Penet River)

【Outline of Work】

- 1 New Water Treatment Plant (300 liter/s)
- 2 Distribution Pipe $\phi 600$ (8.8km)
- 3 Water Pipe Bridge (5 sites)



**Surrounding Landuse
(Terraced Rice field)**



Planning Site for Water Treatment Plant

Figure-5.2 Western Water Supply System and Current Condition of planned WTP

<Weir>

The intake construction is suggested in form of permanent weir with building height that is possible to lead gravitational flow to the storage tank. The using of pump machine is only implemented if the river topography and buildings position are impossible to be flowed gravitationally.

<Water Treatment Plant>

WTP position is planned on the rice fields owned by the state which has already released by Water Supply Company (PDAM) Badung of 0.75 ha. Nowadays the available access road is not adequate, however there is narrow road that is able to be widen by acquisition private's ownerships.

<Transmission Pipe>

Transmission pipe shall be installed along the side of Canggu – Kerobokan road, and connected to the

existing 12” pipe at Br. Gede Kerobokan.

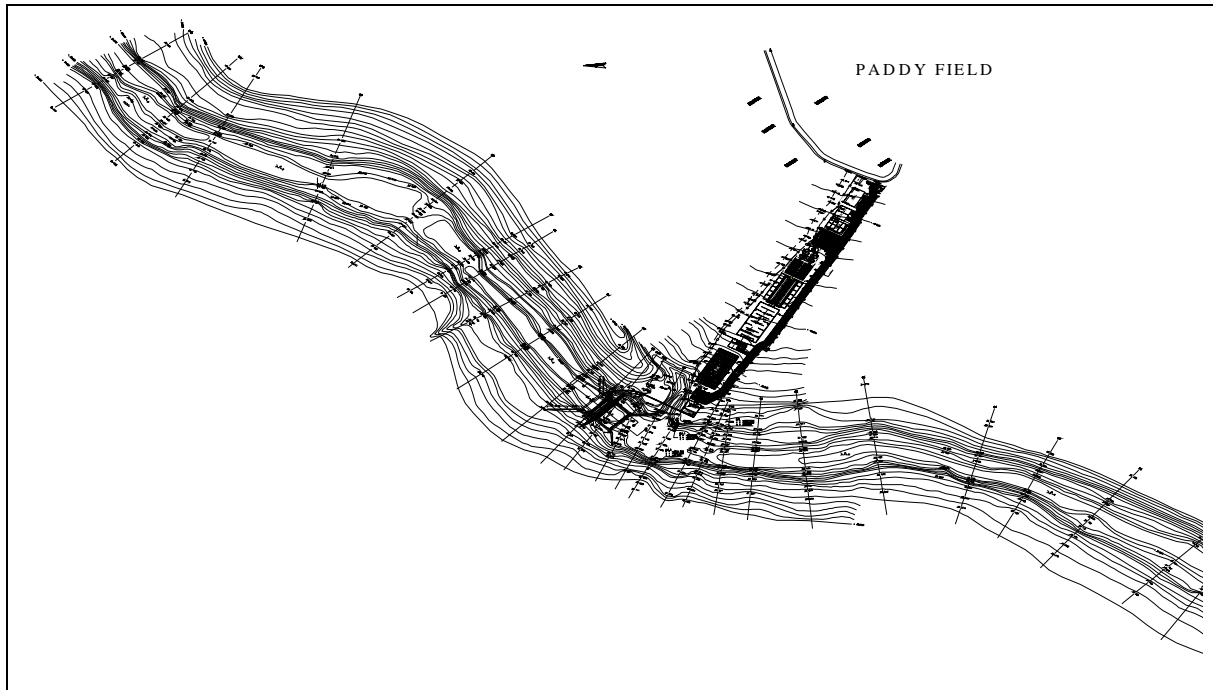


Figure-5.3 General Plan of Western Supply System (Penet River)

(2) Central Water Supply System

The raw water is taken at the downstream area of Ayung River which is close to the existing WTP Ayung I, II, and III locations; those are located in Peraupan Village, East Denpasar Sub district, Denpasar City. Based on the water supply plan in the long run (target year 2025), the production capacity was planned as 1,800 l/sec (by 3 staging with 600 l/sec for each).

<Central Water Supply System>
Central System Water Treatment Plant (River Ayung)