

7.1.2 Analysis towards the Significant and Important Impact

Based on the explanation of the prediction and impact evaluation seems that the important impacts due to the Ayung River Dam Development Activity Plan:

Important Negative Impact :

1. Change of topography and land scape.
2. Degradation of geologic stability.
3. Degradation of land physical and chemical characteristic.
4. Degradation of Ayung River water quality.
5. Increase of erosion and sedimentation.
6. Increase of the change of land use and decrease of environmental aesthetics value.
7. Disturbance on aquatic flora and fauna.
8. Negative attitude and perception toward the project.
9. Disturbance on holy area/place and local values.
10. Disturbance on community's security and orderliness.
11. Deterioration of community's health.
12. Transportation disturbance.

Important Positive Impact due to this Activity:

1. Improvement of Micro climate components
2. Increase of environmental aesthetics values
3. Increase of water resources potential and reserve in Bali
4. More habitats for biological diversity in Bali
5. Decrease of sedimentation risk in Ayung river body
6. new economic sources and job opportunities on Payangan and petang, particularly local economy
7. Increase of community's health, especially Southern Bali
8. Increase of government, community and region's income

The negative impacts, including the positive impacts, are shown on the explanations below:

1. Change of land scape's topography

Change of land scape's topography is a significant impact as the direct impact from the access road construction, cut and fill activities (cofferdam, dam and spillway), and quarry development and plugging an impounding activities. The negative impacts occur, especially, on the wavy or hilly area, with steep slopes. Change of land scape's topography will give change to the physical and chemical land characteristic, and change of soil's type, such as: Aquic soil characteristic occurs due to inundation and horizon beneath the land surface so that the soil classification is experiencing basic changes. The other thing which might happen are secondary impacts to the other environment component, including: vegetation, land use, aesthetic and water quality, especially Ayung River water quality, it is the increase of turbidity. The turbidity provides negative impacts to the aquatic biota on Ayung River. Nevertheless such condition persists only on construction phase and can be restored within steps on the operational phase through environment management and organizing activities

2. Degradation of Geologic Stability

It is evaluated that the degradation of geology stability due to the cut and fill activities, quarry development on construction phase, cut and fill on cofferdam, main dam, and spillway, while the quarry development is done by excavation on and out of the river body using heavy equipments, which is able to deteriorate the geology stability. Excavation on

river bed and steep slope of riverbanks can disturb the geologic structure holding the load above can be decreasing. This leads to slide on steep slopes of riverbanks. The secondary impacts on other environment components are decrease of water quality, loss of natural vegetation, and so on.

3. Degradation of land's physical and chemical characteristic

It is evaluated that the degradation of land's physical and chemical characteristic is due to the construction and operational activities during access road construction, mobilization of workers and equipment, land clearing and stripping, grouting on the quarry, material transportation to and from the project location and quarry development as well as plugging and impounding on operational phase. The degradation of land's physical and chemical characteristic due to the damage on soil's pores space (macro, mezzo, and micro pores space) and increase of land bulk density. This can cause the decrease of land infiltration power and increase of run off during the heavy rain. The loss of soil cover and damage of soil's pores space (macro, mezzo, and micro pores space) cause the increase of run off and decrease of land infiltration power. It causes negative impacts toward the increase of erosion and sedimentation, especially during the heavy rain. The next impact is the degradation of water quality on rainy season and decrease of water potential on dry season.

4. Change of Land Use and Aesthetics

It is evaluated that change of land use and aesthetics are due to the activities of access road construction, land clearing and stripping, cut and fill activities, and quarry development. Land clearing and stripping include vegetation/trees cutting, and also cut and fill activities. Land clearing and stripping activities are using bulldozer, excavator and loader. It also causes land open, that the land use and the aesthetics are basically changed. Cut and fill activities on cofferdam, main dam and spillway are conducted by using heavy equipments, Cofferdam is constructed by developing a tunnel, the excavated materials are filled on the main dam. Spillway is also constructed through excavation (cut), therefore it is predicted that all of these activities will change the land use and aesthetics.

On the operational phase, plugging and impounding are the activities with negative impacts to the land use and environmental aesthetics. The protected area and dam's surrounding organizing activities can cause positive impacts to the environment, such as, improvement on ecologic, drainage, ergonomic and aesthetics functions. There will be a very positive change of land use and aesthetic.

Change of land use and aesthetic is a basic impact, particularly, on the inundated area of dam inundation and its environs. Change of land use from the agriculture, plantation and resemble typology of land into dominant aquatic zone, certainly, will provide various effect level on the environmental aesthetics component, biological component or non-biological component, as well as social component on that area.

5. Increase of erosion and sedimentation

According to the comparative analysis with data of BPDAS Unda Anyar (2003-2004), that the dam plan area (Ayung Dam) and catchments area or recharge area for Ayung dam is categorized as quite good condition, or it is "rather critical", it means that the erosion risk is relatively small so that the sedimentation is also relatively small. Related to the project, the activities on the construction phase, which are evaluated which may cause erosion and sedimentation are access road construction, land clearing and stripping, cut and fill activities and quarry development. Land clearing and stripping activities include vegetation/trees cutting, and also cut and fill. These activities are using bulldozer, excavator, and loader. Land clearing and stripping cause the land open that the land on the activity location is easily

getting erosion and sedimentation on the lower part in the downstream. The erosion impact leads to loss of top layer, which has very good physic, chemical (fertile) characteristics, and evaporation of nutrition, especially, nitrogen.

The erosion potential can be formulated as below:

$$Et = Eo (Ct.Pt)/(Co.Po)$$

Where

Eo, Et = magnitude of land erosion before and after the project (ton/ha/year)

Co, Ct = plantation factor before and after the project

Po, Pt = human acts factor in land preservation before and after the project

Table 7.3 Value of Plant factor and Act Value

No	Type of plant	Factor Value (C)	No	Sort of Land Preservation Act	Factor Value (P)
1	Without plants	1,000	1	Without acts	1,00
2	Dense forest	0,001	2	Contour system	0,01-0,20
3	Meadow	0,010	3	Wide stripe system	0,1 – 0,30
4	Peanut	0,40-0,08	4	Straw soil covering	0,01
5	Cotton	0,50	5	6 ton/ha added corosol	0,50
6	Tobacco	0,58	6	Temporarry meadow	0,10-0,50
7	Rice and corn	0,46	7	Stripe with crotolan, width of 1,0 m distance of 4,5 m	0,64
8	Brachara grass	0,002	8	Peanut plants soil covering	0,06-0,20

Source: Sofyan A, 1978.

From the calculation of erosion potential with the existing vegetation condition on the project area, the land clearing and structure development can cause increase of slide potential around Ayung riversides.

On the land clearing of 0,6 ton/ha/year, the change will be shown by the development activities in a particular area.

Table 7.4 The erosion before and after the land clearing and stripping

No	Project site status	factor					Et
		Eo	Co	Ct	Po	Pt	
1	Before the project: Rice, dry field	0,65	0,46	0,46	1	-	0,65
2	On land clearing	0,65	0,46	1	1	1	1,41
3	After land clearing, the land is inundated	0,65	0,46	0,58	1	0,30	0,25

On the land stripping, the erosion will increase, on the rainy season it will become 1,41 ton/ha/year, which leads to the increase of river turbidity (content of dissolved substance is increasing, from 56 mg/l into 122 mg/l) this activity will persist during the construction before the impounding activity. If the change of parameter

(river turbidity) is more than 100 %, it indicates negative impact due to it disturbs the river biota life and surrounding.

According to the socio-economy survey result, generally the communities (> 75%) are worried about the project. Most of the respondents worried about flood and slide, therefore the value becomes significant and important negative. Temporary impact only persists on construction phase. On the operational phase, the environment condition will be balance again.

Erosion and sedimentation will be decreasing as the organizing activities of protected area and dam's surrounding, and maintenance of dam and its facilities' functions are conducted. These activities are able to improve the land's physical characteristic which determines the erosion magnitude such as land structure stabilization and improve of land permeability. Such improvement is able to minimize the land erodibility, so that it can minimize the erosion on the project location and sedimentation on project's downstream. The activities of protected area and dam's surroundings organizing give important positive impact to the environment such as improvement of ecologic, drainage, ergonomic and aesthetic functions. Within stages, these activities will improve the land's characters as permeability and land structure. This land's character is very important in determining the erosion magnitude. The land use organizing by implementing the land and water conservation system, as terrace development and good land cover around the dam are also the erosion function which can minimize the loss of soil and sedimentation around and out of the dam's surrounding.

6. Disturbance on Aquatic Flora and Fauna Component

The negative impacts of the aquatic flora and fauna are dominant indirectly and secondary impact from the increase of sedimentation and degradation of water quality which is evaluated coming from the land clearing, stripping, and acquisition, cut and fill, stone and concrete construction for the dam, spillway and so on, quarry development and hydraulic electricity power.

The mud hole impact can be rapidly spread to the cumulative water column in the waters bed. The increase of turbidity and sedimentation in Ayung River can cause disturbance on ecology system in that river, such as: Disturbance on sun light penetration that decrease the primary productivity, decrease dissolved oxygen. Disturbance on aquatic biota's respiration due to the filament of the fish gills covered by the mud, and even death to the basic community (phyto and zoobenthos) because it is covered by the mud. This impact affects other environment component, such as degradation of water quality that affects the tourism in Ayung River. Those are reversible, still, continuous, even sustainable if the management and rehabilitation on the upstream is not running well.

7. Degradation of sacredness value of certain holy area or loss of cultural heritage

There are several matters related to the cultural heritage and degradation of sacredness value of particular holy area, those are Tangluk Temple or Gunung Lebah Temple, land owned by the village (*tanah laba/druwen desa* [land owned by the village = 14 ha]), holy spring (*petirtaan*) and meditation site which is in unity with Tangluk Temple, loss of holy area of campuan-Buangga, holy springs on banjar Badung-Melinggih and ritual activities *Nganyut (Ngaben)* on Melinggih Village which is often conducted around the main dam.

Tangluk temple belongs to one of the temples worshipped by 200 households of Desa Adat Susut-Buahan which its ceremony (*piodalan*) is on Purnama (The Full Moon) X. Based on the result of the interview with the priests (*pemangku*) and Bendesa Adat Susut, seems that there are still a lot of people worried about the existence of the holy places and holy springs

which are possible to be inundated. Until today, *bendesa adat*, priest (*pemangku*) and *krama adat* (traditional society) of Susut are not ready to give such solution related to the very complex religious matter (*niskala*).

So does Nganyut ceremony which is oftenly conducted by *krama adat* (traditional society) of Melinggih Village (especially Payangan Desa) located around the main dam, which will obviously can cause conflict with the project. Related to Nganyut ceremony and holy springs, there is an alternative offered by *bendesa adat*, it is the Nganyut location or holy spring must be moved to the south part of the dam. However, the consequence is that initiator must pay all the cost for the road development and other supporting facilities as well as all of the ceremonies.

The Chinese Cemetery (Pekung Cemetery) on Payangan Desa which is owned by 72 Chinese families of Payangan should be concerned. These days, they are worried about the loss of the cemetery or disturbance on ritual activities if the project is operated.

8. Negative attitude and perception of the community toward the Ayung River Development Plan

The impact related to the community's perception and attitude is negative. It can be seen from the survey result of the community towards Ayung River Dam Development Plan. According to the research's result, dam is required indeed by the community, especially for the development of agricultural irrigation, tourism and small industry. This can be seen from the result that most of the community (88,57%) agree that the dam is developed on that area. However, there are several respondents doubt about the dam's benefits due to lack of socialization to the general community. The socialization is only to the village's apparatus and community's figures, while the whole community has not got any information about the dam development. There are also respondents who do not agree about the dam (11,43 %). Some of their reasons are the project will disturb rafting activities and can cause slide.

The impact magnitude is appropriate to the important impact measurement guideline due to the complaints of Ayung River water's consumers using the river as part of economic activities such as tourism, fishery, irrigation, potable water and bathing, washing, and toilet activities.

The impacted community is covering those who consume Ayung River as their earnings, including 450 employees from 6 rafting companies on Petang Sub district and 74 workers of a rafting company on Payangan Sub district. Those numbers will increase if it is related to the workers who indirectly take benefit from rafting activities. The impact evaluation category is important negative due to the big numbers of impacted community at the area, still do not get any direct advantages from the activity of Ayung Dam development.

The impact spread area is not only covering the project site, but will spread out, with the important criteria intensity due to the change of land scape from river basin to a dam. The impact will spread around the side of Ayung River basin, and getting larger to the wider radius.

No one is directly losing their land due to Ayung Dam development plan. However based on the interview result with the community on that area, it is obtained that the socialization about the project has not been optimally done that there are still several evaluations which cause negative perceptions about the aim and functions of the project related to the land usage. The impact criteria is important negative. This is related to the possibility that the impact's cumulative character can be continuously persisted and the environment unable to assimilate it.

Apart from that, in the socialization, it is found that the design of the dam related to some local cultural aspects such as holy places, cemetery and other social values. Such conditions lead to negative attitude and perception from the community toward the project.

9. Disturbance on community's security's and orderliness

Actually, the disturbance of community's security and orderliness is a manifestation from the uncontrolled negative attitude and perception because of the pressure from the project activities. It can come from several activities. One of them is land procurement from the project and its supporting facilities, particularly for those related to the untransparency of land releasing process, low prices for the land, unappropriate land compensation. Apart from that, the house and holy places condemnation are also the anxieties of most of the community which can lead to community's security and orderliness disturbances.

The conflict of Nganyut and project can also be the source of community's security and orderliness disturbance if there is no wise management or solution for it. The dust and noise pollution produced by the project or social jealousy to the outside workers while lot of the people there are jobless can also be the source of the disturbance. The turbidity and decrease of Ayung River which disturb rafting activities, subak agriculture, PDAM water supply, as well as bathing, washinh, and toilet activities of the people downstream are the other factors which can motivate the community's security and orderliness disturbance.

10. Degradation of community's health

Degradation of community's health is a vital impact due to it is related to the human being. The standard of a particular activity, generally, is based on its interaction to human. In accordance to Ayung Dam development plan on Buangga Village, some impacts which can disturb or deteriorate the community's health, both the project workers or the society around are evaluated. The disturbance or deterioration due to sanitation degradation such as deterioration of air quality, water quality and space/land as explained below:

a. Workers' waste

This impact is because the operational of workers' base camp, cut and fill activities which produce material pile, and vehicle mobility. A big numbers of people which is once in a time in a particular place will give significant impact to the environment as the consequence of domestic waste. According to Gotaas, 1956, a normal mature human will produce average feces around 83 gram and urine of 970 gram. Most of them are water which consists of organic substances, 20 % for feces and 2,5 % for urine. The prediction of human's feces quantity without urine is about 135-270 gram per capita per day wet weight. Or 35-70 gram per capita per day dry weight, as on the table below.

Table 7.5 The composition prediction of feces without urine

No	Component	Content (%)
1	Water	66-80
2	Organic substance (dry unit weight)	88-97
3	Nitrogen	5-7
4	Phosphorus	3-5,4
5	Potassium	1-2,5
6	Carbon	40-55
7	Calcium	4-5
8	C/N ratio	5-10

Source: Gotaas, 1956

If the workers are 200, then approximately $200 \times 270 \text{ gram} = 54\,000 \text{ gram}$ of feces will get in to the environment per day when the workers gather on the base camp location. The domestic waste components contain feces waste and liquid waste. Within a year there will be 19.710 kg of feces waste which get in the environment around the project. In spite of the chemical component in the feces waste, per gram of feces, there are millions of microorganisms, which are generally non pathogens. Those microorganisms can be bacteria, virus, protozoa, or parasite wombs. The coliform bacteria known as *Escheria coli* and *Fecal streptococci* which are often in the human's digestive system produced by human and other *voicilos term are 50* millions in average (Hammer, 1977).

b. Secondary impact of air pollution and noise

Increase of air pollution due to the cut and fill activities, cut and fill of cofferdam, stone setting and activities using motorized equipments. Mobilization and demobilization of heavy equipments in big numbers will increase the air pollution and noise level. This impact will affect the ecosystem situation around the river and settlements on Petang and Payangan Sub district. The heavy equipments are predicted working for 8 hours per day, with average speed of 30 km/hour, the working hours is $8 \times 30 \text{ km} = 240 \text{ km}$ per day for each.

According to the data of WHO Publication No 62, 1982, the emission factor of premium fuel for NO pollution is 7,6848 kg/unit, CO is 281,2797 kg/unit. For solar, the NO pollution is 9,2103 kg/unit and CO 36,4226 kg/unit.

Based on the equation of emission = emission factor x gasoline usage, the magnitude of air quality and noise change due to Ayung Dam development can be recognized. The dust parameter will increase of $3,768 \times 2,009 = 7,57 \text{ kg/day}$. While the parameter of NO will increase of 34,7 kg/day, CO increase of 137,2 kg/day.

The ambien concentration of air quality parameter, theoretically, is ue to the emission of dust and gas by gasoline: Based on th equation of Kenneth E Nool, 1977, the ambien concentration is shown as below:

$$C = Q.s/ u.Z$$

Where

C = ambien concentration (ug/m³)

Q = emission per width unit (ug/sec/m³)

S = length of investigated area according to the wind direction

u = wind velocity (m/sec)

Z = mixing level between polluting substance and the air (m).

Based on the beginning existing environment condition, the parameter of wind velocity on the study area is 2,06 m/sec. Length of observation area from North West = 600 m, mixing level = 100 m, mobilization/demobilization area= 180.000 m². Emission per width unit for the dust is 0,489 ug/det/m²; NO = 2,231 ug/sec/m²; and CO = 8,824 ug/sec/m².

According to the calculation result compared with air quality standard of Decree of Governor of Bali Province No 515, 2000, it is obtained that Ayung Dam development will cause increase of air pollution , however it is still below the

permitted quality standard. Therefore, the increase of air quality is categorized as negative impact and moderate. The increase of noise can be known from the condition before and after the project by the equation of increase of noise as followed:

$$L_p \text{ total} = 10 \log (P_1^2/P_0^2 + P_2^2/P_0^2 + \dots P_n^2/P_0^2)$$

For some heavy equipments, there are increase of noise factors which can be explained as below:

Table 7.6. Factor of Increasing of heavy Equipment Noise

Equipment	Total	LP (15 m) (dB)	P_n^2/P_0^2
Bulldozer	4	88	$2,52 \times 10^9$
Excavator	3	88	$5,03 \times 10^9$
Loader	4	75	$1,27 \times 10^9$
Breaker	5	75	$1,56 \times 10^8$
Dump truck	20	75	$6,36 \times 10^8$
Compactor	3	88	$1,89 \times 10^8$
Total			$1,04 \times 10^{10}$

Therefore the predicted L_p total on mobilization/demobilization of heavy equipments are as followed:

L_p total in distance of 15 m = $10 \log (1,04 \times 10^{10}) = 100,17$ dB. The farther distance of the noise level, the less noise level due to the blurring by air and other factors.

Noise from the motorized vehicles is not continuous noise. Based on equation of "Traffic Noise Index (TNI)":

$$TNI = 4 (L_{10} - L_{90}) + L_{90} - 30.$$

Where :

L_{10} = Traffic noise on peak hour (L_p total 700 m)

L_{90} = back ground noise

It can be known that TNI at the study area = $4 (66,79 - 50) + 50 - 30 = 87,16$ dB.

Noise index value (TNI) = 87,16 dB is for field condition, if there is no hindrance, such as trees barrier or hills. At the study area, there are many big trees along the road which will absorb the noise caused by the passing heavy vehicles. The trees absorption value is calculated with equation:

$$A = (0,18 \log 1,000 - 0,30) r \text{ (dB)}$$

Where:

For the limit of human's sense of hearing, $f = 1000$ Hz. With distance (r) of 100 m, hence the absorption value is:

$$A = (0,18 \log 1,000 - 0,30) 100 = 23 \text{ dB.}$$

Hence TNI value of the settlements around the noise source is $87,16 - 23 \text{ dB} = 64,16$ dB.

Investigated from the noise quality standard for settlements of 55 dB in the night and 60 dB in the day.

Due to the water quality, air quality (dust) deterioration and increase of noise and vibrate are quite potential impacts to disturbance of community's health, therefore for the health and safety of the construction workers (health defense) such management effort should be done: regular water spray on the open area, well covering for material and substances which are corrosive for the health, and security to the B3 materials and also project's rubbish

management. In spite of it, the project workers must be completed with job safety equipments such as, boot, ear plugs, mask, glasses, helmet and other protecting equipments, and it must be ensured appropriate to the workers' requirements.

11. Transportation and job accident

Job safety and accident as well as transportation are important parameters which must be concerned of in the project works, moreover it is a project with international standard and it touches human also.

~~This impact is due to mobilization/demobilization of heavy equipments, transportation of materials and main civil construction activities in Ayung Dam development.~~ The project has plan to widen the road from 4 m into 10 m and also asphaltting the road. If it is conducted, the negative impacts are predicted can be avoided. If there is no effort in asphaltting the road and traffic management, that there will be transportation disturbance and risk of job accident. The heavy equipment, especially dump truck that transports the materials for the project will pass the main road and regencial roads to the project location. This activity is predicted damaging the asphalt on some part of road on Petang and Payangan Sub ditrict (present condition of th road is class IV, with capacity of 2 – 5 tons) and causing traffic jam. Considering that the mobilization of heavy equipment is only once, so that the change of parameter is predicted to be relatively small.

Traffic jam and danger of accident may happen in front of Payangan Market and Petang Sub district Office on the track passed by dump truck from Denpasar to project location (the level is relatively small or small impact category) if the project's vehicles do not follow the traffic signs and over the permitted speed for those heavy vehicles/equipment.

Most of the project activities plan of Ayung dam development have their own risks which may endanger the workers and may cause accident in doing their jobs. Moreover Ayung Dam development plan is a big project, using big and heavy equipments, and the project is located on an area with difficult topography (wavy, steepy slope, steep and danger of slide). To minimize the K3 diturbances, the initiator must implement and conduct some protecting efforts toward the job safety and accident by:

- a. Working system organizing and good working time
- b. Implement the good security system
- c. Determine the job safety and security standard, it is a must to prepare job safety equipments such as: boot, ear plugs, mask, protecting glasses, helmet and other protecting equipments must be appropriate to the construction workers' requirement.

The important impact, include the positive impact is shown on the explanation below:

12. Increase of Micro Climate Quality

There is a significant change of land scape on the operational activities, from land scape into aquatic zone with the surface of $\pm 73,17$ ha. According to Handoko (1996), one of the elements which form a climate in particular area is aquatic zone. Bali as a small island has aquatic zones (Beratan, Buyan and Tamblingan Lakes and also Batur Lake have in a row position and on plateau; this condition have been creating relatively different climate for Bali compared with other small islands in Lesser Sunda (Nusa Tenggara). Based on it, the existence of aquatic zone of Ayung River Dam is predicted able to increase the vapour in the air that affect the temperature and relative humidity on the area will be improved. Change on some particular micro climate determining factors such as temperature, humidity and pressure also affect the rainfall. The positive impact to the micro climate is more significant by the activities of protected area maintenance and reforestation as well as dam's

surrounding land scpa organizing. Those activities are related to each other in forming a better micro climate. The consevation area and dam's surrounding organizing and maintenance on dam's operational are long lasting and continuous activities, that it is predicted the impact will persist in a long time (30 years), with quite big intensity and significant and principal change.

This basic change will be a good stimulator for the environment on downstream. The dam water storage will affect the river system below, it is expected that the river basin which is related to Ayung-river and its river basin that covering Gianyar, Badung and Denpasar City, certainly, will get the positive impacts.

13. Increase of Water Resources Potential

The operational of Ayung River Dam is predicted to be able to increase Souther Bali's water resources potential significantly of 3,6 m³ per second to fulfill the raw water requirement (potable water, sanitation, and city flushing) and stabilize the irrigation water for 9.542 ha of rice field and hydraulic electricity power with capacity of 12,3 MW. Apart from the increase of water reserve, continuous water availability in a year is more guaranteed in a better quality. The water quality also becomes better, because th dam is not only as a water storage but also improve the water quality through physical, chemical and biologicprocess in a new ecology system. The tendency of decrease of sedimentation and water turbidity which flows downstream, significantly, will be able to increase the water resources potential for other more strategic requirements (domestic needs, potable water and others).

14. Improvement of environmental aesthetic values and land use

Chaneg of land use and environmental aesthetic values on the operational phase seem to be significant after plugging and impounding activities, and organizing activities of protected area and dam's surrounding. Plugging and impounding can change the land use and aesthetics permanently. The predicted impact spread area is of 73,17 ha (entire dam's inundation). This impact will continuously persists during dam's operational, with the intensity of change of natural land use (bushes and river basin) into aquatic zone Ayung River Dam). The other impacted environment components are geology stability, land stability, land's physical character, hydrology, terrestrial flora and fauna. This impact is cumulative and reversible.

The positive impact evaluated from the inundation activity leads to diversity of land usage on that area, the dam is very synergic and supporting the available land use. More over, the activities of protected area and dam's surrounding organizing are very positive for the general improvement of environment that resultantively, it is expected to improve the ecologic, drainage, ergonomic and aesthetics functions. There will be change of land use and aesthetic which become better. The spread impact areas are on the project location and its environs.

The significant impact of land use change and conservation organizing with good and harmonious landscape is the increase of environmental aesthetic value of the area.

This impact will then impact the development of growth sources on the area such as : alternative tourism development, fishery and other synergic project with the dam management. The improvement of the land use and aesthetic value is cumulative.

15. Decrease of slide, erosion and sedimentation potential

The darn operational, maintenance of dam and its facilities' functions, and protected area and dam's surrounding organizing activities are able to improve the land's physical character which determines the erosion magnitude such as land structure stabilization and

improvement on land permeability. Improvements on land's physical characters are able to minimize the land erodibility that can minimize the erosion on the project location and sedimentation on project's downstream. The spread impact areas are on all over the project location and its surrounding, include Ayung River's downstream. This impact is naturally and continuously happening, and becoming more positive as the time goes by, with the intensity from a moderate erosion to the easy one or from serious sedimentation into the easy one.

Generally, sediment and mud are settled on the dam's bed because of the impounding activity. Then, this sedimentation will be able to decrease the storage capacity/dam inundation area. By certain hydrology technique, several sedimentation activities can be mitigated by passing the muddy-water through spillway with low threshold on the beginning of the flood and block the spillway channel's doors in the end of the flood.

The prediction of sedimentation speed on the project area is: $0,91 \text{ m}^3/\text{ha}/\text{year}$, with river basin: 9036 ha, (effective volume of inundated area = $2.296.000 \text{ m}^3$). The volume of sedimentation on certain period:

1 year: $0,91 \text{ m}^3/\text{ha}/\text{year} \times 9036\text{ha} \times \text{year} = 8.233 \text{ m}^3$ (decrease of effective volume 0,4%).
5 years: $0,91 \text{ m}^3/\text{ha}/\text{year} \times 9036\text{ha} \times 5 \text{ years} = 41.114 \text{ m}^3$ (decrease of effective volume 2%).
10 years: $0,91 \text{ m}^3/\text{ha}/\text{year} \times 9036\text{ha} \times 10 \text{ years} = 82.228 \text{ m}^3$ (decrease of effective volume 4%).
50 years: $0,91 \text{ m}^3/\text{ha}/\text{year} \times 9036 \text{ ha} \times 50 \text{ years} = 411.138 \text{ m}^3$ (decrease of effective volume 18%).
100 years: $0,91 \text{ m}^3/\text{ha}/\text{year} \times 9036 \text{ ha} \times 100 \text{ years} = 822.276 \text{ m}^3$ (decrease of effective volume 39%).
200 years: $0,91 \text{ m}^3/\text{ha}/\text{year} \times 9036 \text{ ha} \times 200 \text{ years} = 1.644.552 \text{ m}^3$ (decrease of effective volume 72%).
280 years: $0,91 \text{ m}^3/\text{ha}/\text{year} \times 9036 \text{ ha} \times 280 \text{ years} = 2.302.373 \text{ m}^3$ (decrease of effective volume 100%).

It is proposed to drain the mud in the first and second year period that the dam operational will not be disturbed. The sedimentation problem on the inundation area, commonly solved by the effort of erosion mitigation on the upstream river basin, such as reforestation and land conservation. These are part of the regular maintenances conducted by the Ayung Dam project in cooperation with the local Forestry Service. The change of parameter within 100 years is 39 %.

16. Positive Impact toward Flora and Fauna Component

Generally, the impact evaluation to the biologic component, both terrestrial flora and fauna and aquatic flora and fauna, on dam operational is positive. The positive impacts based on several prominent matters:

- a. Environment improvement and habitat diversity. The existence of dam with its aquatic zone of 73 ha is a stimulator for some terrestrial fauna such as mammals, amphibie, reptile and aves (birds); to feed, dink and breed. The aquatic zone, generally, provides litoral/neritic zone as a vegetation/aquatic plants growth which is very good habitat to feed for several water birds, such as, heron, *kokokan*, *kowak malam*, *belibis*, *ibis*, *trinil* and other terrestrial birds. Apart from that, this area also becomes their nest. The sides of dam are very good habitat for the life of terrestrial fauna due to the area is cool, safe, and convinience.
- b. The aquatic zone of the dam has positive meaning for the vegetation growth in that area, by the increase of vapour in the air due to the vaporation will provide fresh cllimate to the plant, local plants and introduction as it is programmed on the reforestation activity.
- c. The dam operational is very positive for the component of aquate fauna, both amphibie and fish. The dam can be a fish hatchery to supply fishes to the downstream. By introducing several kinds of fishes such as: Ikan Mas/Carp (*Cyprinus carpio*), Nilem (*Osteochilus hassellti*), Tawes (*Puntius javanicus*), and

Nila GiV(*Oreochromis niloticus*, GIV), with their natural growth, known as plankton feeder, it is expected that they are well breded. Eventually through this flushing program, it is hoped that it is able to restock the young fishes continuously to the downstream through natural flow.

17. Increase of Local Economy Potential and Regional Income

Inspite of the negative impacts on physical-chemical components, Ayung Dam Development Plan also provide positive impacts to the socio-economic components in particular. Those positive impacts are:

- a. Increase of regional income (regency and city). By the dam's operational, it is expected to be able to increase the water supply service (3.600 l/sec) to the large community. The distribution of water supply is done by PDAM of each Regency and City. The implication is that it can increase the regional income.
- b. Job opportunities, \pm 200-250 persons on dam's construction and \pm 50 persons on operattional phase. It is expected to minimize the jobless rate in Bali.
- c. Business opportunities and new economic development cover the business opportunities related to the worker's needs, such as: a place to stay, small shops for food and beverage, and other daily needs, transportation rental and so on.
- d. Increase of electricity in Bali, the development of Ayung hydraulic electricity power with capacity of 12,7 MW will minimize the electricity supply from Java. Therefore the dam is supporting the electricity in Bali.
- e. Increase of gasoline use efficiency, water energy is such renewable energy. To generate the elctricity of 12,7 MW will economize the gasoline(solar)/HSD.
- f. New economy sources, some opportunities of natural tourism object devlopment with dam and its surrounding as the basics.

18. Positive Impacts toward the Cultural Value

The result of socialization which has been conducted for several times on the villages around the project (Melinggih, Susut-Buahan, Pangsas, Buanga-Getasan) shows that the community support the project plan as long as it does not adverse them and there is a guarantee for no environmental damages or decrease of water volume to the downstream. This support is based on the problem which is a common reality that leans to be increasing related to the crisis of water supply resources and electricity in the future. The dam development is expected to solve the water supply crisis, and electricity crisis. Economically for agriculture yields, the dam will be functioned as connecting bridge between Petang Market (Badung Regency) on the west and Payangan Market (Gianyar Regency) on the East. Despite it, *krama* Desa Adat Getasan who their ancestor originally came from Payangan and annually held ceremony on Agung Temple Payangan Desa will pass shorter route. According to the interview with The Head of Village of Getasan and *krama adat* (traditional society) Buangga, the bridge is a great expectation of the local community.

7.2. Analysis as the Basic of Environmental Feasibility

Environmental feasibility analysis of Ayung Dam development plan which covers dam development, quarry and hydraulic electricity power as well as the supporting facilities basec on the main pillar of environmental aspect:

- Spatial plan appropriateness
- Technology of Environmental Impact Management
- Economic beneficial
- Community's agreement

1. Spatial plan appropriateness

Site activity plan as mention before is a part of area that administered by two regencies those are: Badung Regency and Gianyar Regency. While the river position that split the two regencies according to Indonesian Water Law is adminstered by provincial government.

As a part of regencies area, site activity plan should admit and implement each regencies spatial plan. Besides that, each of regencies spatial plan should be a line with Provincial Spatian Plan (RTRWP) that in Bali has been determined as Local Government No. 3 / 2005 about Spatial Plan for Bali Province 2005 – 2010.

For Badung Regency, site plan of Ayung Dam that is situated in Petang sub-District should convey conservation character for its low land in the downstream. It is caused by recent Badung Spatial Plan 2005 – 2010 has determined Petang Sub-district as conservation zone with specific activity over the area limited mainly in agroforestry – agrotourism term. So with the regulation in Gianyar Regency, on which the high position of the site dam planned in the northern part of the regency is determined as conservation area. Normally, based on local regulation in both regencies, the dam planed as it function on conserving its downstream area is appropriate.

On Local Government Regulation No. 3 / 2005 about Bali Spatial Plan, the plan to develop dam in the same location is already stated. The conclusion then is that the dam development has been appropriates to the all spatial plan both in regencies level and provincial level.

2. Technology of Environmental Impact Management

According to the investigation to the prediction and impact evaluation of Ayung dam development which includes dam, quarry, hydraulic electricity power and its supporting facilities development, the dam can cause important negative impact to the environmental component. Basically, all of those important impacts can be managed, through some approaches, by the social, economy, culture approaches as well as technology and institutional approaches.

The impact technology which can be implemented in order to minimize the impact:

- a. Management toward the change of land scape topography
For the investigated area, the change of land scape topography can be managed through adjustment approach with the basic topography, structure's height tolerance. dam typology and other supporting facilities are designed not to be antagonist toward the natural ones. On the development of Ayung River Dam, the landscape's topography will be synergic with the surrounding's condition after the operational phase.
- b. Management towards degradation of soil's physical and chemical characteristic, soil stability and also increase of erosion and sedimentation:
 - Terraced rice field for the sloping land
 - Build a dike to hold the erosion
 - Concertina, water-channel and drainage channel
 - Replantation or planting for the unproductive land with the local plants suitable to the protected forest's vegetation
 - Road asphaltting and hardening and covering planting.

- c. Management towards the deterioration to the Ayung River water quality
 - Build cofferdam, and other borders to minimize the mud hole on the construction phase
 - Reboisation on open space around the project
 - Limiting the land clearing and stripping on the rainy season
- d. Management towards the change of land use
 - The using of productive land is exerted to be as minimum as possible, so that the correction on dam design is required.
 - Development of supporting facilities and infrastructures such as: office, warehouse, workers' residence and other facilities in the buffer.
- e. Management towards the degradation of species abundance and diversity of aquatic flora and fauna
 - Reboisation and replantation with protected area and dam's surrounding organizing so that it can be functioned as the filter to the erosion and sedimentation which cause mud hole and deterioration of Ayung River water quality.
 - Build an early protection to the cofferdam and other borders to minimize the mud hole's seepage and disturbance mitigation to the biota (aquatic flora and fauna).
- f. Management towards the transportation disturbance
 - The mobilization of heavy equipments and also the required materials for exploration and exploitation activities are exerted to be conducted during the lowa traffic time or in the evening, after 10 pm local time and must be completed with a permission from Communication Service or interrelated institution.
 - Considering the road capacity of Denpasar – Petang or Denpasar – Payangan or Bena – project location and or Karangasem – project location is 60 ton in maximum, therefore the equipments which weighe more than 60 tons must be separated in components and not more than the road capacity.
 - Road rehabilitation from Getasan – Buangga – project location (for Western area) and Payangan – project location such as widen, hardening, and asphaltting, and conditioning the bending road.

3. Economic Benefits

Inspite of the negative impacts on physics- chemical component, Ayung Dam development plan will also cause positive impact to the socio-economic components in particular. Those positive impacts are:

- a. Increase of regional income (regency and city). By the dam's operational, it is expected to be able to increase the water supply service (3.600 l/sec) to the large community. The distribution of water supply is done by PDAM of each Regency and City. The implication is that it can increase the regional income.
- b. Job opportunities, \pm 200-250 persons on dam's construction and \pm 50 persons on operational phase. It is expected to minimize the jobless rate in Bali.

- c. Business opportunities and new economic development cover the business opportunities related to the service for the worker's needs, such as: a place to stay, small shops for food and beverage, and other daily needs, transportation rental and so on.
- d. Increase of electricity in Bali, the development of Ayung hydraulic electricity power with capacity of 12,7 MW will minimize the electricity supply from Java. Therefore the dam is supporting the electricity in Bali.
- e. Increase of gasoline use efficiency, water energy is such renewable energy. To generate the electricity of 12,7 MW will economize the gasoline(solar)/HSD.
- f. New economy sources, some opportunities of natural tourism object development with dam and its surrounding as the basics.

4. Community's Agreement

The community's attitudes and perceptions toward Ayung River Dam development plan are very various. It leads to pro and contra attitudes of the community. This matter should be analyzed further from the articles of mass media, socialization result, discussion about the project of Ayung Dam and interview conducted by the researchers team.

Still, from the result of interview to 130 respondents from five villages around and downstream's villages or subak, the investigation and analysis experts obtain that the community who agree with Ayung Dam development plan are 90,77 % and those who disagree are 9,23 %.

The agree respondents convey some requirements, such as: (1) There must be such guarantee toward Ayung River's flow to downstream; (2) the released land must be compensate with resemble land or appropriate compensation and will not adverse the community (3) The project should create new job opportunities to the local community; (4) There should be electricity and water supply contribution for the village.

The disagree respondents have some reasons, such as: (1) land releasing (2) Unappropriate compensation (3) Anxiety toward the condemnation of settlements, holy places, and other values; (4) Anxiety of inundation of springs and temples; (5) Anxiety of losing jobs in rafting tourism sub-sector (6) Anxiety of pollution during construction; and (7) decrease of flow discharge to downstream which disturb the subak irrigation and community's bathing, washing and toilet activities.

Based on the social description, more than 50 % of the community agree with Ayung dam development plan.

Some objection to the project can be an early indicator that the government must be careful in giving responses to the project. The project development can rise disturbance on community's security and orderliness, in form of restlessness and worries among the community, it is not only for the community around the project location but the regional level and various community's stratification as well.

7.3 Analysis for the Management Principle

Environment analysis is contain the meaning that all contributing component on the ecological balancing and conservation should be provided with alternative management through various approach, both environment component or activity component that generating the negative impact to the environment.

7.3.1 Analysis Environment Negatives Impact to the Project Plant

Existance of the Ayung Dam is mostly influenced by environment conditions in surrounding area, mainly the upstream zone of the dam. Base on data investigated of erosion and up land covering conditions, its found following matter :

- ✦ Ayung watershed topographyc is very steep (> 75 %) and narrow hill.
- ✦ Geologycal structure is forming by river sedimen that (terrace deposit and both young anf old river alluvium) that is not solid. While the bed geologyc forming by cemented volcanic breccia is rather solid.
- ✦ Soil type in upstream is dominated by Andisols (forming by volcanic ash core and soft stone)
- ✦ It is founded several types of land use that its erodity higher than permitted EDP such as settlement, mix plantation, coffee plantation, dry landand thick forest.
- ✦ Base on BPDAS Unda Anyar data in 2003, generally the land and forest over there are in critical categories.
- ✦ Type of land use in the up-stream Ayung river basin is dry land (33,30 %), mix plantation (29,60 %), rice field (18,20 %), settlement (6,80 %), forest (7,30%), and others (2,82 %).

Base on the above conditions, it is predicted that environment component and human activities such as agriculture, plantation, tourism will driving negatives significant impact to the Ayung Dam conservation on its operational phase. Those the predicted restless are :

- ✦ High erosion on the terresteerial area will lead over sedimentation in the dam. The sedimentation is also potentially occurs by organic waste input from domestic and agriculture activities (*anthropogenic solid waste*) that flows to the Ayung and Siap River, and finally accumulated in the dam.
- ✦ Others than organic sedimentation and waste, Nitrogen (T-Nitrogen) and Phophorus (T-P) and pesticide are input from agriculture (*Agriculture waste*).
- ✦ More over impact from those input is over prosperous (eutrofikation). Eutrofikation phenomnom in the dam area is really not good and harm for dam sustainability.

To minimize the negatives impact on dam life time, local government as the initiator and others people should preparing protection and mitigation through integrated effort (*integrated approach*), namely:

- Issyuing regulation to organizing the dam track and upstream zone land use so that a line with the conservation effort.
- Promoting reforestration, forest regulation environment organizing through one million transplating movement on the critical area upstream of the dam.

- Installing checkdam in the upstream zone that will trap the sedimen before permeated in to the dam.
- Assisting the community on developing new paradigm on agriculture and plantation behaviour, from implementing anorganic fertilizer to be organic farming.
- Promoting echo-tourism for the altertive income, and minimizing land and natural resources but only environmental servises.

7.3.2 Analysis Environment Negatives Impact to the Environment Component

Basically, all the impact describes above potentially occurs on pra-construction, construction and operational phase. Related to the impact causing by Ayung Dam development, its need to managing the impact for mitigation as describe bellow. Detailly, environment management will describe on Environment Management Plan (RKL).

1. Technologycal Approach

Technologycal approach is to implementing various alternatives of available technich to reduce or minimizing negatives impact such as altenatives design, material or others:

- Implementing advance dam construction with better protection (*Concrete Gravity Da*)
- Cress level should be limited below 104,00 m from basement to reducing potential destroyer.
- To minimizing the mud agglomeration causing by the project, it is need to installing the temporary fence and coverdam to avoid the extend of the turbidity so that it will not disturb downstream activity and hydrobiota.
- Avoiding the works accident even on construction and operational phase, it is need to provides Standard Operating Procedure (SOP) for each activities which completes by procedure for securition on work accident. The SOP should be understood by every personnel who incharge for each job. To managing the emergency conditions or routine health workers maintaining its need to operating clinic special for the workers. But in term of dangerous condition, cooperation with Public Health Centre (Puskesmas) and nearest hospital should be maintain.
- At all dangerous spots should be completed by attention sign that inform everybody who will pas over the spot to take care of and following the standard procedur.

SOP that have to provide should be involve following conditions:

- Responsibility for avoiding the accident.
- Reportation when the accident causing an injury.
- Forbiden activity for all stakeholders even on construction and operational phase.
- Lisence on specific item of work such as welding, working in small space and dangers (it is usually on mechanical and electrical installation)
- Personal safety equipment and dangerous waste material storage.
- Sight protection (protection mirror)
- Helmet, safety shoes and belt
- Prohibittion on drug and alcoholic drink.
- Prohibittion to gambling or fire/ sharp things use.
- Determining prohibittion and permitted activity related to the dam security, high voltage of electricity, and others.

- Cleanliness maintenance
- Prohibition to anarchism and or attitudes that breaking the law.
- Vehicle inspection entering and out from the project area.
- And others.

2. Socio-Economic Approach

- To deal with surrounding community regarding to compensation for land acquisition and the negative impact caused by the project based on mutualism relation principle.
- To compensate rational balance in the form of provide rational grocery building for surrounding 'desa adat' financing by initiator to generate economic power of the community in serving tourism activities in the project surrounding.
- To provide temporary health clinic services in the area that predicted occurring health disturbance by project.
- To guarantee the environment conservation to the local government (Bali Province) in the amount of Rp. 1000,000,000,- The cash is used to managing the environment as it is determined on Environment Management Plan (RKL). When a damage occurs caused by the initiator carelessness, then the money is taken by Bali Province government to recover the damage or environment adverse.

3. Institutional Approach

Environment Management in the strategic area related to Ayung Dam Development should be integrated and covering total ecological border, administration authority (Bangli, Badung, Gianyar and Denpasar city) and Government of Bali, multisector (Forestry, Agriculture, Public Work, Tourism, and others), and multidiscipline, so therefore should involve many stakeholders component. Initiator must be kept standing as first responsible institutions that always coordinate and cooperate with others related institutions such as:

- Villages administrator in Petang sub-District, Payangan sub-district, and upland villages administrators and 'desa adat' in Susut and Kintamani sub-District of Bangli Regency.
- Any groups of local people (*local endogenous*).
- Camat of Petang, Payangan, Susut and Kintamani sub-District
- Government of Bali with related institutions :
 - Bappeda, Bapedal
 - Fishery and Ocean Services, Water resources sub-divisions of Public Works, TKP2LH,
 - Tourism services
- Government of Badung, Gianyar, Denpasar and Bangli with their related institutions.

Analysis for environment management principle will detail describe on Environment Management Plan (RKL) and Environment Monitoring Plan (RPL). Supervision upon the that management is addressed to know if the implemented management is correctly done, and a line with the purposes of the management. When the result of the supervision is not a line with the expectation, related technical institutions is proposed to consulting and guidance and also finding alternatives method and technique to handling the problems. Recapitulation on RKL and RPL is describe on following matrix.

CHAPTER VIII

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APPENDIX
PHOTOGRAPH OF SPECIFIC VEGETATION IN STUDY AREA



Vegetation Condition around Ayung River



Vegetation Condition around Ayung River



Rafting Activities on Ayung River



Paku Sarang Burung (*Asplenium nidus*)



Toop (*Arthocarpus elasticus*)



Juwet (*Eugenia cumini*)*



Uduh (*Caryota mytis*) *



Sentul (*Sandoricum koetjape*) *



Kaliandra (*Calliandra sp*)



Jaka (*Arenga pinnata*)



Lateng (*Laportea stimulas*)



Pangi (*Pangium edule**)

CHAPTER IX
APPENDIX

JAPAN INTERNATIONAL COOPERATION AGENCY

**DIRECTORATE GENERAL OF WATER RESOURCES,
MINISTRY OF PUBLIC WORKS
PUBLIC WORKS SERVICE, BALI PROVINCE**

**THE COMPREHENSIVE STUDY
ON
WATER RESOURCES DEVELOPMENT
AND MANAGEMENT IN BALI PROVINCE
IN
THE REPUBLIC OF INDONESIA**

**FINAL REPORT
SUPPORTING REPORT**

**[M] ECONOMIC ANALYSIS
(ECONOMIC, FINANCIAL AND SOCIAL)**

AUGUST 2006

**YACHIYO ENGINEERING CO., LTD.
NIPPON KOEI CO., LTD.**

THE COMPREHENSIVE STUDY ON WATER RESOURCES DEVELOPMENT
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M-1 ANALYSIS ON MASTER PLAN

M-1.1 Economic Evaluation

Economic evaluation aims to select the project that is judged to be the most optimum from the viewpoint of national resources distribution.

Economic evaluation of Master Plan is carried out in this chapter on the following 3 projects:

1. Multipurpose Ayung Dam Project	1) Municipal water supply to Central System 2) Hydroelectric power generation 3) Irrigation water supply
2. Water Supply Project for Southern Area of Bali	1) Western System: 300 lit./day 2) Central System: 1,800 lit./day 3) Eastern System: 800 lit./day
3. Flood Control Project	1) Badung River 2) Mati River

M-1.1.1 Assumptions and Benefits

Economic evaluation is calculated based on the economic cost and benefit. The following assumptions are applied to estimate the economic cost and benefit as shown in Table-M.1 and Table-M.2.

Table-M.1 Assumptions

Items	Assumptions
1. Prices	As of beginning 2005
2. Exchange Rate	1 US\$ = Rp.9,260 Average of middle rate from 1 US\$ = 106.97 Yen May/2004 to April/2005
3. Conversion Factor	Conversion rate of 0.9 for local portion cost
4. Economic Life	
1) Dam	80 years
2) Water Treatment Plant	40 years
3) Water transmission/distribution pipeline	40 years
4) Pumping Motors	15 years
5) Facilities for thermal generation plant	30 years
5. Replacement Cost	Pumping motors: to be replaced in every 15 years
6. Salvaged Value	The residue value of investment cost: to be salvaged at the 30 th year.

Source: Study Team

Table-M.2(1/2) Benefits

Benefit Items	Assumptions	Remarks	Sources
A. For Multipurpose Ayung Dam Project			
1. Central Water Supply	Same as B		
2. Hydroelectric power Generation	Rp.118.6billion	Alternative cost of thermal power plant construction	Study Team estimate based on US\$1million/MW of Indonesia Power
	Rp.72.4billion	Alternative cost of operation/maintenance	Study Team estimate based on Rp.800/kWh of Indonesia Power
	Rp.2.2billion	CDM (CO ₂ emission right)	742g/kWh x US\$5/t-CO ₂
3. Irrigation Water Supply	Rp.1.2million/ha	Without-case: soybean product	Study Team estimate based on information of Food Crops Agriculture Service of Bali Province
	Rp.4.3million/ha	With-case: paddy product	
B. For Water Supply Project for Southern Area of Bali			
1. Domestic Water	Rp.1,800/m ³	3% of presumed household income of Rp.1,600,000/month	Household income is estimated by the Study Team based on the GRDP and interview.
		Household consumption: 26 m ³ /month	Actual data of 3 PDAMs and PT.TB
2. Commercial/Public /Institutional Water	Rp.3,600/m ³	Denpasar and Badung South (PT.TB area)	Actual data of PT.TB
	Rp.3,030/m ³	Badung North and Gianyar	Actual data of PDAM Badung

Table-M.2(2/2) Benefits

Benefit Items	Assumptions	Remarks	Sources
B. For Water Supply Project for Southern Area of Bali			
3. Industrial Water	Rp.7,590/m ³	Denpasar and Badung South (PT.TB area)	Actual data of PT.TB
	Rp.6,620/m ³	Badung North and Gianyar	Actual data of PDAM Badung

C. For Flood Control Project

1. Annual Average Benefit see M-1.1.3(4)

Source: Study Team

For the economic evaluation, 10% to 12% of opportunity cost of capital is generally applied. In Indonesia, 12% of opportunity cost of capital is commonly utilized for economic evaluation of the public projects, so that the same opportunity cost of capital is applied to this master plan study. And 30 years of evaluation time horizon is applied to this master plan study.

M-1.1.2 Economic Cost

The project cost presented in previous chapter is, so to speak, financial cost. The financial cost has to be converted into economic cost applying the conversion factor of Table-M.1 to local portion of the financial cost.

Thus, the economic cost of Multipurpose Ayung Dam Project is set up as shown in Table-M.3. However, Ayung Dam is multipurpose dam for water supply to Central System, hydroelectric power generation and irrigation. Accordingly, the cost of Multipurpose Ayung Dam Project is separated and allocated to respective purpose as presented in Table-M.3 by applying cost allocation method of multipurpose dam based on the justifiable expenditure and alternative costs of respective objectives that is generally utilized in Japan.

Table-M.3 Economic Cost of Multipurpose Ayung Dam Project and Allocated Cost

Unit: Rp.billion

Cost	Multipurpose Ayung Dam	Cost allocated to		
		1. Water Supply (Central System)	2. Hydroelectric Power Generation	3. Irrigation Water
Financial Cost	718.8	308.1	223.4	187.3
Economic Cost	684.7	293.5	212.9	178.3

Source: Study Team

The financial cost of Water Supply Project for Southern Area of Bali and Flood Control Project is converted into economic cost in the same manner as shown in Table-M.4.

Table-M.4 Economic Cost of Water Supply Project and Flood Control Project

Unit: Rp.billion

Cost	Water Supply Project for Southern Area of Bali Western System	Flood Control Project	
		Central System	Western System
Financial Cost	71.8	629.0	Financial Cost 71.8
Economic Cost	69.0	617.5	Economic Cost 69.0

Note: 1) Cost of Central System includes allocated cost of Multipurpose Ayung Dam as presented in Table-M.3.

2) Economic cost of each Water Supply System includes distribution pipeline cost, respectively estimated at 5.1billion for Western, 31.0billion for Central, and 13.8billion for Eastern.

Source: Study Team

M-1.1.3 Economic Evaluation of the Project

In economic evaluation, three economic tools are generally utilized for the analysis. These tools are EIRR, B/C Ratio and NPV. The features of each tool are as follows:

- ◆ EIRR means the economic rate of return of the project. If the project EIRR exceeds 12% of opportunity cost of capital which is applied to this master plan study, the project is assessed to be economically feasible.
- ◆ B/C Ratio means the ratio of benefit-to-cost of the project. After discounting by the above

opportunity cost of capital, if the project B/C Ratio exceeds 1.0 is assessed economically feasible.

- ◆ NPV means the net present value of the project net benefit that is discounted by the 12% of opportunity cost of capital. If the project NPV results in positive, the project is assessed to be economically feasible. Obviously the project NPV results in positive when the project EIRR exceeds 12%. The project NPV means so to speak “net profit”, which is used generally for the purpose to select the project that might generate the largest “net profit” among the other projects.

Taking into consideration the above features, EIRR and B/C Ratio are utilized for economic evaluation of the project.

(1) Multipurpose Ayung Dam Project

The project aims for 1) municipal water supply to Central System, 2) hydroelectric power generation, and 3) irrigation water supply.

EIRR of the project shows 12.2% that exceeds the 12% of opportunity cost of capital. B/C ratio of the project shows 1.02 that exceeds 1.0. Accordingly, Multipurpose Ayung Dam Project is assessed to be economically feasible. See Table-M.5.

Table-M.5 Result of Economic Evaluation of the Projects

Items	Multipurpose Ayung Dam Project	Water Supply Project for Southern Area of Bali=(1)+(2)+(3)	Each system: for references		
			(1) Western System	(2) Central System	(3) Eastern System
EIRR	12.2%	12.3%	17.6 %	11.0 %	13.7 %
B/C Ratio	1.02	1.03	1.28	0.92	1.13

Source: Study Team

(2) Water Supply Project for Southern Area of Bali

The aim of the project is to supply municipal water to southern area of Bali by integrating 3 systems of 1) Western System, 2) Central System, and 3) Eastern System.

EIRR of the project shows 12.3% as shown in Table-M.5 that exceeds the 12% of opportunity cost of capital. Also B/C ratio shows 1.03 that exceeds 1.0. Accordingly, Water Supply Project of Master Plan is assessed to be economically feasible.

< For references >

The result of evaluation of each system is presented bellow (See Table-M.5 For detail, see Appendix- 1);

Western System

EIRR of the system shows 17.6% that exceeds the 12% of opportunity cost of capital. B/C ratio of the system shows 1.3 that exceeds 1.0.

Central System

EIRR of the system shows 11.0% that is slightly bellow the 12% of opportunity cost of capital. B/C Ratio of the system shows 0.9 that is also bellow 1.0.

As previously mentioned in Chapter M-1.1.2, Central System has to share the project cost of dam. This obviously causes to lower the system bellow the economic breakeven level.

Eastern System

EIRR of the System shows 13.7% that exceeds the 12% of opportunity cost of capital. B/C Ratio of the System shows 1.1 that exceeds 1.0.

(3) Sensitivity Analysis

(a) B/C Ratio by Discount Rate Variation

Although both Multipurpose Ayung Dam Project and Water Supply Project for Southern Area of Bali are judged economically feasible, B/C ratio results in only slightly higher than the breakeven point of 1.0.

12% of opportunity cost of capital is applied to economic evaluation of the master plan projects because, in Indonesia, the same cost is commonly utilized for economic evaluation of the public projects. However, for water resources development projects, a large investment cost is indispensable at initial stages. On the contrary, benefit of the project is a relatively small size, even though the benefit is generated continuously over the long period. For this kind of project, 12% of opportunity cost of capital might be rather too high to attain economical viability.

It is an important national project to develop safe and stable water resources in order to secure and fulfill “basic human needs”. So the Government financing and external soft loan is suggested in Chapter M-1.2 as priority procurement measures for the initial investment cost. The weighted-average interest rate of the Government funds and external soft loan is estimated at 4%, which could be considered the lowest level of opportunity cost of capital for this project. Thus, Sensitivity analysis is conducted here by applying three alternative opportunity costs of capital that are; 1) 4% - the above cost, 2) 8% - mean cost between 4% and 12% that is applied to the master plan, and 3) 10% - lowest cost among 10% and 12% that are generally applied for public projects in the world. As a result, respective B/C ratios are confirmed to be sufficiently higher than the breakeven point of 1.0 as shown in Table-M.6.

Table-M.6 Result of Sensitivity Analysis on B/C Ratio

Items	Discount Rate	Multipurpose Ayung Dam Project	Water Supply Project	Each system: for references		
			for Southern Area of Bali=(1)+(2)+(3)	(1) Western System	(2) Central System	(3) Eastern System
Master Plan	12%	1.02	1.03	1.28	0.92	1.13
Sensitivity Analysis	10%	1.2	1.2	1.4	1.1	1.3
	8%	1.5	1.4	1.6	1.4	1.6
	4%	2.4	2.1	2.0	2.1	2.2

Source: Study Team

(b) EIRR by Demand Variation

Among various factors that compose water demand projection, 3 material factors are selected and applied to this sensibility analysis. These factors are population growth, manufacturing industry growth and foreign tourist increase, and are utilized for sensibility analysis on water supply requirement in Chapter G.

1. Population growth

The projected growth is set up at 1.18% (middle growth) until 2010 and 1.05% (lowest growth) from 2011 by referring to the Spatial Plan of Bali Province. In this sensibility analysis, the following 3 types of growth that are applied to the Spatial Plan of Bali Province are also applied until the target year of 2025;

<u>Scenarios</u>		<u>Remarks</u>
1) High 1	1.26%	Spatial Plan of Bali Province
2) High 2	1.18%	Spatial Plan of Bali Province
3) Low	1.05%	Spatial Plan of Bali Province

The result of sensitivity analysis is presented in Table-M.7. For both projects, EIRR of above variation 1) and 2) shows slightly higher than EIRR of Master Plan. Even though EIRR of above variation 3) shows lower than EIRR of Master Plan, its EIRR still exceeds the 12% of opportunity cost of capital 12%.

2. Manufacturing industry growth

The projected growth rate is set up at 5.5% until 2005, and 7% from 2006 by referring to the Spatial Plan of Bali Province. In this sensibility analysis, the following 2 types of scenarios are applied.

<u>Scenarios</u>		<u>Remarks</u>
1) High	8.4%	Spatial Plan of Bali Province from 2006
2) Low	5%	30% lower than the projection from 2006

The result of sensitivity analysis is presented in Table-M.7. For both projects, EIRR of above variation 2) shows lower than EIRR of Master Plan; however, its EIRR still exceeds the 12% of opportunity cost of capital 12%.

3. Foreign tourist increase

The projected increase rate is set up at 4.5%. In this sensibility analysis, the following 2 types of scenarios are applied.

Scenarios		Remarks
1) High	5%	10% higher than the projection
2) Low	4%	10% lower than the projection

The result of sensitivity analysis is presented in Table-M.7. For both projects, EIRR of above variation 2) shows slightly bellow the 12% of opportunity cost of capital. The tourism water demand in 2025 decreases by 1.3% (78lit/sec) compared to the demand in Master Plan. However, EIRR deteriorates by 4.4% for Water Supply Project and by 2.4% for Ayung Dam project which is larger than the 1.3% of water demand decreasing rate. This is because the benefit of industrial sector including tourism is larger than that of other sectors, which means tourism sector is much more sensitive to the demand variation. Tourism sector is the most important industry in Bali Province, so that the Government expects to improve and accelerate more the attractiveness of tourism resources in Bali Island.

Table-M.7 EIRR by Sensitivity Analysis

Variation	Multipurpose Ayung Dam Project	Water Supply Project for Southern Area of Bali=(1)+(2)+(3)	Each system: for references		
			(1) Western System	(2) Central System	(3) Eastern System
<i>EIRR of Mater Plan</i>	12.2%	12.3%	17.6 %	11.0 %	13.7 %
1. Demand Variation					
1.1 Population Growth					
1) high 1: 1.26%	12.4%	12.7%	17.8%	11.3%	14.0%
2) high 2: 1.18%	12.3%	12.4%	17.6%	11.2%	13.9%
3) low: 1.05%	12.1%	12.2%	17.3%	10.9%	13.7%
1.2 Manufacturing Industry Growth					
1) high: 8.4%	12.3%	12.5%	17.5%	11.2%	13.9%
2) low: 5%	12.1%	12.1%	17.3%	10.8%	13.6%
1.3 Foreign Tourist Increase					
1) 5%	12.3%	12.5%	17.5%	12.3%	14.3%
2) 4%	11.9%	11.8%	17.4%	10.5%	13.0%
2. Cost Variation					
1) disregard for contingency	13.0%	13.5%	19.5%	12.0%	15.1%

Source: Study Team

(c) EIRR by Cost Variation

Generally the physical contingency is taken into consideration in estimating the project cost by adding to its construction cost. In Master Plan, 10% of physical contingency is applied. In this regard, the physical contingency is an additional cost provided for unforeseen incidents. Accordingly, this analysis is conducted by disregarding this physical contingency.

The result of sensitivity analysis is presented in Table-M.7. It is obvious that EIRR of both projects exceed 13% and shows sufficient economic viability.

(4) Flood Control Project

The project cost for Flood Control Project is Rp.117.2billion in total, respectively Rp.65.9billion for Badung River and Rp.51.3billion for Mati River.

Flood control benefit is generally defined as the reduction of potential flood damage by the project. The reduction can be obtained from the difference of the flood damages between with- and without-project conditions.

The flood damages are estimated only from probable direct damage to houses as described bellow. Damage to agriculture product and others are neglected because the damage to houses, especially in the metropolitan area, is deemed big enough for project benefits.

<Value of Houses of Badung Regency and Denpasar City>

Total value of houses in Badung Regency and Denpasar City in 2004 is estimated as shown in Table-M.8.

Table-M.8 Value of House

Area	<20m ²	20-49m ²	50-99m ²	100-149m ²	150m ² <	Total
1. Number of Household by House Size						
Badung Reg.	12,737	19,728	41,499	7,758	5,750	87,470
Denpasar City	36,120	38,211	30,651	13,097	15,184	133,263
2. House Construction Price						
Rp./m ²	480,000	680,000	950,000	1,360,000	1,770,000	-
3. Value of House (Rp.billion)						
Badung Reg.	122	463	2,936	1,314	1,527	6,362
Denpasar City	347	896	2,169	2,218	4,031	9,661

Source: 1) Measurement and Technical Planning of Sungai River and Mati River in Final Report of Water Management and Flood Control in Bali 1997/98, Public Work Dept. of Bali Province, 2) Bali in Figures 2003, BPS of Bali Province, , and 3) Study Team

<Flood Damage>

As mentioned in previous chapter, flood area ratio in the residential area is estimated at 4% in Badung Regency and 25.5% in Denpasar City. Flood damage to houses by area is estimated by applying the flood area ratio and direct damage ratio adopted in Japan, and summarized in Table-M.9.

Table-M.9 Direct Flood Damage by Area

Area	Direct Damage Ratio		Flood Area Ratio in the Residential Area	Flood Damage (Rp.billion)
	House	Household Inventory		
Badung Reg.	8.3%	8.6% (for reference)	4.0%	21.6
Denpasar City			25.5%	210.5

Note: Direct damage under the condition of less than 50cm floor level inundation

Source: 1) Manual for River Works in Japan, Ministry of Construction of Japan, and 2) Study Team

The above flood damage by area is divided into flood damage by river basin tentatively by applying the project cost ratio of Mati River Project and Badung River Project, and summarized in Table-M.10.

Table-M.10 Direct Flood Damage by River Basin

Unit: Rp.billion

River Basin	Project Cost	Badung Regency	Denpasar City	Total
Mati River	51.3	43%	9.3	90.9
Badung River	65.9	57%	12.3	119.6
Total	117.2	100%	21.6	210.5

Source: Study Team

< Annual Average Benefit >

The annual average benefit is defined as the reduction of probable damage under with- and without-project conditions. The Project is proposed on 25-year probable flood. The annual benefit accruing from implementation of the Project is estimated, under the present conditions of year 2005, at Rp.7.0billion for Mati River Project and at Rp.2.8billion for Badung River Project as shown in Table-M.11 and. Table-M.12

Table-M.11 Annual Average Benefit of Mati River

Return Period	Flood Damage (Rp.billion)			Average (Rp.billion)	Expectation	Benefit (Rp.billion)
	Without Project	With Project	Reduction			
3 Year	0.0	0	0.0	9.9	0.133	1.3
5 Year	19.9	0	19.8	28.3	0.100	2.8
10 Year	36.7	0	36.7	45.5	0.050	2.3
20 Year	54.2	0	54.2	57.3	0.010	0.6
25 Year	60.0	0	60.0			
Total Annual Benefit						7.0

Source: Study Team

Table-M.12 Annual Average Benefit of Badung River

Return Period	Flood Damage (Rp.billion)			Average (Rp.billion)	Expectation	Benefit (Rp.billion)
	Without Project	With Project	Reduction			
8 Year	0.0	0	0.0	14.3	0.025	0.4
10 Year	28.7	0	28.7			
20 Year	47.1	0	47.1	37.9	0.050	1.9
25 Year	53.0	0	53.0	50.0	0.010	0.5
Source: Study Team				Total Annual Benefit		2.8

< Economic Analysis >

Economic analysis, under present condition of year 2005, on Badung & Mati Rivers Flood Control Project was made by applying all data mentioned above based on the flood return period of 25 years, and indirect flood damage of 10% on the direct flood damage, which resulted in 13.4% of EIRR and 1.1 of B/C ratio. Accordingly, the project could be assessed economically feasible. Obviously it must be emphasized that, taking into consideration increasing population and houses in future, these economic figures under future condition may result in very much higher.

M-1.2 Financial Consideration

M-1.2.1 Multi-purpose Ayung Dam Project

As previously mentioned, the project cost of Rp.718.8billion has to be separated and allocated to relevant projects of 1) Central Water Supply System of Water Supply Project for Southern Area of Bali, 2) Hydro Power Generation and 3) Irrigation Water Supply. Accordingly, financial consideration of Ayung Dam Project should be made separately as follows:

- ◆ Water Supply Project for Southern Area of Bali, taking into consideration the allocated amount from Ayung Dam Project, is studied in the following chapter.
- ◆ For Hydro Power Generation, parties interested such as Indonesia Power, an exclusive national electric power company, could be expected to join the project fully or partly.
- ◆ Financial burden for Irrigation Water Supply has to be discussed prudently with the parties interested such as SUBAK to avoid conflicts.

M-1.2.2 Water Supply Project for Southern Area of Bali

The project cost amounts to Rp.1,037.0billion including allocated cost of Rp.308.1billion from Multipurpose Ayung Dam Project. Obviously, the project cost is far beyond the financial capability of the Provincial Government because annual revenue of the Provincial Government was only Rp.904billion in 2004 including previous year's surplus. Accordingly, financing of Central Government loan and/or foreign soft loan would be inevitable in implementing the project. This loan composition might be expected as presented in Table-M.13.

Table-M.13 Expected Loan Composition

(1) Loan	(2) Portion	(3) Expected Interest Rate	(4) Weighted average Rate	(5) Expected Loan Term including Grace Period
Central Government Loan	20%	14%*	4%	Roll over for 30 years 30 years
Foreign Soft Loan	80%	1.5%		

Note: * Government Bank loan for investment purpose

Source: Study Team based on data from web side of Central Bank of Indonesia and Japan Bank for International Cooperation

< Annualized Project Cost >

Annualized cost can be regarded as annual due amount of repayment and interests of above loan, which can be calculated based on the above loan conditions that are 1) the loan amount of Rp.1,037.0, 2) weighted average interest rate of 4%, and 3) loan term of 30 years.

Annualized project cost of the above loan will be Rp.59.9billion, which accounts for 6.6% of annual revenue of the Provincial Government.

M-1.2.3 Flood Control Project

The project cost of Rp.117.2billion is also so big for the financial capability of Provincial Government, so that, on this, financing from Central Government and/or foreign soft loan may be required.

M-2 ANALYSIS OF FEASIBILITY STUDY

M-2.1 Economic Evaluation

Economic evaluation of feasibility study is carried out on the following 3 projects which were selected as priority in the Master Plan study:

1. Multipurpose Ayung Dam Project	1) Municipal water supply to Central System
2. Water Supply Project for Southern Area of Bali	2) Hydroelectric power generation
	3) Irrigation water supply
	1) Western System: 300lit./day
	2) Central System: 1,800lit./day
	3) Eastern System: 800lit./day

M-2.1.1 Assumptions and Benefits

Economic evaluation is calculated based on the economic cost and benefit. The following assumptions are applied to estimate the economic cost and benefit as shown in Table-M.14 and Table-M.15.

Table-M.14 Assumptions

Items	Assumptions
1. Prices	As of end 2005
2. Exchange Rate	1 US\$ = Rp.9,750 1 US\$ = 110.75 Yen
3. Conversion Factor	Conversion rate of 0.9 for local portion cost
4. Economic Life	4. Economic Life
1) Dam	80 years
2) Water Treatment Plant	40 years
3) Water transmission/distribution pipeline	40 years
4) Electrical Equipment and Machinery	30 years
5) Pumping Motors	15 years
6) Facilities for thermal generation plant	30 years
5. Replacement Cost	Pumping motors: to be replaced in every 15 years
6. Salvaged Value	The residue value of investment cost: to be salvaged at the 30 th year.

Source: Study Team

Table-M.15(1/2) Benefits

Benefit Items	Assumptions	Remarks	Sources
A. For Multipurpose Ayung Dam Project			
1. Central Water Supply	Same as B		
	Rp.116.8billion	Alternative cost of thermal power plant construction	Study Team estimate based on US\$1million/MW of Indonesia Power
2. Hydropower Generation	Rp.139.1billion	and operation/maintenance	Study Team estimate based on Rp.2,000/kWh of Indonesia Power
	Rp.3.2billion	CDM (CO ₂ emission right)	742g/kWh x US\$7/t-CO ₂

Table-M.15 (2/2) Benefits

Benefit Items	Assumptions	Remarks	Sources
A. For Multipurpose Ayung Dam Project			
3. Irrigation Water Supply	Rp.1.4million/ha	Without-case: soybean product	Study Team estimate based on information of Food Crops Agriculture
	Rp.5.2million/ha	With-case: paddy product	Service of Bali Province
Benefit Items	Assumptions	Remarks	Sources
B. For Water Supply Project for Southern Area of Bali			
1. Domestic Water	Rp.2,000/m ³	3% of presumed household income of Rp.1,800,000/month	Household income is estimated by the Study Team based on the GRDP and interview.
		Household consumption: 27 m ³ /month	Actual data of 3 PDAMs and PT.TB in year 2005
2. Commercial/Public /Institutional Water	Rp.3,700/m ³	All target area	Actual data of PDAM Badung and PT.TB in year 2005
3. Industrial Water	Rp.7,620/m ³	All target area	Actual data of PDAM Badung and PT.TB in year 2005
C. For Flood Control Project			
1. Annual Average Benefit	see Chapter M-2.1.3(4)		

Source: Study Team

For the economic evaluation, 10% to 12% of opportunity cost of capital is generally applied. In Indonesia, 12% of opportunity cost of capital is commonly utilized for economic evaluation of the public projects, so that the same opportunity cost of capital is applied to this feasibility study. And 30 years of evaluation time horizon is applied to this feasibility study.

M-2.1.2 Economic Cost

The project cost presented in previous chapter is, so to speak, financial cost and has to be converted into economic cost applying the conversion factor of Table-M.14 to local portion of the project cost.

Thus, the economic cost of Multipurpose Ayung Dam Project is set up as shown in Table-M.16. However, the project aims multipurpose dam for water supply to Central System, hydroelectric power generation and irrigation. Accordingly, the cost of the project is separated and allocated to respective purpose as presented in Table-M.16 by applying cost allocation method of multipurpose dam based on the justifiable expenditure and alternative costs of respective objectives that is generally utilized in Japan.

Table-M.16 Economic Cost of Multi-purpose Ayung Dam Project

Unit: Rp.billion

Cost	Ayung Dam ¹⁾	Cost allocated to		
		1. Water Supply (Central System)	2. Hydroelectric Power Generation ¹⁾	3. Irrigation Water
Financial Cost	1,086.6	263.6	617.5	205.5
Economic Cost	1,010.0	243.4	576.8	189.8

Note: 1) Cost for electric power generation facilities and equipment is included.

Source: Study Team

The financial cost of Water Supply Project for Southern Area of Bali and Flood Control Project is converted into economic cost in the same manner as shown in Table-M.17.

Table-M.17 Economic Cost of Water Supply Project and Flood Control Project

Unit: Rp.billion

Cost	Water Supply Project for Southern Area of Bali				Flood Control Project		
	Western System	Central System	Eastern System	Total	Badung River	Mati River	Total
Financial Cost	113.2	759.5	187.8	1,060.5	72.4	69.2	141.6
Economic Cost	108.8	731.0	175.9	1,015.7	65.5	62.5	128.0

Note: 1) Cost of Central System includes allocated cost of Multipurpose Ayung Dam presented in Table-M.16.

2) Economic cost of each Water Supply System includes distribution pipeline cost, respectively estimated at 2.6billion for Western, 15.5billion for Central, and 2.6billion for Eastern.

Source: Study Team

M-2.1.3 Economic Evaluation of the Projects

(1) Multipurpose Ayung Dam Project

The project aims for 1) municipal water supply to Central System, 2) hydroelectric power generation, and 3) irrigation water supply.

EIRR of the project shows 14.2% that exceeds the 12% of opportunity cost of capital. B/C ratio of the project shows 1.17 that exceeds 1.0. Accordingly, Multipurpose Ayung Dam Project is assessed to be economically feasible. See Table-M.18.

Table-M.18 Result of Economic Evaluation of the Projects

Items	Multipurpose Ayung Dam Project	Water Supply Project for Southern Area of Bali=(1)+(2)+(3)	Each system: for references		
			(1) Western System	(2) Central System	(3) Eastern System
EIRR	14.2%	12.5%	13.2 %	11.4 %	14.7 %
B/C Ratio	1.17	1.04	1.06	0.95	1.20

Source: Study Team

(2) Water Supply Project for Southern Area of Bali

The aim of the project is to supply municipal water to southern area of Bali by integrating 3 systems of 1) Western System, 2) Central System, and 3) Eastern System.

EIRR of the project shows 12.5% as shown in Table-M.18 that exceeds the 12% of opportunity cost of capital. Also B/C Ratio shows 1.04 that exceeds 1.0. Accordingly, Water Supply Project for Southern Area of Bali is judged to be economically feasible.

< For references >

The result of evaluation of each system is presented below (See Table-M.18. For detail, see Appendix- 2);

Western System

EIRR of the system shows 13.2% that exceeds the 12% of opportunity cost of capital. B/C ratio of the system shows 1.06 that exceeds 1.0.

Central System

EIRR of the system shows 11.4% that is below the 12% of opportunity cost of capital. B/C ratio of the system shows 0.95 that is also below 1.0.

As previously mentioned in M-2.1.2, Central System has to share the project cost of dam, which obviously causes to lower the system below the economic breakeven level.

Eastern System

EIRR of the system shows 14.7% that exceeds the 12% of opportunity cost of capital. B/C ratio of the system shows 1.20 that exceeds 1.0.

(3) Sensitivity Analysis

(a) B/C Ratio by Discount Rate Variation

In this feasibility study as well as in master plan study, B/C ratio of both projects results in only slightly higher than the breakeven point of 1.0.

12% of opportunity cost of capital is applied to economic evaluation of this feasibility study because, in Indonesia, the same cost is commonly utilized for economic evaluation of the public projects. However, a large investment cost is indispensable at initial stages to develop water resources projects. On the other hand, benefit of the project is a relatively small size, even though the benefit is generated continuously over the long period. For this kind of project, 12% of opportunity cost of capital might be considered rather too high to attain economical viability.

Safe and stable water resources development is an important national project in order to secure and

fulfill “basic human needs”. So the Government financing and external soft loan is suggested in Chapter 2.2 as priority procurement measures for the initial investment cost. The weighted-average interest rate of the Government finances and foreign soft loan is estimated at 4%, which could be considered the lowest level of opportunity cost of capital for this project. Thus, sensitivity analysis is conducted here by applying three alternative opportunity costs of capital that are; 1) 4% - the above cost, 2) 8% - mean cost between 4% and 12% that is applied to the master plan, and 3) 10% - lowest cost among 10% and 12% that are generally applied for public projects in the world. As a result, respective B/C ratios are confirmed to sufficiently surpass the breakeven point of 1.0 as shown in Table-M.19.

Table-M.19 Result of Sensitivity Analysis on B/C Ratio

Items	Discount Rate	Multipurpose Ayung Dam Project	Water Supply Project for Southern Area of Bali=(1)+(2)+(3)	Each system: for references		
				(1) Western System	(2) Central System	(3) Eastern System
Evaluation	12%	1.17	1.04	1.1	0.95	1.2
Sensitivity	10%	1.4	1.2	1.2	1.1	1.4
Analysis	8%	1.7	1.4	1.3	1.3	1.6
	4%	2.6	2.0	1.7	2.0	2.3

Source: Study Team

(b) EIRR by Demand Variation

In this feasibility study, the same 3 material factors utilized in the master plan study that compose water demand projection are also selected and applied to this sensibility analysis. These factors are population growth, manufacturing industry growth and foreign tourist increase, and are utilized for sensitivity analysis on water supply requirement in Chapter-G.

1. Population growth

The projected growth is set up at 1.18% (middle growth) until 2010 and 1.05% (lowest growth) from 2011 by referring to the Spatial Plan of Bali Province. In this sensibility analysis, the following 3 types of growth that are applied to the Spatial Plan of Bali Province are also applied until the target year of 2025;

<u>Scenarios</u>		<u>Remarks</u>
1) High 1	1.26%	Spatial Plan of Bali Province
2) High 2	1.18%	Spatial Plan of Bali Province
3) Low	1.05%	Spatial Plan of Bali Province

The result of sensitivity analysis is presented in Table-M.20. For both projects, EIRR of above variation 1) and 2) shows slightly higher than EIRR of Feasibility Study. Even though EIRR of above variation 3) shows lower than EIRR of Feasibility Study, its EIRR still exceeds the 12% of opportunity cost of capital 12%.

2 Manufacturing industry growth

The projected growth rate is set up at 5.5% until 2005, and 7% from 2006 by referring to the Spatial Plan of Bali Province. In this sensibility analysis, the following 2 types of scenarios are applied.

<u>Scenarios</u>		<u>Remarks</u>
1) High	8.4%	Spatial Plan of Bali Province from 2006
2) Low	5%	30% lower than the projection from 2006

The result of sensitivity analysis is presented in Table-M.20. For both projects, EIRR of above variation 2) shows lower than EIRR of Feasibility Study; however, its EIRR still exceeds the 12% of opportunity cost of capital 12%.

3 Foreign tourist increase

The projected increase rate is set up at 4.5%. In this sensibility analysis, the following 2 types of scenarios are applied.

<u>Scenarios</u>		<u>Remarks</u>
1) High	5%	10% higher than the projection

2) Low 4% 10% lower than the projection

The result of sensibility analysis is presented in Table-M.20. For Water Supply Project for Southern Area of Bali, EIRR of above variation 2) shows slightly bellow the 12% of opportunity cost of capital. The tourism water demand in 2025 decreases by 1.3% (78lit/sec) compared to the demand in Master Plan. However, EIRR deteriorates by 5.1% for Water Supply Project. This is because the benefit of industrial sector including tourism is larger than that of other sectors, which means tourism sector is much more sensitive to the demand variation. Tourism sector is the most important industry in Bali Province, so that the Government expects to improve and accelerate more the attractiveness of tourism resources in Bali Island.

Table-M.20(1/2) EIRR by Sensitivity Analysis

Variation	Multipurpose Ayung Dam Project	Water Supply Project for Southern Area of Bali=(1)+(2)+(3)	Each system: for references		
			(1) Western System	(2) Central System	(3) Eastern System
<i>EIRR of Feasibility Study</i>	14.2%	12.5%	13.2 %	11.4 %	14.7 %
1. Demand Variation					
1.1 Population Growth					
1) high 1: 1.26%	14.4%	12.8%	13.4%	11.7%	15.0%
2) high 2: 1.18%	14.3%	12.6%	13.2%	11.6%	14.6%
3) low: 1.05%	14.2%	12.3%	12.9%	11.2%	14.4%
1.2 Manufacturing Industry Growth					
1) high: 8.4%	14.3%	12.7%	13.1%	11.6%	14.7%
2) low: 5%	14.0%	12.2%	12.9%	11.1%	14.3%

Table-M.20(2/2) EIRR by Sensitivity Analysis

Variation	Multipurpose Ayung Dam Project	Water Supply Project for Southern Area of Bali=(1)+(2)+(3)	Each system: for references		
			(1) Western System	(2) Central System	(3) Eastern System
<i>EIRR of Feasibility Study</i>	14.2%	12.5%	13.2 %	11.4 %	14.7 %
1.3 Foreign Tourist Increase					
1) 5%	14.3%	12.7%	13.1%	11.5%	15.1%
2) 4%	14.0%	11.9%	13.0%	10.8%	13.6%
2. Cost Variation					
1) disregard for contingency	15.3%	13.8%	14.9%	12.4%	16.1%

Source: Study Team

(c) EIRR by Cost Variation

Generally the physical contingency is taken into consideration in estimating the project cost by adding to its construction cost. In Feasibility Study as well as in Master Plan, 10% of physical contingency is applied. In this regard, the physical contingency is an additional cost provided for unforeseen incidents. Accordingly, this analysis is conducted by disregarding this physical contingency.

The result of sensitivity analysis is presented in Table-M.20. It is obvious that EIRR of both projects shows sufficient economic viability.

(4) Flood Control Project

The project cost for Flood Control Project is Rp.141.6billion in total, respectively Rp.72.4billion for Badung River and Rp.69.2billion for Mati River as presented in previous M-2.2.2.

Flood control benefit is generally defined as the reduction of potential flood damage by the project. The reduction can be obtained from the difference of the flood damages between with- and without-project conditions.

The flood damages are estimated from probable direct damage to houses and business related facilities (estimated at 10% of house damage), and indirect damage (estimated at 10% of direct damage).

<Value of Houses of Badung Regency and Denpasar City>

Total value of houses in Badung Regency and Denpasar City in 2005 is estimated as shown in Table-M.21.

Table-M.21 Value of House

Area	<20m ²	20-49m ²	50-99m ²	100-149m ²	150m ² <	Total
1. Number of Household by House Size						
Badung Reg.	12,737	19,728	41,499	7,758	5,750	87,470
Denpasar City	36,120	38,211	30,651	13,097	15,184	133,263
2. House Construction Price						
Rp./m ²	562,000	803,000	1,124,000	1,606,000	2,088,000	-
3. Value of House (Rp.billion)						
Badung Reg.	143	547	3,476	1,551	1,801	7,518
Denpasar City	406	1,059	2,567	2,619	4,756	11,407

Source: 1) Measurement and Technical Planning of Sungai River and Mati River in Final Report of Water Management and Flood Control in Bali 1997/98, Public Work Dept. of Bali Province, 2) Bali in Figures 2003 & 2004, BPS of Bali Province, , and 3) Study Team

<Flood Damage>

Flood area ratio in the residential area is estimated at 8% in Badung Regency and 25.5% in Denpasar City by taking into consideration of regional population density. Flood damage to houses by area is estimated by applying the flood area ratio and direct damage ratio adopted in Japan, and summarized in Table-M.22.

Table-M.22 Direct Flood Damage by Area

Area	Direct Damage Ratio		Flood Area Ratio in the Residential Area	Flood Damage (Rp.billion)
	House	Household Inventory		
Badung Reg.	8.3%	8.6% (for reference)	8.0%	50.0
Denpasar City			25.5%	241.6

Note: Direct damage under the condition of less than 50cm floor level inundation

Source: 1) Manual for River Works in Japan, Ministry of Construction of Japan, and 2) Study Team

< Economic Evaluation >

Benefit is defined as the reduction of probable damage under with- and without-project conditions on 25-year probable flood. The annual benefit accruing from implementation of the Project under the current condition of 2005 and future conditions of 2015 and 2025 is estimated for economic evaluation as presented in Table-M.23. Obviously, benefit of future years will become larger because of increasing number of houses derived from growing population and business activities.

Economic evaluation is made considering all mentioned above. EIRR of the project results in 15.0% as shown in Table-M.23 that exceeds the 12% of opportunity cost of capital. B/C ratio of the project shows 1.2 that exceeds 1.0. Accordingly, Flood Control Project is assessed to be economically feasible.

Table-M.23 Benefit and Result of Economic Evaluation

Items	Under the Current condition			Under the Future Condition	
		Year 2005		Year 2015	Year 2025
Annual Average Benefit (Rp. billion)	Houses	12.8		15.6	17.2
	Business Facilities	1.3		1.6	1.7
	Indirect	1.4		1.7	1.9
	Total	15.5		18.9	20.8
Economic Evaluation	EIRR			15.0%	
	B/C Ratio			1.2	

M-2.2 Financial Consideration

M-2.2.1 Multi-purpose Ayung Dam Project

The project cost of Rp.1,086.6billion has to be separated and allocated to relevant projects of 1) Central System of Water Supply Project for Southern Area of Bali, 2) hydroelectric power generation and 3) irrigation water supply. Accordingly, financial consideration of Multipurpose Ayung Dam Project should be made separately as follows:

- ◆ Water Supply Project for Southern Area of Bali, taking into consideration the cost allocation of Ayung Dam Project, is studied in the following chapter.
- ◆ Electricity power of Bali is generated 100% by thermal plant of Indonesia Power, an exclusive national electric power company. However, the supply capacity is not sufficient to meet whole demand of Bali, so that the frequent cutoff of power supply has occurred in Bali. On the other hand, operation cost of the thermal plant has jumped in 2005 because of the worldwide higher oil prices than ever. So, Indonesia Power, by joining the Multipurpose Ayung Dam Project, could obviously expect to supply more stably and achieve extremely lower operation cost.

If Indonesia Power joins the project, the company bears the project cost of its own power plant. As to the multipurpose dam project cost, the cost sharing would be a subject of discussion among respective organizations of Central Government.

- ◆ Though beneficiaries of irrigation water supply developed by the multipurpose dam project have to bear the adequate proportional project cost, the prudent dialogue and discussion with the parties interested such as SUBAK is necessary to resolve it.

M-2.2.2 Water Supply Project for Southern Area of Bali

The project cost amounts to Rp.1,060.5billion including allocated cost of Rp.263.6billion from Multipurpose Ayung Dam Project. Obviously, the project cost is far beyond the financial capability of the Provincial Government because annual revenue of the Provincial Government was Rp.904billion in 2004 including previous year's surplus. Accordingly, financing of Central Government loan and/or foreign soft loan would be inevitable in implementing the project. These loans might be suggested as follows:

(1) Loan	(2) Portion	(3) Expected Interest Rate	(4) Weighted average Rate	(5) Expected Loan Term including Grace Period
Central Government Loan	20%	14%*	4%	Roll over for 30 years
Foreign Soft Loan	80%	1.5%		30 years

Note: * Government Bank loan for investment purpose

< Annualized Project Cost >

Annualized cost can be regarded as annual due amount of repayment and interests of loan, which can be calculated based on the above loan conditions that are 1) the loan amount of Rp.1,060.5billion, 2) weighted average interest rate of 4%, and 3) loan term of 30 years.

Annualized project cost of the above loan will be Rp.59.2billion, which accounts for 6.5% of annual revenue of the Provincial Government.

M-2.2.3 Flood Control Project

The project cost of Rp.141.6billion is also so big for the financial capability of Provincial Government, so that, on this, financing from Central Government and/or foreign soft loan may be required.

Appendices

Appendix-1
Economic Evaluation
of Master Plan

Appendix-1.1 Multipurpose Ayung Dam Project

1) Municipal Water Supply to Central System, 2) Hydroelectric Power Generation, and 3) Irrigation Water Supply

IRR	12.2%
B/C	1.02
NPV	17.4

(Rp.billion)

Year	Project Cost									Benefit						Net Benefit			
	Investment				O&M				Total	Water Supply	Power			Irrigation			Total		
	Dam	Water Supply	Power	Total	Dam	Water Supply	Power	Total			Plant	O&M	CDM	Constant	Additional				
2008																			
1	2009	60.6	0	0	60.6	0	0	0	0	60.6	0	0	0	0	0	0	0	0	-60.6
2	2010	162.2	0	0	162.2	0	0	0	0	162.2	0	0	0	0	0	0	0	0	-162.2
3	2011	162.2	24.0	26.3	212.5	0	0	0	0	212.5	0	39.5	0	0	0	0	0	39.5	-173.0
4	2012	168.7	24.0	76.5	269.2	0	0	0	0	269.2	0	39.5	0	0	0	0	0	39.5	-229.6
5	2013	131.0	108.9	69.2	309.1	0	0	0	0	309.1	0	39.5	0	0	0	0	0	39.5	-269.6
6	2014	0	0	0	0	0.9	4.7	1.3	6.8	6.8	24.6	0.0	72.4	2.2	1.5	0.5	101.1	94.3	
7	2015	0	0	0	0	0.9	6.2	1.3	8.4	8.4	35.9	0.0	72.4	2.2	1.5	0.5	112.3	103.9	
8	2016	0	0	0	0	0.9	7.2	1.3	9.4	9.4	44.1	0.0	72.4	2.2	1.5	0.4	120.6	111.2	
9	2017	0	76.3	0.0	76.3	0.9	7.2	1.3	9.4	85.6	44.4	0.0	72.4	2.2	1.5	0.4	120.8	35.2	
10	2018	0	0	0	0	0.9	12.1	1.3	14.3	14.3	77.0	0.0	72.4	2.2	1.5	0.3	153.2	138.9	
11	2019	0	0	0	0	0.9	13.2	1.3	15.3	15.3	83.2	0.0	72.4	2.2	1.5	0.3	159.5	144.1	
12	2020	0	0	0	0	0.9	14.1	1.3	16.3	16.3	88.9	0.0	72.4	2.2	1.5	0.2	165.2	148.8	
13	2021	0	76.3	0.0	76.3	0.9	14.4	1.3	16.6	92.8	90.6	0.0	72.4	2.2	1.5	0.2	166.8	74.0	
14	2022	0	0	0	0	0.9	17.8	1.3	20.0	20.0	112.2	0.0	72.4	2.2	1.5	0.1	188.3	168.4	
15	2023	0	0	0	0	0.9	19.4	1.3	21.6	21.6	124.3	0.0	72.4	2.2	1.5	0.1	200.4	178.8	
16	2024	0	0	0	0	0.9	20.5	1.3	22.6	22.6	131.4	0.0	72.4	2.2	1.5	0	207.4	184.8	
17	2025	0	0	0	0	0.9	21.4	1.3	23.6	23.6	137.2	0.0	72.4	2.2	1.5	0	213.2	189.6	
18	2026	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	11.9	72.4	2.2	1.5	0	225.7	202.0	
19	2027	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	11.9	72.4	2.2	1.5	0	225.7	202.0	
20	2028	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	11.9	72.4	2.2	1.5	0	225.7	202.0	
21	2029	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	0.0	72.4	2.2	1.5	0	213.8	190.1	
22	2030	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	0.0	72.4	2.2	1.5	0	213.8	190.1	
23	2031	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	0.0	72.4	2.2	1.5	0	213.8	190.1	
24	2032	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	0.0	72.4	2.2	1.5	0	213.8	190.1	
25	2033	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	0.0	72.4	2.2	1.5	0	213.8	190.1	
26	2034	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	0.0	72.4	2.2	1.5	0	213.8	190.1	
27	2035	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	0.0	72.4	2.2	1.5	0	213.8	190.1	
28	2036	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	0.0	72.4	2.2	1.5	0	213.8	190.1	
29	2037	0	0	0	0	0.9	21.6	1.3	23.7	23.7	137.8	0.0	72.4	2.2	1.5	0	213.8	190.1	
30	2038	-470.8	-135.1	-28.7	-634.5	0.9	21.6	1.3	23.7	-610.8	137.8	-21.0	72.4	2.2	1.5	0	192.9	803.7	

	Dam	Water Supply			Power	
Investment	684.7	156.9	76.3	76.3	172.0	1,166.2
Amortization	80	40	40	40	30	
Residue	470.8	58.8	34.3	41.9	28.7	

Power				
83.0	11.9	11.9	11.9	118.6
30.0	15.0	15.0	15.0	
13.8	1.6	2.4	3.2	

Appendix-1.2 Water Supply Project for Southern Area of Bali

The project is composed of 1) Western System, 2) Central System, and 3) Eastern System.

EIRR	12.3%
B/C	1.03
NPV	18.2

(Rp.billion)

Year		Project Cost			Benefit	Net Benefit
		Investment	O&M	Total		
1	2008	16.4	0	16.4	0	-16.4
2	2009	79.9	0	79.9	0	-79.9
3	2010	107.3	4.2	111.4	16.1	-95.3
4	2011	131.3	4.8	136.0	18.6	-117.4
5	2012	198.2	4.8	202.9	18.8	-184.2
6	2013	167.9	8.0	175.9	37.5	-138.4
7	2014	0	14.8	14.8	66.7	52.0
8	2015	0	17.0	17.0	82.8	65.8
9	2016	0	18.3	18.3	92.5	74.2
10	2017	76.3	18.3	94.5	93.1	-1.4
11	2018	117.4	23.2	140.6	122.0	-18.7
12	2019	0	25.1	25.1	137.2	112.1
13	2020	0	27.8	27.8	151.7	123.9
14	2021	76.3	29.6	105.8	161.7	55.9
15	2022	0	33.7	33.7	182.3	148.6
16	2023	41.3	35.3	76.6	196.4	119.8
17	2024	0	37.4	37.4	211.1	173.7
18	2025	0	39.9	39.9	225.5	185.5
19	2026	0	42.3	42.3	237.3	195.0
20	2027	24.9	42.3	67.2	237.3	170.0
21	2028	0	42.3	42.3	237.3	195.0
22	2029	0	42.3	42.3	237.3	195.0
23	2030	0	42.3	42.3	237.3	195.0
24	2031	0	42.3	42.3	237.3	195.0
25	2032	0	42.3	42.3	237.3	195.0
26	2033	0	42.3	42.3	237.3	195.0
27	2034	0	42.3	42.3	237.3	195.0
28	2035	0	42.3	42.3	237.3	195.0
29	2036	0	42.3	42.3	237.3	195.0
30	2037	-20.7	42.3	21.6	237.3	215.7
31	2038	-346.9	37.5	-309.4	220.4	529.8
32	2039	-119.6	15.4	-104.2	82.5	186.7

Appendix-1.3 Each System of Water Supply Project for Southern Area of Bali

(For references)

1) Western System

EIRR	17.6%
B/C	1.3
NPV	27.3

(Rp.billion)

Year		Project Cost			Benefit	Net Benefit
		Investment	O&M	Total		
1	2008	16.4	0	16.4	0	-16.4
2	2009	52.6	0	52.6	0	-52.6
3	2010	0	4.2	4.2	16.1	12.0
4	2011	0	4.8	4.8	18.6	13.9
5	2012	0	4.8	4.8	18.8	14.0
6	2013	0	4.8	4.8	18.9	14.1
7	2014	0	4.8	4.8	15.6	10.8
8	2015	0	4.8	4.8	18.3	13.5
9	2016	0	4.8	4.8	18.3	13.6
10	2017	0	4.8	4.8	18.4	13.6
11	2018	0	4.8	4.8	14.5	9.7
12	2019	0	4.8	4.8	17.7	12.9
13	2020	0	4.8	4.8	17.7	12.9
14	2021	0	4.8	4.8	17.7	13.0
15	2022	0	4.8	4.8	13.7	8.9
16	2023	0	4.8	4.8	15.4	10.6
17	2024	0	4.8	4.8	16.9	12.1
18	2025	0	4.8	4.8	16.9	12.1
19	2026	0	4.8	4.8	16.9	12.1
20	2027	0	4.8	4.8	16.9	12.1
21	2028	0	4.8	4.8	16.9	12.1
22	2029	0	4.8	4.8	16.9	12.1
23	2030	0	4.8	4.8	16.9	12.1
24	2031	0	4.8	4.8	16.9	12.1
25	2032	0	4.8	4.8	16.9	12.1
26	2033	0	4.8	4.8	16.9	12.1
27	2034	0	4.8	4.8	16.9	12.1
28	2035	0	4.8	4.8	16.9	12.1
29	2036	0	4.8	4.8	16.9	12.1
30	2037	-20.7	4.8	-15.9	16.9	32.8

Investment	69.0
Amortization	40
Residue	20.7

2) Central System

IRR	11.0%
B/C	0.9
NPV	-38.5

(Rp.billion)

Year	Project Cost							Benefit	Net Benefit	
	Investment			O&M			Total			
	Dam	Water Supply	Total	Dam	Water Supply	Total				
2008										
1	2009	27.3	0	27.3	0	0	0	27.3	0.0	-27.3
2	2010	72.9	0	72.9	0	0	0	72.9	0.0	-72.9
3	2011	72.9	24.0	97.0	0	0	0	97.0	0.0	-97.0
4	2012	75.9	24.0	99.9	0	0	0	99.9	0.0	-99.9
5	2013	59.0	108.9	167.9	0	0	0	167.9	0.0	-167.9
6	2014	0	0	0	0.6	4.7	5.2	5.2	24.6	19.4
7	2015	0	0	0	0.6	6.2	6.8	6.8	35.9	29.1
8	2016	0	0	0	0.6	7.2	7.7	7.7	44.1	36.4
9	2017	0	76.3	76.3	0.6	7.2	7.7	84.0	44.4	-39.6
10	2018	0	0	0	0.6	12.1	12.7	12.7	77.0	64.3
11	2019	0	0	0	0.6	13.2	13.7	13.7	83.2	69.5
12	2020	0	0	0	0.6	14.1	14.7	14.7	88.9	74.2
13	2021	0	76.3	76.3	0.6	14.4	14.9	91.2	90.6	-0.6
14	2022	0	0	0	0.6	17.8	18.4	18.4	112.2	93.9
15	2023	0	0	0	0.6	19.4	19.9	19.9	124.3	104.4
16	2024	0	0	0	0.6	20.5	21.0	21.0	131.4	110.4
17	2025	0	0	0	0.6	21.4	22.0	22.0	137.2	115.2
18	2026	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
19	2027	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
20	2028	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
21	2029	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
22	2030	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
23	2031	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
24	2032	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
25	2033	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
26	2034	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
27	2035	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
28	2036	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
29	2037	0	0	0	0.6	21.6	22.1	22.1	137.8	115.7
30	2038	-211.8	-135.1	-346.9	0.6	21.6	22.1	-324.8	137.8	462.6

	Dam	Water Supply			
Investment	308.1	156.9	76.3	76.3	617.5
Amortization	80	40	40	40	
Residue	211.8	58.8	34.3	41.9	

3) Eastern System

IRR	13.7%
B/C	1.13
NPV	31.8

(Rp.billion)

Year	Project Cost			Benefit	Net Benefit	
	Investment	O&M	Total			
2008						
2009						
1	2010	34.3	0.0	34.3	0.0	-34.3
2	2011	34.3	0.0	34.3	0.0	-34.3
3	2012	98.3	0.0	98.3	0.0	-98.3
4	2013	0.0	3.3	3.3	18.6	15.4
5	2014	0.0	4.8	4.8	26.5	21.7
6	2015	0.0	5.4	5.4	28.7	23.2
7	2016	0.0	5.8	5.8	30.0	24.3
8	2017	0.0	5.8	5.8	30.3	24.5
9	2018	117.4	5.8	123.2	30.6	-92.6
10	2019	0.0	6.6	6.6	36.4	29.7
11	2020	0.0	8.3	8.3	45.0	36.7
12	2021	0.0	9.9	9.9	53.4	43.5
13	2022	0.0	10.6	10.6	56.4	45.8
14	2023	41.3	10.6	51.9	56.7	4.8
15	2024	0.0	11.6	11.6	62.9	51.3
16	2025	0.0	13.1	13.1	71.4	58.2
17	2026	0.0	15.4	15.4	82.5	67.1
18	2027	24.9	15.4	40.3	82.5	42.2
19	2028	0.0	15.4	15.4	82.5	67.1
20	2029	0.0	15.4	15.4	82.5	67.1
21	2030	0.0	15.4	15.4	82.5	67.1
22	2031	0.0	15.4	15.4	82.5	67.1
23	2032	0.0	15.4	15.4	82.5	67.1
24	2033	0.0	15.4	15.4	82.5	67.1
25	2034	0.0	15.4	15.4	82.5	67.1
26	2035	0.0	15.4	15.4	82.5	67.1
27	2036	0.0	15.4	15.4	82.5	67.1
28	2037	0.0	15.4	15.4	82.5	67.1
29	2038	0.0	15.4	15.4	82.5	67.1
30	2039	-119.6	15.4	-104.2	82.5	186.7

Investment	142.0	117.4	41.3	24.9	325.6
Amortization	40	40.0	40	15.0	
Residue	42.6	49.9	23.7	3.3	

Appendix-2
Economic Evaluation
of Feasibility Study

Appendix-2.1 Multipurpose Ayung Dam Project

1) Municipal Water Supply to Central System, 2) Hydroelectric Power Generation, and 3) Irrigation Water Supply

IRR	14.2%
B/C	1.17
NPV	184.2

Year	Project Cost										Benefit						Net Benefit			
	Investment					O&M					Total	Water Supply	Power			Irrigation				
	Dam	Water Supply	Power	Irrigation	Total	Dam	Water Supply	Power	Total	Plant			O&M	CDM	Constant	Additional		Total		
1	2009	58.3	0	0	0	58.3	0	0	0	0	58.3	0	0	0	0	0	0	0	0	-58.3
2	2010	264.1	0	0	0	264.1	0	0	0	0	264.1	0	0	0	0	0	0	0	0	-264.1
3	2011	119.8	0	10.4	0	130.1	0	0	0	0	130.1	0	38.9	0	0	0	0	0	38.9	-91.2
4	2012	215.6	0	62.9	15.3	293.7	0	0	0	0	293.7	0	38.9	0	0	0	0	0	38.9	-254.8
5	2013	216.2	162.5	62.9	15.3	456.9	0	0	0	0	456.9	0	38.9	0	0	0	0	0	38.9	-418.0
6	2014	0	0	0	0	0	1.1	5.8	2.8	9.6	9.6	26.3	0	139.1	3.2	1.2	2.5	172.4	162.7	
7	2015	0	0	0	0	0	1.1	7.7	2.8	11.6	11.6	38.0	0	139.1	3.2	1.2	2.5	184.0	172.5	
8	2016	0	0	0	0	0	1.1	8.9	2.8	12.8	12.8	46.3	0	139.1	3.2	1.2	2.5	192.3	179.5	
9	2017	0	0	0	0	0	1.1	8.9	2.8	12.8	12.8	46.8	0	139.1	3.2	1.2	2.5	192.8	180.1	
10	2018	0	162.5	0	0	163	1.1	15.0	2.8	18.9	181.4	81.5	0	139.1	3.2	1.2	2.5	227.6	46.2	
11	2019	0	0	0	0	0	1.1	16.3	2.8	20.2	20.2	87.6	0	139.1	3.2	1.2	2.5	233.6	213.5	
12	2020	0	0	0	0	0	1.1	17.5	2.8	21.4	21.4	93.7	0	139.1	3.2	1.2	2.5	239.7	218.3	
13	2021	0	0	0	0	0	1.1	17.8	2.8	21.7	21.7	95.4	0	139.1	3.2	1.2	2.5	241.4	219.7	
14	2022	0	162.5	0	0	163	1.1	22.9	2.8	26.8	189.3	112.8	0	139.1	3.2	1.2	2.5	258.8	69.5	
15	2023	0	0	0	0	0	1.1	24.1	2.8	28.0	28.0	132.0	0	139.1	3.2	1.2	1.6	277.1	249.1	
16	2024	0	0	0	0	0	1.1	25.3	2.8	29.2	29.2	138.1	0	139.1	3.2	1.2	0.8	282.5	253.3	
17	2025	0	0	0	0	0	1.1	26.5	2.8	30.4	30.4	144.3	0	139.1	3.2	1.2	0.1	287.9	257.5	
18	2026	0	0	0	0	0	1.1	26.7	2.8	30.5	30.5	145.0	11.7	139.1	3.2	1.2	0	300.2	269.6	
19	2027	0	0	0	0	0	1.1	26.7	2.8	30.5	30.5	145.0	11.7	139.1	3.2	1.2	0	300.2	269.6	
20	2028	0	10.7	0.0	0	10.7	1.1	26.7	2.8	30.5	41.3	145.0	11.7	139.1	3.2	1.2	0	300.2	258.9	
21	2029	0	0	0	0	0	1.1	26.7	2.8	30.5	30.5	145.0	0	139.1	3.2	1.2	0	288.5	257.9	
22	2030	0	0	0	0	0	1.1	26.7	2.8	30.5	30.5	145.0	0	139.1	3.2	1.2	0	288.5	257.9	
23	2031	0	0	0	0	0	1.1	26.7	2.8	30.5	30.5	145.0	0	139.1	3.2	1.2	0	288.5	257.9	
24	2032	0	0	0	0	0	1.1	26.7	2.8	30.5	30.5	145.0	0	139.1	3.2	1.2	0	288.5	257.9	
25	2033	0	10.7	0	0	10.7	1.1	26.7	2.8	30.5	41.3	145.0	0	139.1	3.2	1.2	0	288.5	247.2	
26	2034	0	0	0	0	0	1.1	26.7	2.8	30.5	30.5	145.0	0	139.1	3.2	1.2	0	288.5	257.9	
27	2035	0	0	0	0	0	1.1	26.7	2.8	30.5	30.5	145.0	0	139.1	3.2	1.2	0	288.5	257.9	
28	2036	0	0	0	0	0	1.1	26.7	2.8	30.5	30.5	145.0	0	139.1	3.2	1.2	0	288.5	257.9	
29	2037	0	10.7	0	0	10.7	1.1	26.7	2.8	30.5	41.3	145.0	0	139.1	3.2	1.2	0	288.5	247.2	
30	2038	-608.6	-250.6	-22.68	0	-881.92	1.1	26.7	2.8	30.5	-851.4	145.0	-20.6	139.1	3.2	1.2	0	267.9	1,119.2	

	Dam	Water Supply	Power
Investment	874.0	Refer to Central System	136.1
Land	24.9		
Net	849.1		
Amortization	80		30
Residue	583.8		-250.6

Power			
81.7	11.7	11.7	11.7
116.8			
30.0	15.0	15.0	15.0
13.6	1.6	2.3	3.1

Appendix-2.2 Water Supply for Southern Area of Bali

The project is composed of 1) Western System, 2) Central System, and 3) Eastern System.

EIRR	12.5%
B/C	1.04
NPV	30.6

(Rp.billion)

Year		Project Cost			Benefit	Net Benefit
		Investment	O&M	Total		
1	2009	48.8	0	48.8	0	-48.8
2	2010	193.8	2.5	196.3	9.9	-186.4
3	2011	71.5	4.9	76.4	19.9	-56.5
4	2012	153.6	6.6	160.1	31.8	-128.3
5	2013	223.0	7.7	230.7	39.4	-191.3
6	2014	0	14.3	14.3	70.6	56.3
7	2015	0	17.5	17.5	87.7	70.2
8	2016	0	19.0	19.0	97.5	78.5
9	2017	0	19.0	19.0	98.4	79.4
10	2018	254.6	24.2	278.8	129.3	-149.5
11	2019	0	27.3	27.3	151.8	124.5
12	2020	0	29.8	29.8	160.1	130.3
13	2021	0	31.4	31.4	170.6	139.2
14	2022	162.5	36.2	198.7	187.1	-11.7
15	2023	92.1	37.9	130.0	208.5	78.5
16	2024	0	40.4	40.4	228.4	188.0
17	2025	16.1	43.0	59.1	237.8	178.7
18	2026	0	44.8	44.8	249.0	204.1
19	2027	16.1	45.0	61.1	250.2	189.1
20	2028	10.7	45.0	55.7	250.2	194.5
21	2029	0	45.0	45.0	250.2	205.2
22	2030	0	45.0	45.0	250.2	205.2
23	2031	0	45.0	45.0	250.2	205.2
24	2032	0	45.0	45.0	250.2	205.2
25	2033	24.2	45.0	69.2	250.2	181.0
26	2034	0	45.0	45.0	250.2	205.2
27	2035	0	45.0	45.0	250.2	205.2
28	2036	0	45.0	45.0	250.2	205.2
29	2037	10.7	45.0	55.7	250.2	194.5
30	2038	-612.7	45.0	-567.7	250.2	817.9

Appendix-2.3 Each System of Water Supply Project for Southern Area of Bali

(For references)

1) Western Water Supply System

EIRR	13.2%
B/C	1.06
NPV	8.0

(Rp.billion)

Year		Project Cost			Benefit	Net Benefit
		Investment	O&M	Total		
1	2009	21.6	0	21.6	0	-21.6
2	2010	87.1	2.5	89.6	9.9	-79.7
3	2011	0	4.9	4.9	19.9	15.0
4	2012	0	4.9	4.9	20.1	15.2
5	2013	0	4.9	4.9	20.2	15.3
6	2014	0	4.1	4.1	16.8	12.7
7	2015	0	4.9	4.9	19.9	15.0
8	2016	0	4.9	4.9	19.9	15.0
9	2017	0	4.9	4.9	20.0	15.1
10	2018	0	4.0	4.0	15.9	12.0
11	2019	0	4.9	4.9	19.6	14.6
12	2020	0	4.9	4.9	19.6	14.7
13	2021	0	4.9	4.9	19.6	14.7
14	2022	0	4.0	4.0	15.5	11.5
15	2023	0	4.5	4.5	17.4	12.9
16	2024	0	4.9	4.9	19.1	14.2
17	2025	16.1	4.9	21.0	19.1	-1.9
18	2026	0	4.9	4.9	19.1	14.2
19	2027	0	4.9	4.9	19.1	14.2
20	2028	0	4.9	4.9	19.1	14.2
21	2029	0	4.9	4.9	19.1	14.2
22	2030	0	4.9	4.9	19.1	14.2
23	2031	0	4.9	4.9	19.1	14.2
24	2032	0	4.9	4.9	19.1	14.2
25	2033	0	4.9	4.9	19.1	14.2
26	2034	0	4.9	4.9	19.1	14.2
27	2035	0	4.9	4.9	19.1	14.2
28	2036	0	4.9	4.9	19.1	14.2
29	2037	0	4.9	4.9	19.1	14.2
30	2038	-31.2	4.9	-26.3	19.1	45.4
Investment		108.8	16.1			
Land		1.7		1.7		
Motor		16.1				
Net		90.9	16.1			
Amortization		40	15.0			
Residue		27.3	2.1	29.4		

2) Central Water Supply System

IRR	11.4%
B/C	0.95
NPV	-22.2

(Rp.billion)

Year	Project Cost							Benefit	Net Benefit	
	Investment			O&M			Total			
	Dam	Water Supply	Total	Dam	Water Supply	Total				
1	2009	15.4		15.4	0	0	0	15.4	0	-15.4
2	2010	73.8		73.8	0	0	0	73.8	0	-73.8
3	2011	33.5		33.5	0	0	0	33.5	0	-33.5
4	2012	60.3		60.3	0	0	0	60.3	0	-60.3
5	2013	60.4	162.5	223.0	0	0	0	223.0	0	-223.0
6	2014	0	0	0	0.3	5.8	6.1	6.1	26.3	20.3
7	2015	0	0	0	0.3	7.7	8.0	8.0	38.0	30.0
8	2016	0	0	0	0.3	8.9	9.2	9.2	46.3	37.1
9	2017	0	0	0	0.3	8.9	9.2	9.2	46.8	37.6
10	2018	0	162.5	162.5	0.3	15.0	15.3	177.8	81.5	-96.3
11	2019	0	0	0	0.3	16.3	16.6	16.6	87.6	71.0
12	2020	0	0	0	0.3	17.5	17.8	17.8	93.7	75.9
13	2021	0	0	0	0.3	17.8	18.1	18.1	95.4	77.3
14	2022	0	162.5	162.5	0.3	22.9	23.2	185.7	112.8	-73.0
15	2023	0	0	0	0.3	24.1	24.4	24.4	132.0	107.6
16	2024	0	0	0	0.3	25.3	25.6	25.6	138.1	112.5
17	2025	0	0	0	0.3	26.5	26.8	26.8	144.3	117.5
18	2026	0	0	0	0.3	26.7	27.0	27.0	145.0	118.0
19	2027	0	0	0	0.3	26.7	27.0	27.0	145.0	118.0
20	2028	0	10.7	10.7	0.3	26.7	27.0	37.7	145.0	107.2
21	2029	0	0	0	0.3	26.7	27.0	27.0	145.0	118.0
22	2030	0	0	0	0.3	26.7	27.0	27.0	145.0	118.0
23	2031	0	0	0	0.3	26.7	27.0	27.0	145.0	118.0
24	2032	0	0	0	0.3	26.7	27.0	27.0	145.0	118.0
25	2033	0	10.7	11	0.3	26.7	27.0	37.7	145.0	107.2
26	2034	0	0	0	0.3	26.7	27.0	27.0	145.0	118.0
27	2035	0	0	0	0.3	26.7	27.0	27.0	145.0	118.0
28	2036	0	0	0	0.3	26.7	27.0	27.0	145.0	118.0
29	2037	0	10.7	11	0.3	26.7	27.0	37.7	145.0	107.2
30	2038	-169.2	-250.6	-419.9	0.3	26.7	27.0	-392.9	145.0	537.8

	Dam	Water Supply						
Investment	243.4	162.5	162.5	162.5	10.7	10.7	10.7	
Land	6.0	2.5	2.5	2.5				7.6
Motor		10.7	10.7	10.7				
Net	237.4	149.2	151.8	151.8	10.7	10.7	10.7	
Amortization	80	40	40	40	15	15	15	
Residue	163.2	56.0	75.9	91.1	3.6	7.2	9	243.0

3) Eastern Water Supply System

IRR	14.7%
B/C	1.20
NPV	44.8

(Rp.billion)

Year		Project Cost			Benefit	Net Benefit
		Investment	O&M	Total		
1	2009	11.8	0	11.8	0	-11.8
2	2010	32.8	0	32.8	0	-32.8
3	2011	38.0	0	38.0	0	-38.0
4	2012	93.3	1.6	94.9	11.7	-83.2
5	2013	0	2.8	2.8	19.2	16.4
6	2014	0	4.1	4.1	27.4	23.3
7	2015	0	4.6	4.6	29.8	25.2
8	2016	0	4.9	4.9	31.3	26.4
9	2017	0	4.9	4.9	31.6	26.7
10	2018	92.1	4.9	97.0	31.8	-65.2
11	2019	0	5.8	5.8	44.6	38.9
12	2020	0	7.1	7.1	46.9	39.8
13	2021	0	8.4	8.4	55.6	47.2
14	2022	0	9.0	9.0	58.8	49.8
15	2023	92.1	9.0	101.1	59.1	-42.0
16	2024	0	9.9	9.9	71.2	61.3
17	2025	0	11.2	11.2	74.4	63.2
18	2026	0	12.9	12.9	84.9	71.9
19	2027	16.1	13.1	29.2	86.1	56.9
20	2028	0	13.1	13.1	86.1	73.0
21	2029	0	13.1	13.1	86.1	73.0
22	2030	0	13.1	13.1	86.1	73.0
23	2031	0	13.1	13.1	86.1	73.0
24	2032	0	13.1	13.1	86.1	73.0
25	2033	13.4	13.1	26.5	86.1	59.6
26	2034	0	13.1	13.1	86.1	73.0
27	2035	0	13.1	13.1	86.1	73.0
28	2036	0	13.1	13.1	86.1	73.0
29	2037	0	13.1	13.1	86.1	73.0
30	2038	-161.7	13.1	-148.6	86.1	234.7

Investment	175.9	16.1	92.1	13.4	92.1
Land	2.9		2.4		2.4
Motor	16.1		13.4		13.4
Net	156.9	16.1	76.3	13.4	76.3
Amortization	40	15.0	40	15	40
Residue	54.9	4.3	38.1	9.0	47.7

JAPAN INTERNATIONAL COOPERATION AGENCY

**DIRECTORATE GENERAL OF WATER RESOURCES,
MINISTRY OF PUBLIC WORKS
PUBLIC WORKS SERVICE, BALI PROVINCE**

**THE COMPREHENSIVE STUDY
ON
WATER RESOURCES DEVELOPMENT
AND MANAGEMENT IN BALI PROVINCE
IN
THE REPUBLIC OF INDONESIA**

**FINAL REPORT
SUPPORTING REPORT**

[N] SOCIAL EVALUATION

AUGUST 2006

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NIPPON KOEI CO., LTD.**

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N-1 INTRODUCTION

Social surveys were conducted one time for each Master Plan and Feasibility Study stage for the purpose of grasping people's opinions to the proposed priority projects and to reflect them to the plan and design. The social surveys were organized with linking stakeholders' meetings, i.e., result of stakeholders' meetings which staged at early stage were reflected the TOR of the social survey and results of the survey were confirmed in posterior stakeholders' meetings. In this part, result of social surveys and social evaluations which generated by both social surveys and stakeholders' meetings are described, while the result of stakeholders' meetings are described in the Supporting Report Part-P.

N-2 FIRST SOCIAL SURVEY

N-2.1 Outline of Survey

The study was conducted in four selected target areas/ study sites, which are:

- Denpasar and surrounding tourism centers especially along Badung and Mati Rivers for flood control project
- Ayung River basin for Buangga Reservoir development project to increase raw water supply for Denpasar and surrounding tourism center
- Unda River basin for Gunaksa Estuary Reservoir development project to increase water supply for Regencies of: Denpasar, Badung, Gianyar, and Tabanan, Klungkung, and Karangasem
- Telagawaja River for reservoir development project to increase water supply for Karangasem Regency.

The information /data collected in the study comprising of primary as well as secondary data. The primary data included the following items: *identity of respondents; socio-economic aspects; health and sanitation condition; socio-cultural aspects; and opinion / attitude toward the expected project* .The secondary data collected from relevant regencies (*kabupaten*) where the project is to be located and directly affected by the project included the following items: *demographic aspects; land use; and Gross Regional Domestic Product by sector or category of industries*.

The primary data /information were collected by interview survey through questionnaire and interview guides when appropriate, prepared in advance and by employing Rural Rapid Appraisal technique. The respondents for individual interview were 100 persons per target area, so that for the four selected target areas mentioned above the total respondents amounted to 400 persons.

N-2.2 Study Results

N-2.2.1 Denpasar and Surrounding Areas (along Badung and Mati River Courses) for Flood Control Project

(1) Characteristics of the Samples

Only selected characteristics will be discussed here. The average age of all samples is about 49 years old. With regard to their education attainment some of them are still illiterate (5% of total sample), but 24% are university graduates who belong to non farmers only. Not all of them are Hindu, but 13% of them are non Hindu like Muslim, Buddhist, and Christian. But quite surprisingly, 5% of total sample are Muslim. However, considering the fact that in Denpasar and surrounding areas, the chance that the urban farmers come from outside Bali is great. This is reflected by the fact that 6 out of 50 sample farmers are outsiders. For the sample as a whole 41% are outsiders but it is not clear their places of origin.

There are 2% jobless/unemployed, 15% are civil servants, whereas the rest are engaged in private enterprise either trading/self-employed or as employees. A great majority (72%) of total respondents have no side job. There are some farmers (3 out of 50 sample farmers) are actually part time farmers.

Nearly 95% of the family members of the total sample are working and only 5% are seeking for job. As

an average, about 2.8 persons of the household members of the sample contributing to the household income. The average number of family member for the whole sample is 4.5; almost 15% of the total family members are under 15 years old, only 2.2% are more than 64 years, while the rest are between 15-64 years old.

(2) Socio-economic Aspects

a) Ownership of House, Furniture, and Sources of Energy Use

The greatest majority of the sample has their own house, only 8 % of them live in houses on a contract basis. In general, their living quarters are equipped with one kind or another of electric appliances like TV set, radio, video cassette, and /or electric fan. In addition, they also have one kind or another of the furniture like refrigerator, washing machine and / or gas stove. In general, each household has two bikes. A few of the total sample have even car.

A larger proportion of the total sample use gas as the source of energy for cooking (59%), 24% use kerosene, but 24% still use firewood. But there is one farmer out of 50 and 2 out of 50 non farm families also use electricity for cooking. Roughly, the socio-economic condition of the respondents in this study site is more or less similar with that in Denpasar and surrounding areas.

b) Household Income and Expenditures

The average of total family income for the whole sample reached about RP 2,069,000 per month. Considering that the average number of family member is about 4.5 persons, the per capita household income of the total sample become around RP 459.800 per month. The average total household consumption expenditure per month for the sample as a whole was around RP 1,437,630. This implies that only about 69.5% of the income was spent for consumption expenditures. Of the total consumption expenditures, 44.8% was allocated for food and drink; 11.6% for transportation; 12.0 % for education; 5.0 % for medical care; 10.8 % for ritual; 7.8 % for electricity; 6.0 % for telephone; only 0.9% for clean /PDAM water, and the rest 1.1 % for others not specified. On per capita basis, the figure for average total consumption was around RP 319,473 per month.

c) Access to Public Facilities

Denpasar and surrounding areas, has sufficient access to public utilities such like bank, cooperative, market, shops of various kinds, hospital, polyclinic, public transportation, and many others. Many respondents (51 % of total sample) borrow money from the bank when needed rather than from cooperative. This is because they prefer to deposit their money to the bank. Beside, the bank may provide more amount of borrowing/credit they needed compared with the cooperative. Main difficulty in obtaining the credit either from bank or cooperative is the collateral in form of fixed asset like house or land.

As for purchasing daily basic needs, many respondents (76%) use the nearby retail shops and local public market. For the sample farmers, 33% of them sold their products directly on farm, and about 42% to the nearby local market and retail shops.

Public transportation facility is easily accessed by the respondents. It takes only about 10 minutes to reach the asphalt road on foot. They can use their own bikes or even cars for those who possess them, or take the available public transportation.

(3) Health and Sanitation

The housing condition can be described as follows: the greatest majority of the total sample (95%) use brick as material for the wall of their houses, but still about 5 % use woven bamboo; and 79% use ceramic, but still 4 % use just earth for the floor; 77% use tile for the roof. With regard to water sources used for bathing and washing, only 39% of the sample as a whole use PDAM water, but the majority (63%) use well, whereas for cooking, they use PDAM water (38%) and well (60%) and the rests use spring. Most of the respondents (96%) have house toilets, but 1% still use river as a toilet and 3 % use their backyards.

Most of the respondents (88%) do not have sewage disposal facility in their living quarters. The majority (85%) in fact uses the existing drainage for sewerage disposal, and 3 % use their backyards /house yards.

As for garbage disposal, 48% of the total sample just burns it; 49% put it at certain places to be collected by some body especially in charge for collecting the garbage.

Most common diseases suffered by the respondent are influenza (63% of the sample); coughing (18%); fever (16 %); rheumatic (8%); and others (12%). Of the 9 cases of death reported since the last 3-5 years, most of them were above 20 years old and none who were below 5 years old. The death is due to old age (3), cancer (3), heart attack (2), coughing /tuberculoses (1).

(4) Socio-cultural Aspects

a) Religious Ritual

Bali is known as an island of a thousand temples, rich with tradition and culture. Religious ritual seems to dominate the daily activities of the Hindu Balinese. It is a reflection of implementation of the so called *Tri Hita Karana (THK)* principle that governs the daily life of Hindu Balinese. THK means “three causes of happiness and tranquility” consisting of three elements: *parhyangan* (supernatural realm / belief in God), *pawongan* (social realm), and *palemahan* (environmental realm). In order to achieve happiness and tranquility man should constantly devote himself to God the Almighty through praying and offering, preserve harmonious relationship with other human being and with his natural environment as well. Through religious rituals, harmonious relation between man and God, between man and his fellow beings, and between man and nature may be realized.

There are various kinds of religious rituals commonly performed in Bali. Beside routine temple anniversary, public as well as clan or family temple, there are also certain kinds of ritual which are usually performed every 210 days according to lunar calendar. Particularly *Tumpek Kandang* (“Fauna Day”) and *Tumpek Uduh* (“Flora Day”) each of which comes every 210 days on a specified day and month, and also *Nyepi* (New Year which comes every year around February/March but not every 210 days) clearly symbolize a spiritual endeavor of the Hindu Balinese to preserve the ecosystem or the balance of nature.

In this study only the information on rituals related to the *rite of passage* was gathered since this kind of rituals vary from household to household. In Denpasar and surrounding areas during the last one year, the greatest number of event is the *otonan* (birth day ceremony) which is about 430 events for the whole sample as a whole. This implies that the intensity of performing birth day ceremony through making special offering and praying for one’s health and long live to God seemed to be quite high. Since the number of family members for the whole sample totals 452 persons, it means that the household has made offering to God for the birth day ceremony of almost every one of the family member.

b) Existence of Sekehe / Local Professional Organization

The existence of *sekehe* (local association of particular profession) found in the study site are among others *Sekehe TrunaTruni* (Youth Association) generally found at each hamlet/village around Bali, *Sekehe Gong* (Music Association), *subak* (irrigation association), *Sekehe Pesantian* (Religious/Traditional Singer Association), *Sekehe Arisan* (Rotating Credit Association), etc. Most of them are stagnant but some are increasing their activities. Especially the music associations show an increase in its activities due to high motivation and awareness of its members probably because of progress of tourism.

c) Gotong Royong Activity (Group Action)

Group action generally related to ritual activity at hamlet level especially in preparing all necessary requirements for the ritual, activity for cleaning the local environment for the anniversary of national Independence Day of 17 August every year. About 23% of the respondents said that *gotong royong* activity almost stagnant (the same as before), only 23% considered it as increasing and 12 % declining.

d) Security and Orderliness

Security and orderliness in the community seem to be well maintained. This is because in the study site, there are found several police offices. Further more, each hamlet usually has a local security post responsible for safeguarding the hamlet and reporting to the police office if there is any threat to the community such like robbery, a fight or physical conflict, etc. Also recently, there is a revitalization of

the traditional safety guard called *pecalang*, functioning as police for the concerned traditional village. Since the last 5 years, the type of criminal found usually near urban areas (down stream areas) are among others theft, fighting, robbery, murder, adultery, etc, but all only very rarely happened but no recorded data available.

e) Migration

Immigration to the study areas almost non existence since the last five years, But, in the year 2003/2004 out-migration to East Java amounted to only 5 persons.

(5) Opinion /Attitude of Respondent towards the Project Plan

Higher proportion of the total respondents (98%) did not know yet about the plan of flood control project in Mati and Badung rivers, but the greatest majority (94%) said that they could understand the possible benefit of the project. Several possible benefit mentioned by the respondents are among others to minimize flooding (56%), and to increase irrigated area (30%).

A greater percentage (73%) of the total sample agreed with the project plan. Important reasons for the objection toward the project are possible land acquisition coupled with unfair compensation (50% of total options), pollution during construction (got nearly 43%), and no job after project got only 7 % of the options given by those who disagreed (a respondent who disagreed could give more than one options or reasons for disagreement). If all of the factors that make them disagreed about the project plan could be overcome, the percentage of respondents who agreed become to almost 99%. Only 13 respondents gave their opinions concerning the form of compensation. About 69% of them expected cash money and 31 % preferred exchange with other land.

As regard to the project site in relation to river excavation for flood control project, they proposed several locations but quite general and not well specified, probably because it is rather difficult for interviewer in formulating the question and as a result the answer given by the respondents might be also not quite well specified.

The intensity of transportation to move the material for the project construction as well as the removal of excavation materials might increase significantly. Traffic jam and noises might become big problem. But since it is only temporary, 51% of the sample would be able to tolerate such condition.

N-2.2.2 Ayung River Basin for Buangga Reservoir Project

(1) Characteristics of the Samples

The age of all respondents averages 40 years old. As for education background, relatively high percentage (27 %) are still illiterate; but 9% are university graduate especially non farmer respondents, and a greater majority have primary and secondary education. They are mostly Hindu, only 4 % are non Hindu.

About 15% have main job as business employees / trading /private enterprises, 55% work as drivers; farmers (19%); and others (11%). Among the sample farmers, 4% of them seem to have a status as part time farmers. Total unemployed account to 6% of the respondents. About 10% (5 out of 50) of the sample farmers also work in others' farm as wage earner, and many of the non farm respondents also work as part time farmers (14 out of 50). There are about 11% of the total respondents are outsiders but it is not clear their places of origin (all of them are non farmers).

Numbers of household members under working-age group for the sample as a whole total to 216 persons, nearly 88% of them are employed, but almost 12% are seeking for job. As an average, about 2 persons in each household are contributing to the household income. Of the 446 persons of the total family members for the whole sample, almost 18% are under 15 years old and about 8 % are more than 64 years old. The average number of household members is about 4.5 per each household.

(2) Socio-economic Aspects

a) Ownership of House, Furniture, and Sources of Energy Use

The greatest majority of the sample has their own houses, and only 7 % of them live in houses either on a contract basis or live with the family. In general, their living quarters are equipped with one kind or another of electric appliances like TV set, radio, video cassette, and /or electric fan. In addition, they also have refrigerator, washing machine and / or gas stove.

A greater majority of the total sample use fire wood as the source of energy for cooking (64 %). The figure for those who are using gas is 41%, kerosene 28%, and electricity only 2%.

b) Household Income and Expenditure

In Ayung River study area, the average family income for the whole sample was about RP 1,294,000 per month. The average size of family member is 4.5 persons for the whole sample. The per capita household income therefore become around RP 287,555.

The average total household consumption expenditure per month was around RP 1,087,460 which means that almost 84 % of the total average household income was spent for consumption. About 38.6 % of this amount was allocated for food and drink; 12.2 % for transportation; 13.2 % for education; 7.4 % for medical care; 19.6 % ritual; 3.6 % for electricity; 3.7 % for telephone; 1.2 % for clean water, and the rest 0.5% for others not specified. On a per capita basis, the average total consumption was around RP 241,658 per month. Ritual is the second large percentage of expenditure after food and drink.

c) Access to Public Facilities

Access to public utilities in Ayung River study site, is not so far different with that in other sites as already described for Denpasar and surrounding areas. There are sufficient public utilities which can meet the needs of local residents for public services such like bank, cooperative, market, shops of various kinds, hospital, polyclinic, public transportation, and many others. There are about 61% respondents have experienced in using the service of financial institutions such as bank and cooperative.

More than 85% of total respondents use the nearby retail shops and 11.5% use local public market for purchasing their daily basic needs. For the sample farmers, 64 % of them usually sell their products directly on farm, and about 42 % to the nearby local market and retail shops, but there are 16 % of them are subsistence farmers. It is necessary to note that a farmer may sell their farm products to more than one place. Public transportation facility is easily accessed by the respondents. It takes only about 10 minutes to reach the asphalt road on foot where they can take public transportation or use their own bikes.

(3) Health and Sanitation

The housing condition in Ayung River study site can be described as follows. Only about 2 % of the total sample still uses woven bamboo for the wall of their houses, and the rest 98% use brick. For the floor, 66 % use ceramic, and 34 % use cement. Almost all of them use tile for the roof. With regard to water sources used for bathing and washing, 66 % of the sample as a whole have access to PDAM water, while the rest 34 % either use well and, or spring /river. For the purpose of cooking, the greatest majority use PDAM (83%), and the rest 17 % still use spring/river water /well. Greater majority of the respondents (84 %) have house toilets, but 13% still use river as a toilet and 3 % use backyard.

Most of the respondents (92 %) do not have sewage disposal facility in their houses. The majority uses the existing drainage and their backyards, but about 8 % still use the nearby river for sewage disposal. As for garbage disposal, most of them have treated it in a rather proper manner such as by burning and put it at certain places but still about 6 % just throw it to the river / drainage canal.

Most common diseases suffered by the respondent are influenza (76% of the sample); fever (26 %); and coughing (16%). There are about 10 deaths reported since the last 3-5 years, most of them were above 20 years old and none who were below 5 years old. Five people died because of cancer (2), asthma (2), and diarrhea (1), while the reasons of the other 5 death were unknown.

(4) Socio-cultural Aspects

Like in Denpasar study site, the highest number of event of religious rituals related to the rite of passage of the respondents in Ayung River study site during the period 2004-2005 (last one year since the study was conducted) is also the otonan (birth day ceremony) which is about 98 events followed by spiritual cleansing (mebayuh) amounting to 28 events for the whole sample as a whole.

a) Existence of Sekehe / Local Professional Organization

The existence of *sekehe* (local association of particular profession) found in the study site are among others *Sekehe TrunaTruni* (Youth Association) generally found at each hamlet/village around Bali, *Sekehe Gong* (Music Association), subak (irrigation association), *Sekehe Kecak* (Monkey Dancer Association), *Sekehe Manyi* (Rice Harvesting Association), *Sekehe Memula* (Rice Transplanting Association), *Sekehe Arisan* (Rotating Credit Association), etc. Most of them are stagnant but some are increasing their activities. The Rotating Credit Association and Youth Association are among the ones which tend to increase their activities due to high motivation and awareness of their members. Especially the Youth Associations shows an increase in its activities also because of the external support from village government.

b) Gotong Royong Activity (Group Action)

Gotong royong activities are almost similar with the ones found in other study sites which are mostly related to ritual activity at hamlet level especially in preparing all necessary requirements for the ritual, activity for cleaning the local environment for the anniversary of national Independence Day of 17 August every year. About 64 % of the respondents said that *gotong royong* activity was stagnant, only 26% considered it as increasing whereas 10 % declining.

c) Security and Orderliness

In this study area as in the case of study site of Denpasar and surrounding areas, the security and orderliness in the community seem to be also well maintained. This is because in the study site, there are found several police offices. Further more, each hamlet usually has a local security post responsible for safeguarding the hamlet and reporting to the police office if there is any threat to the community's security. Since the last 5 years, the type of criminal found usually near urban areas (down stream areas) are among others theft, fighting, adultery, murder, etc, but all only very rarely happened but no recorded data.

d) Migration

Migration (in and out migration) in the study areas almost non existence since the last five years,

(5) Opinion /Attitude of Respondent towards the Project Plan

Only 21% of the total respondents did not know yet about the plan of multipurpose project at Ayung River. However, the greatest majority (84%) said that they could understand the possible benefit of the project. According to their understanding, several potential benefits are among others to increase irrigated area (52% of total respondents); and improve water quality for washing and bathing (29%). A few of them mentioning the creation of tourist spot, new job opportunity, but a few of them also said no benefit will be obtained from the project. A greater percentage (76%) of the total sample agreed with the project plan, and only 23% disagreed. Important reasons for the disagreement toward the project are land acquisition with unfair compensation (got more than 79 % of the total options), pollution during construction (11%), and no job opportunity after project which got 9.5% of options given by respondents who disagreed (one who disagreed could give more than one options / reasons for disagreement).

No response or information obtained concerning the form of compensation. But according to a few respondents they preferred exchange with other land of similar kind within their own village. If land acquisition could be compensated in such a way so as to satisfy the owners, and all of the other factors that make them disagreed about the project plan could be overcome, the percentage of respondents who agreed might increased to almost 98%. The intensity of transportation to move the material for the project construction may become a problem to local residents, but 70 % of the sample would be able to tolerate it since it is only temporary in nature.

As regard to the project site in relation to river excavation for flood control project, they proposed several locations but quite general and not well specified or irrelevant probably because it is rather difficult for interviewer in formulating the question since the definite site of the project is not fixed yet and as a result the answer given by the respondents might be also not quite well specified. About 39% proposed Buangga Dam as the site of the project plan, and 21% said they did not know or have no idea at all.

N-2.2.3 Telagawaja River Basin for Raw Water Development Project

(1) Characteristics of the Samples

Some of the important characteristics of the samples /respondents in Telagawaja River basin can be described as follows. The age of all respondents averages 42.5 years old. As for education background, almost all of them can read and write (literate) with primary education about 54%, secondary education 30%, and university graduate (6 %). They are all Hindus.

Among the sample farmers, 4% (2 out of 50) seem to have a status as part time farmers. The unemployed were only 2 % for the sample as a whole. A greater percentage of total respondents (74%) have no side job. Within non farmer respondents, 4 out of 50 (8%) are working as part time farmers; whereas within farmer respondents 6 out of 50 (12%) are also working in others' farm as wage earners. There are about 4 % of the total respondents are outsiders but it is not clear their places of origin (all of them are non farmers).

The total number of household members under working-age group for the sample as a whole amounting to 236 persons, more than 96% of them is employed, but more than 3 % are seeking for job. As an average, about 2.4 persons in each household are contributing to the household income. Of the total 426 family members for the whole sample, nearly 22 % are under 15 years old and only 2.3 % are more than 64 years old. The average number of household members is about 4.3 persons per each household.

(2) Socio-economic Aspects

a) Ownership of House, Furniture, and Sources of Energy Use

High proportion of total sample (78%) have their own houses, only 19 % of them live in contracted houses, and 2 % living with their family. Their living quarters are also equipped with electric appliances of one kind or another such as TV set, radio, video cassette, and /or electric fan. They also have one kind or another of the following furniture: refrigerator, washing machine and/or gas stove. Some respondents have telephone facility in their houses. A few of the total sample have even automobile.

A greater majority of the total sample use kerosene as the source of energy for cooking (52 %). The figure for those who are using gas is 25%. None of the respondent use electricity for cooking, but there are still about 32 % of them use fire wood.

b) Household Income and Expenditures

The average of total family income for the whole sample in Telagawaja River study site was about RP 1,217,473 per month. The average number of family member is 4.3 persons for the sample as whole. Hence, the per capita household income of the total sample become around RP 283,133 per month.

The average total household consumption expenditure per month for the sample as a whole was around RP 993,129. This means that about 81.6 % of the family income was spent for consumption. The total household consumption expenditures comprising of about 44.3 % for food and drink; nearly 10 % for transportation; 13.7 % for education; 4.8 % for medical care; 11.9 % ritual; 6.3 % for electricity; 5.3 % for telephone; 2.1% for PDAM water; and the remaining 1.5 % for others not specified. On a per capita basis, the average total consumption was around RP 230,960 per month.

c) Access to Public Facilities

In Telagawaja River study site, access to public facilities is not so far different with that in other study sites as already described earlier. There are sufficient public utilities which can meet the needs of

local residents for public services. There are about 59 % respondents have experienced in using the service of financial institutions such as bank and cooperative. About 82% of total respondents use the local public/village market and 41% use nearby retail shops for purchasing their daily basic needs. For the sample farmers, nearly 64 % of them usually sell their products at village market and about 18 % directly on farm, while the rest sell their products at either sub district market or to the market at regency level. It is necessary to note that a respondent may purchase daily necessity /sell the farm product at more than one place.

It seems to be a common situation in Bali now days that public transportation facility is easily accessed by the people. It is a common situation in all of the study sites that it takes less than 10 minutes to reach the road on foot where they can take public transportation.

(3) Health and Sanitation

Only about 2 % of the total sample still uses woven bamboo for the wall of their houses, 1% earth, and the rest 98% use brick. Around 69 % use ceramic, 26 % use cement and there are 5% respondents still using earth for the floor. Almost all of them use tile for the roof. About 78 % of the sample as a whole have access to PDAM water, while the rest 22 % either use well and, or spring /river for bathing and washing. For cooking, the greater majority use PDAM (82%), and the rest 19 % still use spring/river water /well. Greater majority of the respondents (86 %) have house toilets, but 14% still use river as a toilet.

The respondents who do not have sewage disposal facility in their houses total around 69 %. Many use the existing drainage and their backyards for sewage disposal. Most of them have treated garbage rather properly by burning and put it at certain places but about 13 % just throw it to the river / drainage canal.

Most common diseases suffered by the respondent are influenza and fever representing about 82 % and 41 % respectively. There are about 20 deaths reported since the last 3-5 years, most of them (90 %) were above 20 years old and the rest 10% were below 5 years old caused by polio .Those died over 20 years old were due to old age (6), asthma (3), diarrhea (2), and for unknown reasons (4).

(4) Socio-cultural Aspects

a) Religious Ritual

In Telagawaja study site, here also the greatest number of event is the *otonan* (birth day ceremony) amounting to 262 events followed by spiritual cleansing (*mebayuh*) and a birth of a baby including when the baby reached 42 days, and 105 days of age.

b) Existence of Sekehe / Local Professional Organization

The existence of **sekehe** (local association of particular profession) found in the study site are almost similar with the other study sites as mentioned above. These are *Sekehe TrunaTruni* (Youth Association), *Sekehe Gong* (Music Association), subak (irrigation association), *Sekehe Arisan* (Rotating Credit Association), and Sport Association etc. Music Association and Rotating Credit Association were said to be increasing in their activities. However, Youth Association was said to be declining due to emerging places for recreation and enjoyment for the young people.

c) Gotong Royong Activity (Group Action)

Almost the same situation with other study sites in relation to *gotong royong* activity is mostly related to ritual activity at hamlet level especially in preparing all necessary requirements for the ritual, activity for cleaning the local environment for the anniversary of national Independence Day of 17 August every year. About 76% of the respondents said that *gotong royong* activity was stagnant, only 46 % considered it as increasing.

d) Security and Orderliness

In Telagawaja study site as in the case of other study sites, the security and orderliness in the community seem to be also generally speaking well maintained. Since the last 5 years, the type of criminal found usually near urban areas (down stream areas) are among others theft, fighting, adultery, murder, etc, but all only very seldom occurred.

e) Migration

There were only 3 persons who have migrated to other provinces in Indonesia within the period of 1995-200.

(5) Opinion /Attitude of Respondent towards the Project Plan

Almost all of the total respondents did not know yet about the plan of raw water development project at Telagawaja River. And higher proportion (58 %) said that they could understand the potential benefit of the project. They thought that several potential benefits are among others improving water quality for washing and bathing (80 %), and increasing irrigated area (43%). The greatest majority (80 %) of the total sample agreed with the project plan, and only 20 % disagreed. Reasons for the objection are land acquisition with unfair compensation (got more than 46 % of total options), pollution during construction (24 %), and no job opportunity after project which got 29 % options from those who disagreed (one respondent who disagreed could give more than one option or reasons for disagreement).

No response obtained concerning the form of compensation. But according to a couple of respondents they preferred cash money, and to some they preferred exchange with other land of similar kind. The intensity of transportation to move the material for the project construction although may become a nuisance to local residents, but 68% of the sample could tolerate it since it is only temporary. About 53 % of respondents did know for certain where the project site is to be located, and 43 % proposed it should be somewhere at Telagawaja but not quite specific.

N-2.2.4 Unda River Basin for Gunaksa Estuary Reservoir Project

(1) Characteristics of the Samples

The average age of all respondents is 40 years old. There are about 3% are still illiterate, but most of them have higher education background with primary education about 15 %, secondary education 54%, and university graduate (28 %). About 12 % are non Hindus. There are about 4 % of respondents have no job (unemployed), but most of them have main occupation as trader (45%), business employee (23 %) and 21 % are civil servants, farmers (3%), and others (4%).

The greatest majority (84%) have no side job. Only 16 % of them have side job like traders (13%) and farmers (3%). A large proportion of the sample (52 %) is outsiders. This is to be well understood since they are urban dwellers who are usually quite heterogenic.

The total number of household members under working-age group for the sample as a whole amounts to 346 persons (including those who are still in school). Of the total family members there are about 267 persons supposed to be able to contribute earning to the family, but in fact only about 91 % are employed, and almost 9% are still seeking for job. As an average, about 2.7 persons in each household are contributing to the household income. Of the total 422 family members for the whole sample, nearly 16 % are under 15 years old and only 2 % are more than 64 years old. The average number of household members is about 4.2 persons per each household.

(2) Socio-economic Aspects

a) Ownership of House, Furniture, and Sources of Energy Use

Only 65% of total the sample have their own houses, 33 % of them live in contracted houses, and 2 % living with their family. Their living quarters are also already equipped with electric appliances of one kind or another. Some respondents have telephone facility in their houses. A few of the total sample have even automobile. A greater majority of the total sample use gas (66%), kerosene (20%), but 10% still use fire wood, and 4% already use electricity as the sources of energy for cooking.

b) Household Income and Expenditures

The average of total family income for the whole sample was about RP 1,928,740 per month. The average size of household is 4.2 persons for the sample as whole. Hence, the per capita household income of the total sample become around RP 459,224 per month. The average total household

consumption expenditure per month for the sample as a whole was around RP 1,100,130 accounting to about 57.0% of the family income. The total household consumption expenditures comprise of about 41.7% for food and drink; nearly 13.7 % for transportation; 10.1 % for education; 6.7 % for medical care; 8.1% for ritual; 7.7 % for electricity; 7.9 % for telephone; and 3.1 % for PDAM water. On a per capita basis, the average total consumption was around RP 261,936 per month.

c) Access to Public Facilities

In Unda River study site, access to public facilities is almost the same as in other study sites as already described above. There are sufficient public utilities which can meet the needs of local residents for public services. About 60 % respondents have experienced in using the service of financial institutions such as bank and cooperative. About 41% of total respondents use the local /village market and 26.6% use nearby retail shops, and 16.5% use nearby supermarket, and the rest 15.6 % use sub district market for purchasing their daily basic needs. For those who have fruit trees at their house yards / back yards most of them sell their fruits to the local village market. It seems to be a common situation in Bali now days that public transportation facility is easily accessed by the people. It takes only less than 10 minutes for every one to reach the asphalt road on foot or directly use bike or even car from his house.

(3) Health and Sanitation

All sample use brick as material for the wall. Around 90% use ceramic, and 10 % use cement for the floor. Almost all of them use tile for the roof (97%). A greater majority (86%) have access to PDAM water, the rest 19% use well. For cooking purpose, 80% use PDAM water, well (15%), river/spring (3%) and the rest 3% use mineral / bottled water.

The greatest majority (95%) of the respondents has house toilets, but 5% still use backyard / fishpond. The respondents who do not have sewage disposal facility in their houses total around 76%, but only use drainage canal or back yard instead. Most of them have treated garbage rather properly by burning and put it at certain places but about 2 % just throw it to the drainage canal, or buried it at back yard.

Most common diseases suffered by the respondent are influenza, fever, and coughing representing about 65%, 23 %, and 16% respectively. There are about 14 deaths reported since the last 5 years, all of them were above 20 years old mainly caused by stroke and asthma (33%), either cancer or old age (17%), and the rest 50% for unknown reasons..

(4) Socio-cultural Aspects

Like in other study sites, here also the greatest number of event is the *otonan* (birth day ceremony) amounting to 203 events followed by ceremonies related to a baby at birth and when reaching the age of 42 days, and 105 days (before reaching 210 days of age).

a) Existence of Sekehe / Local Professional Organization

The kinds of *sekehe* generally found in this study site are among others: *Sekehe TrunaTruni* (Youth Association), *Sekehe Gong* (Music Association), subak (irrigation association), *Sekehe Arisan* (Rotating Credit Association), *Sekehe Genjek* (a kind of singer group/association), *Sekehe Pesantian* (a group /association engaging in singing a kind of traditional song usually related to religious ceremony), etc. Most of such associations are stagnant. But some show increasing activity particularly the *Sekehe Pesantian*. However, Youth Association was said to be declining due to emerging places for recreation and enjoyment for the young people.

b) Gotong Royong Activity (Group Action)

Almost the same situation with other study sites in relation to *gotong royong* activity as already described earlier. About 63 % of the respondents said that *gotong royong* activity was stagnant, but 34 % considered it as increasing, and only less than 3% as declining.

c) Security and Orderliness

The security and orderliness in Unda River study site seem to be also generally speaking well maintained. Since the last 5 years, no recorded data on criminal problems was obtained but it was

informed that the types of criminal found usually are among others theft, fighting, adultery, murder, etc, but occurred very seldom.

d) Migration

There were only 8 persons who have migrated to other provinces in Indonesia within the period of 1995-2004. Among this, 4 persons moved to Java, 1 person to Lombok, and 3 persons to Kupang (East Nusa Tenggara).

(5) Opinion /Attitude of Respondent towards the Project Plan

Most respondents (92%) did not know yet about the plan of Gunaksa Reservoir at downstream of Unda River. The respondents were doubtful/ not quite sure about the project's potential benefit but after have been explained, they could guess about it. Several possible benefits mentioned by respondents are: to improve water for bathing and washing (85%), minimize river flooding (8%), and opportunity for trading due to tourism.

The greatest majority (85 %) of the total sample agreed with the project plan, and only 15 % disagreed. Reasons for their disagreement are pollution during construction (got nearly 43 % of total options), no job opportunity after project (got 33%), and land acquisition with unfair compensation (got 24% of total options). It is to be noted that a respondent who disagreed could give more than one option or reasons for disagreement. No response obtained concerning the form of compensation. But according to a couple of respondents they preferred cash money, and to some they preferred exchange with other land of similar kind.

Most of the respondents worried about the adverse effect brought about by the transportation problems during construction stage like, pollution, noise, traffic jam, etc., but more than 50% of them could tolerate since it is only temporary. About 30 % of respondents were indifferent toward where the project should be located, and 24 % did not give any answer or did not know anything about it. Around 32 % just said it should be at places wherever appropriate.

N-3 SOCIAL EVALUATION OF MASTER PLAN

N-3.1 General

The Master Plan as proposed by the Study Team has incorporated programs and projects such as water resources development and water supply, water quality improvement, river basin conservation, and institutional strengthening essentially reflects the felt needs of most stakeholders. Again, capacity building which is of primary important, particularly when the institutional reform in water resources would have been realized, that is to say when the present *Sub Dinas* of Water Resources and Rural Infrastructure has got its new status as Dinas. Many of development projects in the past have neglected this capacity building component of the project so that the operation and maintenance of the project was not optimal. Thus, important components and prioritization of programs and projects mostly constitute the stakeholders' felt needs or in other words, they are generally in tune with stakeholders' needs and aspirations. This is because of the fact that in effort to formulate the Master Plan for Water Resources Development and Management in Bali Province, the Study Team has intensively employed a participatory approach in obtaining information through several times of Stakeholders' Meetings, Technical Meetings, Steering Committee Meetings, and Workshops.

The involvement of numerous stakeholders in decision making process in any planning stages in a democratic and transparent manner may create sense of belonging and sense of responsibility to the results of the study. It is hoped that the Study Team could contribute a kind of learning process to the local people in participatory planning in an effort to compile Water Resources Master Plan for Bali up to 2025. Since from the beginning, The Study Team has already involved various stakeholders including the subaks' representatives. More over, one of the strategies for the Master Plan is respecting the unique culture and tradition of the Balinese which based on the principle of *Tri Hita Karana*. *Based on the participatory approach, it is likely that the Master Plan will get strong support from the stakeholders. In fact many stakeholders want quick realization of the expected projects / programs as included in Master*

Plan. In this context, Master Plan is considered to be socially feasible.

The Study Team has attempted to introduce the participatory planning or bottom up planning in water resources development to the local people and the bureaucrats which seems to be quite timely and demanded in this era of reformation, transparency, openness, and regional autonomy.

The Master Plan also stresses the important of respecting the existing subaks and their needs and aspiration are to be taken into account in water resources development and management. It is also well recognized that care is to be taken to avoid conflict with the subak. In addition, since the Master Plan also intends to introduce volumetric measurement in water allocation among farmers and among intakes /subaks, it is also considered of great important to take extra care with its implementation and to involve subak and farmers in decision making process.

Involving farmers at every stage of irrigation project planning is of crucial important to avoid frustration among farmers when the project failed to meet their needs and aspirations, as once experienced by a number of countries in the past when the national governments attempted to modernized their irrigation systems. The project implementers did not give ample room to local participation and too often did not take into account the needs and aspiration of the existing traditional water users associations (WUA). Many of the newly introduced system seem to be more suitable for “government-managed” rather than “farmer-managed” systems. As a result, many newly-built systems have become dysfunctional or not so effective. Such experience of government “intervention” in a number of countries has made irrigation planners aware of the importance of employing participatory approach by involving local WUA in any stage of irrigation development planning. Drawing a lesson from such experience, the present Master Plan is respecting the existing subaks and trying to be more careful in dealing with irrigation development planning in Bali.

Now days, water in Bali has become very critical. The demand for water both quantity and quality tends to increase in the coming decade. This is due to the increasing urbanization and increasing number of hotel and restaurants. The need for water exceeds its availability. This implies that the competition in the use of water becoming very keen. As a result, water conflict among farmers and non farmers has been inevitable. In former days, the people could take and use water directly from irrigation canal for cooking, drinking, washing and bathing. But now, water is polluted, and most people and even the farmers themselves also want clean water. No wonder that water becoming scarcer and scarcer. *This means, that Master Plan for water resources development and management in Bali as has been formulated is becoming even more important and therefore it is highly expected and welcome by the Bali community, since it may help gradually cope with the problems related to water resources in Bali.*

N-3.2 Beneficial Effects

The beneficial effects of the programs/projects to be included in the Master Plan from the social point of view may be described as follows.

1. Empowerment

The involvement of various stakeholders in contributing opinion, suggestion, and proposal related to water resources development and management is considered as quite beneficial to local people since it may enhance their knowledge and skill in participatory planning. The Counterpart Team and staff of Sub-Dinas SDAPP were also trained on Project Cycle Management (PCM) method which is a tool for managing the entire cycle of a development project. The PCM training may improve the capability of staff of Public Works Office in building sustainable plans based on logical steps that can meet felt needs of the local people.

More over, institutional strengthening as one component of the Master Plan in which it will include capacity building activity is also considered very useful since it may guarantee the sustainability of projects that are to be implemented, since the staff responsible for the operation and maintenance of the projects would be well prepared to handle it properly. But, efforts need to be taken that the trained staff would not move to other irrelevant office or departments, so that their acquired skill will not become idle.

Again, soft measures for flood mitigation program in form public campaign and education how to treat

domestic waste and garbage will gradually change the attitude of people in the long run so that clean river and improved environmental health can be ensured.

2. Improvement of public health and sanitation

The provision of clean water supply which based mostly on surface river waters, the improvement of water quality, and the flood damages mitigation programs, may provide a long term beneficial effect to the society in general. Until now many people still use open dug well, river and spring as sources for bathing and washing and even for drinking. The implementation of the Master Plan would make it possible for more and more people to get clean water for domestic uses. Accordingly, flood damages mitigation both through hard as well as soft measures such like public campaign and education on environmental friendly garbage disposal may help improve the environmental health and the people's quality of life.

3. Creation of new job opportunity

The implementation of Master Plan is expected to be able to generate employment opportunity to the community both during construction and post construction phases. During construction stage a great number of unskilled laborers are required. Local people would be able to participate as sub contractor for certain kind of activities, e.g., as provider of construction material, transportation for dredged riverbed material, etc. Especially for large scale project such like Ayung Reservoir, after it is operational, business opportunity related to tourism may emerge.

4. Development of recreational facilities for leisure

River improvement to mitigate flooding, large reservoir development such as Ayung Reservoir may be quite potential for the emergence of recreational facilities for leisure in the future. For example in case of Ayung Multipurpose Development Project, due to its potential in restoring fish aquatic ecology in the down stream river reaches, the community can be able to use this places for fishing either just for leisure or for additional earning for some people. Regulation with strict law enforcement to avoid river pollution and environmental degradation shall be formulated. River improvement is potential for the emergence of recreational activities such like canoeing and fishing ground. This may eventually create new job opportunity which is also useful for tourism.

5. Increasing farmers' income

Increase production of irrigated agriculture very much relies on adequate and continuous supply of irrigation water. Irrigation development as one component of the Master Plan is expected to be able to meet such requirement. Through a proper linkage and partnership with various agencies, government as well as non government like tourism agency, the farmers shall be able to provide agricultural product such vegetables, fruits, and other crops having high demand potential to the hotels and restaurants. But this seems to require a pro-farmer government policy, since the farmers in many countries still need support from their respective government. If this requirement can be met, the continuous water supply for irrigation as planned according to Master Plan may increase the farmers' welfare in the near future.

N-3.3 Adverse Effects

1. Land acquisition problem

Many projects need land acquisition. In case of Ayung Reservoir development project for example, a considerable acreage of land (around 74 ha) may be adversely affected since it is potentially submerged when the reservoir is operational. Land acquisition is also required for other prioritized projects to be located at Petanu and Sugi / Penet rivers (both for raw water development) especially for the site of water treatment plants even though only just less than a hectare. In general, the owners of such lands will likely have no objection to free their land to be used for the project sites as long as the value of compensation is not quite disadvantageous to them. Hence, to avoid dissatisfaction among landowners, it is considered necessary to handle land acquisition problem with care, through negotiation in a transparent, accountable, and honest manner.

2. The removal of human settlement and temples

Considering the fact that Bali is known as “an island of a thousand temples”, there is a great possibility for any water resources development project to disturb the existing temples. The local residents living adjacent to the project sites generally worry so much about the possible removal of houses and temples. However, it is the strategy of the Master Plan to respect local culture and avoid as much as possible the removal of human settlement and other objects or facilities with historical and religious value. As a matter of fact through feasibility study no removal of human settlement and temples is required by the prioritized projects like Ayung Reservoir, Petanu River Raw Water Development, Sugi River Raw Water Development, and Badung-Mati River Flood Control.

3. Disturbance to existing holy springs

It is well recognized that Hindu Balinese consider water as very important for religious ritual. For this purpose, water is often taken from the “holy” springs spread at many places along the river courses. In the implementation of surface water development projects, it is quite possible to affect the existing springs used by the local people for religious ritual activities. In case of Ayung Reservoir Multipurpose Project, it is found one holy spring that will be submerged. However, it is still possible to persuade the local people to use other springs located somewhere along the river which will not be submerged. This needs to be discussed thoroughly with the local people under the guidance of the Hindu Council and the high priest.

4. Potential conflict

The implementation of programs /projects as incorporated in the Master Plan may create potential local conflict of interest especially when surface water is to be used for potable water sources by constructing intake at upper stream. It is recognized that the related subaks will not agree with any water taking upstream that would reduce their current water supply. The potential conflict is to be avoided in the plan by locating the intake at the lowest stream of the river such as the case of Sugi, Petanu, and Unda Rivers.

Another possible conflict that may arise is due to the use of outsiders during the construction stage as unskilled laborer. Usually, a considerable number of workers are needed especially for digging, excavation, carrying construction material, carrying dredged riverbed material, etc. Although local people want to be involved in such kind of works, it will not be sufficient. Still a large number of unskilled workers are needed from outside especially for large project like Ayung Multipurpose Project. The causes of conflict may be among others envy on the part of local people due to not being recruited as workers, outsiders’ attitude of being disrespectful to local custom merely because of their own ignorance which may be considered as an insult to the local people, criminal act such as stealing by outside laborer may induce anger of local people, etc.

The Master Plan also has potential social conflict of interest especially with regard to the sharing of project benefit after its implementation. The upstream community tends to consider that the beneficiary of the project is mainly the lower stream community. Whereas in fact, it is the upstream people who are considered to be blamed for any deterioration of catchments area. In this context, it is of prime importance to take into account the equity dimension of any water resources development project after it is operational.

N-4 SECOND SOCIAL SURVEY

N-4.1 Outline of Survey

The second social study was conducted in four prioritized project sites listed below:

1. *Ayung Reservoir Multipurpose Project* located at downstream of about 500 m from the confluence points of both Ayung River and Siap River at Banjar Buangga, Getasan Village.
2. *Sungi /Penet River Raw Water Development Project*. The intake is at around downstream very close to the confluence point of Sungi and Penet Rivers and its water treatment plant is not so far from the intake.

3. *Petanu River Raw Water Development Project.* The intake is located at the River Mouth of Petanu River and its water treatment plant is nearby the River Mouth of the same river in the District of Gianyar.
4. *Badung and Mati River Flood Control Project.* This project is mainly in the form of riverbed excavation of Badung River and Mati River. For Badung River, the excavation will take place between Buagan Weir and Gajah Mada Street, whereas for Mati River, between Gunung Soputan Street and Bypass Street.

The study items to be included in this second study are more or less the same with the ones included during the first study, especially with regard to the primary data /information related to identity of respondents, socio-economic aspects, health and sanitation, and attitude toward the project as have been described earlier. However, concerning the study items of attitude toward the project, in the second study other points were included especially information about the anxiety about the project, the expectation to the project / what kind of benefit the respondent expecting to get from the project. The respondents were added to include the poor people, owners of land supposed to be submerged, in addition to farmers and local residents living close to the villages most potentially affected by the projects concerned. Additional items initially intended to be included in the second study are those related to communication / interaction between local people with Local Government especially local government at village level; existing condition of the rice farming with special reference to land tenure status, cropping intensity, cropping farmers' opinion concerning the present status of Sedahan–Agung, water conflict, the land to be submerged in relation to its utilization, its tenure status, compensation required, etc., the use of the river by local community in their daily life such as for ritual and economic activities, the existences or locations of sacred and holly springs and other cultural heritages that should be preserved or be taken into account; and activities which can pollute river water. However, they are quite minimally gathered.

Particularly for the case of Badung River and Mati River Flood Control Project, other relevant information initially intended to be collected also include the occurrence of flood during the last 10 years with special regard to its frequency, its causes, degree of damage, and estimated amount of loss in money value, etc.

The following secondary data at most relevant villages and or sub districts level where the projects are to be located were highly expected to be gathered are among others: total number of people under poverty line/ poor group, criteria for determining poor group, government programs to alleviate poverty and the amount of budget allocated to each program, billing rate of electricity, PDAM water, number of household using electricity and PDAM water, regulation on land acquisition, composition of land acquisition committee, the procedure to be followed, length of time (number of days/month required to complete the process), estimated value of compensation, costs incurred for the processing, etc; total area of paddy fields converted to other usage since the last five years, and so on.

N-4.2 Study Result

N-4.2.1 Ayung River Study Site

(1) Demography, Education, and Sources of Livelihood

There are about 5 villages most potentially affected by the Multipurpose Development Project to be located at Ayung River. These are Pangsang, Getasan and Carangsari all are within Petang Sub district in Badung Regency. The other two are the villages of Buahang and Melinggih within Payangan Sub district in Gianyar Regency. Table-N.1 below shows the demographic aspects, education level, and main sources of livelihood of the people living at the above mentioned villages.

Table-N.1 Demographic Aspect, Education, and Sources of Livelihood of the Villages Most Potentially Affected by the Project at Ayung River

Description	Villages within Petang Sub district that most potentially affected (total 3 villages) *)	Villages within Payangan Sub district that most potentially affected (total of 2 villages) @
Demographic aspects:		
Number of population (persons)	9,309	7,683
Sex ratio (% of male over female)	99.5	99.0
Number of households	2,610	1,973
Population density (persons/km ²)	540	535
Education :		
No schooling	6.0 %	5.4 %
Still in elementary school	34.5 %	9.6 %
(E+M+H) graduate #)	56.0 %	82.8 %
University graduate	3.5 %	2.2 %
Main sources of livelihood:		
Agriculture	85.04 %	62.75 %
Trade	5.18 %	4.51 %
Industry	0.66 %	5.91 %
Transportation / communication	1.44 %	3.16 %
Government / Services	4.65 %	12.31 %
Others	3.03 %	11.36 %

Note: Source: computed from Sub district of Petang in Figure, 2003. #) (E+M+H) = Elementary, Middle and High School; *) those 3 villages are Pangsang, Getasan and Carangsari; the two villages are Buahang and Melinggih

Higher percentage of population at Petang Sub district has agriculture as the main source income compared to that of Payangan sub district. It reflects the fact that being near Ubud, an important tourist spot in Bali, job opportunity outside agriculture has become increasingly important.

Although the average density of the two villages (Buahang and Melinggih) within Payangan Sub district is smaller than that of the 3 villages within Petang Sub district, in fact the Village of Melinggih has the highest density among the 5 village mentioned above which is accounting to 918 persons per km², meaning to say it is above the average of each of the said sub districts.

(2) Current Use of the River Ayung by the Local Community

a) Religious Ritual

There are several places of sacred values near Ayung River. One important temple (Tangluk Temple) belongs to Customary Village of Susut-Buahan in the Payangan Sub district, Gianyar Regency. About 200 households are involved in this temple's activities. It has close relation with the holy spring found very close to the site plan of the reservoir (about 200m from the temple) which emerges from the wall of a cave with a very small discharge (0.005 liter /sec.) The ritual performed at this temple called "nangluk merana") literally means to avoid pest and other calamity. People make offering and praying here for God's Blessing in order the community are always safe and sound, free from natural calamity such like epidemic, and the crops are also free from pest attack. This ritual is performed every dark moon at the sixth month according to Balinese Calendar (around December) every year.

Beside that, the ceremony of temple anniversary is also performed by the community every year during full moon of the tenth month of Balinese Calendar (around April). To perform these rituals, it needs holy water from the above mentioned holy spring which would be submerged if the reservoir is built. This holy spring is also often used by many people from outside the village even from other regencies to visit this holy spring usually during the full moon or important holy days to take water and perform a ritual for spiritual cleansing (*meruwat*). The community worry about this, but can not decide whether or not the existing holy spring can be replaced by other springs which may not be submerged by the project, unless a higher authority e.g. the Council of Hindu Religion and the high priest would guarantee for the “safety” of this replacement and yet this should be socialized to the community concerned. In fact as it was informed, there are about at least 7 other holy springs located at upper stream of the project site from which the local people used to take water for various kinds of religious rituals, since religious ritual is impossible without the use of holy water. That is why Hindu Religion in Bali was one called *Agama Tirtha* (“Water Religion”).

Another sacred place considered to have historical value is a stone-carved-like place supposed to be used as a place for meditation located about 200 m below the Tangluk Temple. The priest of this temple used to meditate and pray here prior to the performance of ritual at the temple.

The river is also used for other religious ritual called “*nganyut*” (a follow up process of *ngaben* (cremation ceremony), in which the ashes after burning is to be thrown into the river or sea. Since the sea here is rather far from the villages, the river is used for this purpose because the ashes finally will also flow to the sea. The local people used to throw the ashes to the river somewhere at the north of a bridge connecting Payangan and Buahon Villages. Similar ritual is used to be performed by the villagers of Melinggih around the river close to the project site which is below the Chinese Cemetery.

Another important temple called Pucak Meru Temple at the east of Kesianan Village is located at edge of the river about 60 m from the surface of river water. For the temple ceremony and other rituals, the local people are used to take water from a holy spring (called Taman Beji of Pucak Meru Temple). But this spring may not be submerged as it is far from the project site.

Other important place related to the religion is a Chinese Cemetery located above the planned reservoir at eastern side of Ayung River (at the village of Payangan Desa, Gianyar. This cemetery belongs to about 72 Chinese households. These people worry about the possibility of the project especially during the construction stage particularly the widening of access road may disturb the burial ceremony or other events related to their custom and tradition such as *Cingbing* around April for 7 days duration.

b) Economic Activities

The area around as well as in the river is not used only for religious rituals, but also for certain economic activities. Important activities are related to tourism such as rafting, and villa/hotel. At upstream there are found 3 rafting business: Bali Discovery, Bali Fantasi, and Bali Holiday. The most potentially affected is Bali Holiday with its route starting from Kesianan Hamlet of Pangsari Village and finish at Buangga Hamlet of Getasan Village. It takes around one hour. There are about 50 employees consisting of local residents of both hamlets mentioned above. The company gives contribution amounts to RP 150,000 per month to the Customary Village, and also RP 150,000 to be equally shared by the owners of land being used for passing through of its customers.

Elephant safari for tourism is another important activity starting from Beng Hamlet, Carangsari Village passing the route through southward and back to the start line. Normally, there are about 200 tourists everyday. During construction stage this activity may possibly be affected due to transportation of the project. Donation by management of the company amounts to RP 200,000 per month to the Desa *Adat* of Buangga (Customary Village) and the same amount also to the *Desa Dinas* of Buangga (Administrative Village of Buangga).

Two villas namely Ubud Hanging Garden and Vila Nandini are found close to the project site. These villas make best use of the view of the river side at the eastern part of the Siap tributary. If the water surface would be below the foot of the bridge of Susut it would be no problem, and accordingly the view would become even much better.

c) Daily Household Activities

In the past, river played important role for providing domestic water use such as bathing, washing,

water source for cooking and drinking, playing and swimming for children. And last but not the least it was also a source of income for the people living nearby for fishing. But at present that role has been declining significantly. Particularly in case of Ayung River at the upper streams, the local people seem very difficult if not impossible to carry out fishing activity since the steeply slope of the river bank which is very hard to access. At the lower stream, fishing is just for hobby and recreation. A few people still use the river at points easily accessed for bathing and washing and taking water for cooking as revealed by the survey result that about 6% of the total sample of 130 persons still using river as a source for bathing and washing; and 1.5% for cooking and drinking. The people having land adjacent or extended to edge of the river can plant fruit trees within the river demarcation and take the harvest but must be responsible to preserve it for the sustainability of the natural environment around the river. Moreover, they also can take edible green leaves for vegetable, grasses for the cattle, and firewood.

d) Agricultural Activities

Ayung River water is used by many subaks. The subaks most potentially affected by the project among others are those drawing water from the intakes/dams of Sengempel, Kedewatan, Mambal, Praupan, and Oongan. It was informed by the concerned subaks' heads that the average size of holding of the farmers in Sengempel Subak, Tanah Yeng Subak, Kalangan Samu Subak and Lungatad Subak is about 0.36 ha, 0.38 ha, 0.39 ha, and 0.32 ha respectively. The cropping pattern being practiced at those mentioned subaks is almost similar as follows:

- Paddy- Paddy- Paddy/*Palawija* (secondary crops) at Sengempel Subak, the dominant crops for *palawija* are peanut and corn;
- Paddy-Paddy- *Palawija* at Tanah Yeng Subak, the important crops for *palawija* are peanut, flower, and *kangkung* (leafy vegetable grows in water);
- Paddy-Paddy-*Palawija* at Kalangan Samu Subak and the most important crop for *palawija* is also peanut; and
- Paddy- Paddy-*Palawija* at Lungatad Subak. The dominant crops for *palawija* are soy bean and vegetables.

Those subaks are facing several problems such like inadequate water supply, poor condition of irrigation facility which needs rehabilitation especially at Kalangan Samu Subak, and land slide and high sedimentation at Sengempel Subak. The problem of declining number of subak members is found in Praupan Subak, Buaji Subak, and Ancak Subak in which as a result of high rate of loss of rice land due to conversion to other uses, has reduced the group action activities of the members in irrigation system maintenance. The heads of concerned subaks expressed their worry if the project would disturb the irrigation water supply to the subaks. In addition, water pollution is also said as a problem. It is informed that the river water is now polluted due to domestic sewerage and plastic garbage, and garment industry. The water flowing through irrigation canal /drainage is similarly polluted due to the waste coming from pig rising as well as from plastic garbage.

(3) Characteristics of the Respondents

The average age of all samples is about 49 years old. About 10.8 % with no schooling; but 3.0 % university graduate, 86.2 % elementary school, middle and high school graduate. Agriculture is the main source of earning of the respondents (65.0 %). The average family size is 3.8 persons but only 2.0 persons contributing income to the family

(4) Housing Condition and Sources of Energy Use

Brick/concrete brick is common material used for wall by the respondents (91.5 %) and the rest still use woven bamboo; for the floor they use ceramic/cement (90.0%) and the rest 10.0% other than ceramic/cement; almost 97% use tile for the roof. A greater percentage of the respondents (72.3 %) still use firewood for cooking; 29.0 % gas, and 22.3 % kerosene. Whereas for lighting only about 2.0 % still use kerosene lamp but the rest 98 % all use electricity

(5) Household Income and Consumption Pattern of the Respondents

Table-N.2 presents the same information but in comparison among categories of respondents. The average of total family income for the whole sample amounted to RP 1,219,461 or RP 318,397 per capita per month. The average total household consumption expenditure per month for the sample as a whole was around RP 1,158,246 or RP 302,414 per capita. Thus, about 95.0% of the income was spent for consumption expenditures.

Table-N.2 Household Income and Consumption Expenditure per Month by Category of Respondents in Ayung River Study Site, 2005.

Description	Farmers	Local residents	Owners of land	Poor group	Total Sample
Family size (persons)	4.35	3.52	4.00	3.25	3.83
Average total household income (RP)	1,254,688 (288.340 <i>per capita</i>)	1,542,841 (438.307 <i>per capita</i>)	1,688,333 (422.083 <i>per capita</i>)	410,208 (126,217 <i>per capita</i>)	1,219,461 (318,397 <i>per capita</i>)
Average consumption expenditure (RP/month)	1,193,875 (95.2 % of total income) (274,454 <i>per capita</i>)	1,254,866 (81.3 % of total income) (356,496 <i>per capita</i>)	1,581,200 (93.7 % of total income) (395,300 <i>per capita</i>)	404,875 (98.7 % of total income) (124,577 <i>per capita</i>)	1,158,246 (95.0 % of total income) (302,414 <i>per capita</i>)
Consumption Expenditure by Category of Items (in % of total consumption expenditures)					
Food and drink	51.04 %	40.93 %	40.26 %	52.43 %	44.03 %
Transportation	13.43%	24.35 %	22.03 %	14.05 %	20.18 %
Education	9.94 %	9.83 %	14.76 %	8.46 %	11.32 %
Health	4.42 %	4.14 %	2.85 %	4.94 %	3.86 %
Ritual	15.05 %	10.78 %	11.79 %	13.07 %	12.33 %
Telephone	1.91 %	4.46 %	3.99 %	0	3.38 %
Electricity	3.76 %	3.91 %	3.11 %	5.76 %	3.74 %
PDAM water	0.45 %	1.60 %	1.21 %	1.29 %	1.16 %
Total	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Of the total consumption expenditures, 44.0% was allocated for food and drink; 20.2% for transportation; 11.3 % for education; 3.9 % for medical care; 12.3 % for ritual; 3.7 % for electricity; 3.4 % for telephone; only 1.2% for clean /PDAM water. It is clear that in the case of the poor households, their consumption comprising more than half (52.4%) of food and drink which is slightly greater than the other categories of respondents. This seems to be consistent with Engel theory that the poor group relatively spent more on food and drink in terms of percentage to the total expenditures compared with the higher income groups. The criteria for poor households, number of households by regency number of households in the villages / sub districts mostly affected by the concerned projects are summarized in Appendix.

(6) Health and Sanitation Condition

With regard to water sources used for bathing and washing, about 7.7 % of the sample as a whole still use river water, 60.0 % spring, 60.0 % well, and only 7.7 % PDAM water; whereas for cooking and drinking about 53.0 % use PDAM water, more than 39 % well, and nearly 11% spring /river water. Most of the respondents use house toilets (85 %), 9.2 % still use the backyard for toilet, but 10 % still use river as a toilet.

Some of the respondents do not have garbage disposal facility in their living quarters (7.7 % just throw it into river and 2.3 % to the backyard). But most of them (90 %) have already treated it properly either by burning, burying, or collecting it at waste box.

The common diseases often suffered by the respondent are fever (70 %); cold (67%); TBC/ cough

(46%); and influenza (36 %). In case the member of the family requires medical services they usually come to local polyclinic (77 %), 79 % to midwife, 65 % consult a private doctor, and 8.5 % to public hospital.

(7) Opinion /Attitude of Respondent towards the Project Plan

About 56.2 % of the total respondents did not know yet about the plan of project in Ayung River, 44.8 % said they knew it already. About 57% could understand, whereas the rest 43 % still did not understand the potential benefit of the project. Several possible benefit mentioned by the respondents are among others to increase irrigated area, increase domestic water supply, and some other else.

More than 58 % of the total sample agreed with the project plan whereas 42 % still doubtful/worried about the project especially related to land acquisition, loss of job, unfair compensation, etc. If all of the factors that make them worry about the project plan could be overcome, the percentage of respondents who agreed become to almost 91 %. Only 12 persons of respondents still did not agree for one reason or another such as the downstream subak would likely get less water, afraid if there is a removal of settlement, village will be submerged, and many others only because they did not understand about project specification. Of the 30 respondents who gave their opinions concerning the form of compensation, more than 73 % of them expected exchange with other land of similar type; the rest said it would depend upon consensus among owners of the land. A few owners of land required that their land should be priced not too far below RP 50 millions per are.

Expectation of the respondents to the project can be summarized as follows. The major expectations are among others it must be beneficial for local community including the farmers, create new job; fair compensation for land acquisition, protect the existing holy spring, no removal of settlement, and so on. The subak heads and some farmers proposed that the project should not decrease the water supply to the subak during the construction as well as after operation. The project should be able to enhance the water supply to the subaks. The local residents proposed that the project will consider the followings:

- Recruitment of the local people during the construction stage;
- Supply electricity and clean water to local community;
- More intensive socialization on the project specification to local community since most of them did not know yet about the project plan;
- The new habitat for the monkey (black and gray monkey) needs to be created if the existing habitat is to be disturb due to the reservoir in order the monkey will not annoy the villagers and disturb the fruit gardens of the local people;
- The quality/strength of the reservoir should be guaranteed for people's safety;
- The project implementer should provide a place for *nganyut* ritual somewhere along the river;
- A new bridge and road over the river to connect Petang and Payangan should be built so that the local people can take a shorter way to travel.

(8) Access to Public Facilities, Local Professional Organization, Gotong Royong Activity

Denpasar and surrounding areas, has sufficient access to public utilities such like bank, village cooperative, market, shops of various kinds, hospital, polyclinic, public transportation, and many others. About 62 % of total sample have experienced in borrowing from the available bank/cooperative. Nearly 42 % of them used it for productive purpose, 28.4 % for productive purpose, 11 % for education, 10 % for medical care and ritual, and the rest for some other purposes. Main difficulty in obtaining the credit is said due to the collateral requirement. A greater percentage of respondents (66.2 %) are facing financial problem in their family.

For purchasing daily basic needs, many respondents (76.9%) use the nearby retail shops, 40.7 % village market. There is 39.2 % of respondents sell agricultural product direct to consumers, and 20% to village / sub district market. It takes only about 10 minutes to reach the market on foot.

A number of sekehes found in the study site are among others Sekehe Truna Truni (Youth Association), Harvesting Association, Hoeing Association, Transplanting Association, generally found at each hamlet/village around Bali, Sekehe Gong (Music Association), subak (irrigation association), Sekehe Pesantian (Religious/Traditional Singer Association), Sekehe Arisan (Rotating Credit Association), and

many others.

Group action often carried out in this study site is related to the following activities: cleaning drainage canal, villages roads maintenance, temple maintenance, ritual activity, building hamlet hall, planting trees for re-greening of the local environment, etc.

(9) Conflict and Security

There are several kinds of conflict found in the study site as informed by respondents. Nearly 25 % of the respondent said that conflict often occurred related to the use of natural resources, while 64 % said conflict never occurred, while the rest 12 % did not know about it or did not answer. The cause of conflict usually among subak is concerning water share especially between upstream and down stream subaks. Another kind of conflict which often occurred was between subak and rafting business, because subak blocked the river with stones to heighten the water surface so that it could enhance the flow of river water to the subak's intake, whereas the rafting men removed them. Conflict between hotel and rafting also occurred because the hotel polluted the river and producing bad smell which disturbed rafting activity. Conflict between local people and rafting also once happened because the rafting management did not give contribution to the villagers from the benefit of the rafting business. Conflict between hotel located at eastern side of the river (Kedewatan, Payangan -Gianyar) only enjoy the beautiful view at the western side of the river belonging to Badung Regency, while the people in Badung did not get anything from tourism. The people in western side (Sub district of Abiansemal) feel they are exploited and hence put corrugated iron sheets on their paddy fields so that the tourists staying at the hotel could not enjoy the beautiful view of the rice terrace because of getting dazzled due to the sun reflection from the sheets. Another kind of conflict needs to be mentioned here is the protest of the members of Citra Subak against the PDAM due to the taking of groundwater with deep tube well which caused the irrigation canal getting dried.

N-4.2.2Sung i /Penet River Study Site

(1) Demography, Education, and Sources of Livelihood

The project for raw water development is to be located downstream close to the confluence point of Sungai and Penet Rivers. There exist three villages adjacent to the project's site. Villages which are mostly affected are Cemagi and Munggu Villages of Mengwi Sub district, and Braban Village of Kediri Sub district. More than a half of the population has already finished schooling at least elementary school graduates. University graduate accounted to only 3 % of the population. Data on education and source of livelihood in Braban Village are not obtained / unavailable. But it was informed that agriculture, small industry and trade are most important sources of livelihood of Braban Village.

Both villages of Cemagi and Munggu still rely greatly on agriculture for source of livelihood. These villages also have much higher population density compared to that of Braban Village. Male population of Cemagi Village is larger than female whereas for Munggu Village the female is greater than male population. As an average for both villages the family size is around 4.9 persons per household.

Table-N.3(1/2) Demographic Aspect, Education, and Sources of Livelihood of the Villages Most Potentially Affected by the Sungai/Penet River Raw Water Development Project

Description	Two villages within Mengwi Sub district (Cemagi and Munngu villages) *)	One village within Kediri Sub district (Braban Village) @)
Demographic aspects:		
Number of population (persons)	10,878	5,420
Sex ratio (% of male over female)	104.4	98.6
Number of households	2,233	1,446
Population density (persons/km ²)	1,080	783
Education :		
No schooling / not yet in school	29.0 %	No information/ data available
Still in elementary school	8.9 %	
(E+M+H) graduate #)	58.8 %	
University graduate	3.3 %	

Table-N.3(2/2) Demographic Aspect, Education, and Sources of Livelihood of the Villages Most Potentially Affected by the Sungai/Penet River Raw Water Development Project

Description	Two villages within Mengwi Sub district (Cemagi and Munngu villages) *)	One village within Kediri Sub district (Braban Village) @)
Main sources of livelihood:		
Agriculture	84.6 %	Agriculture, trade, and industry (data not available)
Trade	5.6 %	
Industry	1.5 %	
Transportation / communication	1.6 %	
Government / Services	5.9 %	
Others	0.7 %	

Note: Source: *) computed from Sub district of Mengwi in Figure, 2003. ;@) computed from Sub district Kediri in Figure, 2003; #) (E+M+H) = Elementary, Middle and High School.

(2) Current Use of the River Sungai /Penet by the Local Community

Not so much information could be gathered concerning the use of the Sungai River as well as Penet Rivers. Upstream of the planned intake for the portable water there exist several intakes for irrigation (subaks) but will certainly not to be affected. In Bali, Subaks taking water from the rivers usually perform “water opening” ceremony (*magpag toya*) at their respective dam temples prior to land preparation.

River waters at the confluence points are believed to be sacred in Bali. In case of the confluence point between Sungai and Penet Rivers, it is often used for spiritual cleansing ceremony (*meruwat*) by local people. As the intake is to be located downstream of this confluence point, it is worried if the project might adversely affect this sacred location for such kind of activity.

The paddy fields adjacent to the project sites (its intake and WTP), belong to the command area of Sub subak (*tempek*) of Kelakah within the Let Cemagi Subak. This subak has a temple called Lesung Temple but located rather far from the project site, so it would not be affected.

It is still common every where in Bali, though practiced by only a few people particularly those who have no access to PDAM water or dug well, to use rivers for washing, bathing, cooking, and even for toilet. Some people also throw garbage in to the rivers.

It is a common practice that the people having land adjacent or extended nearby the edge of the river are allowed to plant fruit trees within the river demarcation and take the harvest but must be responsible to preserve it for the sustainability of the natural environment around the river. Moreover, they also may take edible green leaves for vegetable, grasses for the cattle, and small trees for firewood.

(3) Characteristics of the Respondents

As characteristics of the respondents, one thing needs to be stressed here is that agriculture still predominant source of livelihood for most respondents, and average number of family members contributing to household earning is about 2.2 persons, whereas the size of family averages about 3.7 persons. As an average, each household has 1.4 motor bikes, 1.1 TV sets, and 0.75 radio/tape. Car is owned only by two respondents.

(4) Housing Condition and Sources of Energy Use

Most respondents have houses with wall made of brick and concrete brick; with floor made of ceramic and cement, whereas for the roof they use tile. Only 4.4 % of respondents still use coarse grass /thatch for the roof of their houses. Almost all respondents use electricity for lighting. But for cooking a greater percentage still use fire wood (66.7%), while gas and kerosene are used by 43.3% and 27.8% of respondents respectively.

(5) Household Income and Consumption Pattern of the Respondents

Table-N.4 summarized the average household income and consumption expenditure per month during the last one year, by category of respondent. For the respondents as a whole the average household income amounts to about RP 947,222 and on per capita basis it accounts to RP 255,316 per month. Of the total household income, nearly 78 % was spent for consumption. Of the total consumption expenditures, a greater percentage (59%) was allocated to food and drink. Other consumption item with relatively large percentage is rituals. Expenditure for clean /PDAM water still to be a “luxury” for most of respondents.

Comparison among categories of respondents, it seems clear that the poor group spent most of the family income for consumption (more than 92 %). Of the total consumption expenditure the poor respondents allocated more than 79 % for food and drink which is the largest percentage compared with other groups of respondents. Further more, the poor respondents neither have telephone facility nor PDAM water service. However, electricity consumption comprises nearly 6.0 % of their total consumption expenditures.

Table-N.4 Household income and consumption expenditure per month by category of respondents per month in Sungi/Penet River Study Site, 2005.

Description	Farmers	Local residents	Owners of land	Poor group	Total Sample
Family size (persons)	3.68	3.94	3.47	3.75	3.71
Average total household income (RP)	726,316 (197, 368 per capita)	1,054,688 (267,687 per capita)	1,284,211 (370,089 per capita)	665,000 (177,333 per capita)	947,222 (255,316 per capita)
Average consumption expenditure (RP/month)	585,789 (80.65 % of total income) (159,182 per capita)	784,219 (74.35 % of total income) (199,040 per capita)	938,789 (73.10 % of total income) (270,544 per capita)	613,500 (92.25 % of total income) (163.600 per capita)	737,022 (77.81% of total income) (198,658 per capita)
Consumption Expenditure by Category of Items (in % of total consumption expenditures)					
Food and drink	59.75 %	48.68 %	58.87 %	79.26 %	58.93 %
Transportation	14.96 %	12.91 %	7.43 %	3.91 %	10.11 %
Education	2.07 %	5.46 %	1.82 %	2.85 %	3.43 %
Health	2.52 %	6.26 %	7.74 %	2.44 %	5.32 %
Ritual	8.72 %	12.19 %	14.21 %	5.62 %	10.93 %
Telephone	2 02 %	3.70 %	4.77 %	0	3. 02 %
Electricity	9.97 %	10.04 %	5.17 %	5.91 %	7.95 %
PDAM water	0	0.76 %	0	0	0.31 %
Total	100.0 %	100.0%	100.0 %	100.0%	100.0 %

(6) Health and Sanitation Condition

The greatest majority of the whole respondents use house toilet, but only less than 4 % still use either river or back yard as toilet. Only less than 7 % use PDAM water, and still about 5 % uses river, but the majority use dug well water for bathing and washing, whereas for cooking and drinking almost 90 % still use dug and tube well, only 6.6 % PDAM water and 6.6 % spring. Most of them drink water after boiled. Most respondents have already treated garbage properly either by burning, burying, or collecting it at waste box. Only 2 % just throw it to the back yard. The common diseases often suffered by the respondent are fever (62 %); cold (45 %); flu (42 %); and TBC/ cough (37 %). All respondents said they usually come to local polyclinic when the member of the family requires medical services. Less than 27 % used to visit midwife, and only 4 % consult a private doctor for check up.

(7) Opinion /Attitude of Respondent towards the Project Plan

The total respondents who did not know yet about the plan of the project accounted to around 84 %, but nearly 16 % said they knew it already. Only 23 % could understand, whereas the rest 77 % still did not understand the potential benefit of the project. Several possible benefits of the project according to the respondents are among others to increase water supply for bathing/washing, for drinking water, for irrigation water and for tourism activity.

The greater percentage of respondents (65.6 %) had no objection to the project plan, but the rest 34.4 % still doubtful /did not agree because they believed that the project would take their land with unfair compensation and make them loss job. If such disadvantageous factors could be avoided, the percentage of those who agreed increase to 97.8%. The landowners who gave their opinions concerning the form of compensation, they mostly preferred cash money, but some preferred exchange with other land of similar type and others still need consensus with other owners. A few owners of land required that their lands should be valued between RP 30 millions and RP 100 millions per are.

The major expectation of the respondents toward the project is among others: it must be beneficial to local community, it should increase water supply for irrigation should create new job, and the project should be realized as soon as possible. The subak heads proposed that the project should not cut the water supply during construction of access road and not to decrease water supply to the subak after operation, provide job opportunity for members of the farm family, the existing road used by the farmers/subak needs widening. The village heads and local residents hoped that the local community would be able to share the project benefit through PDAM water faucet installed at hamlet hall. The project also is expected to employ local workers to the extent possible, to assist the upgrading of villages road adjacent to the project, fair compensation for the land acquisition, assistance to the existing temples located close to the WTP, and so on.

(8) Access to Public Facilities, Local Professional Organization, Gotong Royong Activity, and Security

The project site is located near Denpasar. Thus, just like any other study site there exists sufficient and convenience access to public utilities such like bank, village cooperative, market, shops of various kinds, hospital, polyclinic, public transportation, and many others. About 59 % of total sample have experienced in borrowing from the available banks/cooperatives. Of those, about 55 % for consumptive purpose, 32 % for productive purpose, more than 7 % for medical care and ritual, nearly 4 % for education. Main difficulty in obtaining the credit is said due to the collateral requirement.

For purchasing daily basic needs, nearly 69 % of respondents use the nearby retail shops, 61 % use village market. Of the 35 respondents who usually have agricultural products to sell, about 83% directly sell to the consumers, and the rest to the village/sub district market.

The existence of local professional organization, *gotong royong* activities, and order and security, are generally almost similar condition with those found in other places or villages in Bali as already described in other study sites both in the case of the first social survey as well as in the second social survey.

N-4.2.3 Petanu River Study Site

(1) Demography, Education, and Sources of Livelihood

Two villages which are Sukawati Village of Sukawati Sub district and Saba Village of Blahbatuh Sub district, both belong to Gianyar Regency, are most potentially affected by the project of raw water development to be located at downstream of Petanu River.

Table-N.5 Demographic Aspect, Education, and Sources of Livelihood of the Villages Most Potentially Affected by the Petanu River Raw Water Development Project.

Description	Sukawati Village of Sukawati Sub district	Saba Village of Blahbatuh Sub district
Demographic aspects:		
Number of population (persons)	9,718	7,317
Sex ratio (% of male over female)	92.2	98.6
Number of households	1,928	1,519
Population density (persons/km ²)	1,322	1,109
Education :		
No schooling / not yet in school	21.3 %	43.3 %
Still in elementary school	19.3 %	32.6 %
(E+M+H) graduate #)	57.2 %	23.4 %
University graduate	2.2 %	0.7 %
Main sources of livelihood:		
Agriculture	31.3%	61.5 %
Trade	19.4 %	13.0 %
Industry	21.5 %	6.1 %
Transportation / communication	1.2 %	1.3 %
Government / Services	13.3 %	4.5 %
Others	13.3 %	13.6 %

Note: Source: computed from Sub district of Sukawati in Figure, 2003. And Sub district Blahbatuh in Figure 2003; #) (E+M+H) = Elementary, Middle and High School.

The demographic aspects, education level, and main sources of livelihood of the people living at those mentioned villages can be seen in Table-N.5. Both villages have rather high population density which is more than 1,000 persons per Km². Agriculture still dominant source of livelihood especially in the Village of Saba of Blahbatuh Sub district, whereas in Sukawati Village, trade and industry have become increasingly important sources of income. From education profile, apparently the village of Saba has higher proportion of population still at school age compared to Sukawati Village.

(2) Important Activities Carried Out by Local Community Living Adjacent to the Project Site

a) Religious Activities

The biggest and most important ritual performed at Saba Village known as “*Karya Agung Pedanan*” usually performed once every 30 years on the dark moon of the fourth month according to Balinese calendar (around October). This ritual is almost similar with purification ceremony performed by the villagers of Saba called “*Pedusdusan Agung Desa*”. Several kinds of animals such as buffalo, goat, young cow, chicken, ducks, and goose are used for offering as holy sacrifice. Five (5) years after this ritual, two more rituals but of much smaller scale also needs to be performed. The holy water used for various rituals are taken from the springs found along the river course of Petanu.

Another important ritual by local community of Saba Village is “*nangluk merana*” commonly performed in Bali for purpose of avoiding pest attack and diseases as well as other form of natural calamity. At Saba Village, it is performed every year on dark moon of the sixth month according to Balinese calendar (around Denpasar) at Ciwapati Temple. The animal used as sacrifice is a masculine black pig.

Not like other most villages in Bali, the New Year ceremony (“*Nyepi*”) at the Village of Saba is not carried out on dark moon of the ninth Balinese Month, but on full moon of the tenth Balinese Month. The sacrifice using several animals is aimed for “purification of environment” or for achieving the balance nature.

About 150 m to the east of the planned intake, there exists a holy spring at the adjacent to Anakan Temple. The anniversary ceremony of this temple is on the dark moon of the fourth month (around October) every year for three days duration exactly the same time with the anniversary ceremony of the Dalem Ulun Setra Temple (a village temple for the death) of Saba Village. The holy spring of Anakan Temple is used for various kinds of religious rituals.

The Er Jeruk Temple located at Sukawati Village at downstream of Petanu River close to the beach. This temple is managed by the Subak-gede of Sukawati assisted by the Customary Village of Sukawati. The anniversary festival of this temple is performed 35 days after *Galungan* Festival (a religious ritual to symbolically celebrate the “victory of the good deed against evil”).

b) Daily Life and Economic Activities

Besides used by the subaks for irrigation purpose, both sides of the river are also used by local people especially the farmers to take grasses and green leaves to feed their cattle. At certain points of the river bank is used by local people for quarrying. The local people also sometimes use the river for fishing just for hobby. Springs found along the river course are quite useful besides for rituals, also still important water sources to some people for bathing, washing, and even for cooking and drinking.

A hotel called Lor Inn having 35 units of villas with land area of around 4.5 ha is found nearby the project site but will not be directly affected. The hotel owned by Limited Company of Petanu Utama has 100 employees. A deep tube well is used as a source of water supply.

The project site is located within the area of Sukawati Subak-gede with total paddy land is about 419 ha consisting of 13 member subaks. The WTP is to be located at the area belonged to the Gelumpang Subak. The required land for the WTP is about 0.75 ha. In addition, the land adjacent to the intake may be potentially affected. For access road it needs land acquisition. Therefore, it needs negotiation with the owners. At downstream of the planned intake, no other subak’s intake being found, so the project may not disturb the current irrigation water supply.

The cropping pattern practiced by the farmers at Sukawati Subak-gede is paddy-paddy-*palawija*. The important crops for *palawija* (secondary crops) are corn, soy bean, cassava, etc. The Sukawati Subakgedede is responsible for the management of Er Jeruk Temple as mentioned above. This subak also has several subak temples located surrounding the project site but not directly affected.

(3) Characteristics of the Respondents

Because rapid development of tourism sector in Gianyar especially at Sukawati Village, business undertaking has become increasingly important as main source of livelihood of the people living adjacent to the planned project. More than 34 % of respondents get earnings from trading /business activities, which the same percentage of those working in agricultural activities. The average number of family members contributing to household earning is about 2.3 persons, whereas the size of family averages about 3.9 persons. As an average each household has 1.3 bikes, 1.0 TV sets, 0.8 bicycle. Car is owned only by four respondents.

(4) Housing Condition and Sources of Energy Use

The respondents use brick for wall amount to nearly 53 %, concrete brick almost 46 %, and the rest still use woven bamboo; for the floor they use ceramic/cement (almost more than 98 %); nearly 93% use tile for the roof. The majority of the respondents (73 %) still use firewood for cooking; 41.4 % kerosene, and 21.4 % gas. Where as for lighting all respondents use electricity.

(5) Household Income and Consumption Pattern of the Respondents

The average of total family income for the whole sample amounts to RP 1,115,000 or RP 282,995 per capita per month. The average total household consumption expenditure per month was around RP 912,121 or RP 231,503 per capita. It means that about 82 % of the income was spent for consumption expenditures. Of the total consumption expenditures, almost half was for food and drink. Electricity and PDAM water expenditures comprise only 5 % and 3 % of the total expenditure respectively. In case of

respondents representing poor group, the food and drink items consist nearly 56 % of total consumption expenditure.

Table-N.6 Household Income and Consumption Expenditure per Month by Category of Respondents in Petanu River Study Site, 2005.

Description	Local residents	Owners of land	Poor group	Total Sample
Family size (persons)	3.84	4.47	3.74	3.94
Average total household income (RP)	1,085,938 (282,796 per capita)	2,033,333 (454,884 per capita)	556,522 (148,803 per capita)	1,115,000 (282,995 per capita)
Average consumption expenditure (RP/month)	950,031 (87.5% of total income) (247,404 per capita)	1,315,467 (64.7 % of total income) (294,288 per capita)	596,326 (107.2 % of total income) (159,445 per capita)	912,121 (81.8 % of total income) (231,503 per capita)
Consumption Expenditure by Category of Items (in % of total consumption expenditures)				
Food and drink	43.35 %	54.43 %	55.77 %	49.45%
Transportation	12.02 %	7.75 %	10.64 %	10.41 %
Education	11.92 %	14.44 %	4.83 %	11.18 %
Health	5.57 %	4.18 %	5.22 %	5.07 %
Ritual	12.73 %	7.55 %	14.29 %	11.46 %
Telephone	5.87 %	4.18 %	0	4.09 %
Electricity	5.44 %	4.58 %	6.31 %	5.37 %
PDAM water	3.01 %	2.89 %	2.94 %	2.98 %
Total	100.0 %	100.0 %	100.0%	100.0 %

(6) Health and Sanitation Condition

River and springs are still used by 34 %, and well by about 4 %, but PDAM water is used by more than 74% of total respondents for bathing and washing. As for cooking /drinking, only less than 6 % still use dug well, 44 % river and spring, 54 % PDAM water. The respondents using river and backyard as toilet amount to 20 % whereas more than 84 % already used house toilet.

Some of the respondents do not have garbage disposal facility in their living quarters (about 4 % of them just throw it into river and drainage). Most of them burn it (90%), and about 27 % put it in garbage basket at home to be taken regularly by garbage collector.

The kinds of diseases often suffered by the respondent are cold (70 %); fever (nearly 46%); flu (46 %), and TBC/ cough (41%). In case the member of the family requires medical services they usually come to local policlinic (87%), to midwife (57%), consult a private doctor (10 %) and public hospital (1.4 %).

(7) Opinion /Attitude of Respondent towards the Project Plan

Only 11.4 % of total respondents have known about the planned project which is to be located down stream of Petanu River. The majority said they did not know yet. Only about 21.4% could understand, whereas the rest 78.6 % still did not understand the potential benefit of the project. Several possible benefit mentioned by the respondents are among others to increase irrigated area, increase domestic water supply, for tourism activity, etc.

The respondents who agreed with the planned project account to 71.4 %, whereas 28.6 % still doubtful. Many respondents still worry about the project especially related to land acquisition, loss of job, unfair compensation, and pollution during construction phase. If all of the factors that make them worry about the project plan could be overcome, the percentage of respondents who agreed become to almost 99%. Of the 8 respondents representing landowners, with regard to compensation for their land, four of them are expected exchange with other land of similar type, two preferred exchange with land of any type, and two expected cash money. They proposed that the land should be valued at market price, or at least between RP 50 millions and RP 100 millions per are.

The major expectation of respondents are among others it must be beneficial to the local community, also useful for irrigation, should not pollute environment, and many others. The subak heads proposed that the project should not decrease the water supply to the subak during the construction as well as after operation. To the extent possible, they request additional irrigation water supply especially for Cengceng Subak. Many respondents also proposed the following points:

- Since Petanu River is believed to very sacred, it is necessary to perform proper ritual prior to carrying out any activity especially related to the construction of the project;
- The use of local workers should be given priority during project implementation;
- Further socialization is necessary to local people (of Saba and Sukawati villages);
- The installment of transmission pipe should not disturb the existing irrigation canal and other subak's facilities;
- When the project is operational, the clean water supply for Er Jeruk Temple as well as for local community including some amount of donation during temple festival should be provided;
- Land acquisition should be carried out in a transparent manner.

(8) Access to Public Facilities, Local Professional Organization, Gotong Royong Activity, and Security

The project site is to be located near the bridge of Tohpati-Kusamba Bypass crossing over the Petanu River. Being located within Gianyar Regency one of important tourist center in Bali Province, there are sufficient and convenience public utilities such like bank, village cooperative, market, shops of various kinds, hospital, policlinic, public transportation, and many others. About 70 % of total sample have experienced in borrowing from the available banks/cooperatives. Of those, about 53 % for consumptive purpose, 16.3% for productive purpose, 8 % for medical, etc. Almost no difficulty was encountered in assessing credit.

For purchasing daily basic needs, more than 88 % of respondents use the nearby retail shops, whereas the village market is used by 31%. Of the 40 respondents who have agricultural product of certain kinds, 67.5 % sell directly to consumers and the rest to village / sub district market.

The existence of local professional organization, *gotong royong* activities, and order and security, are generally almost similar with those in other places or villages in Bali as already described in other study sites both in case of first social survey as well as in second social survey, so it will not be repeated here anymore.

N-4.2.4 Badung-Mati Rivers Flood Control Project

(1) Demography, Education, and Sources of Livelihood

Three villages within Kuta Sub district (Kuta, Legian and Seminyak villages) in Badung Regency, and three other villages within Denpasar Barat Sub district (Padang Sambian Klod, Pemecutan Klod, and Dauh Puri Klod villages) in Denpasar City, are potentially affected by the Flood Control Project at Badung and Mati Rivers. Table-N.7 shows demographic aspects, education level, and main sources of livelihood of the people living at those said villages. Villages within Denpasar Barat Sub district indicate extremely high population density (5,882 persons per km²) which is almost five times as dense as villages within Kuta Sub district. Trade and industry are dominant sources of livelihood for the people in Kuta Sub district, while in Denpasar Barat Sub district the most important sources of livelihood are government and services followed by trade.

Table-N.7 Demographic Aspect, Education, and Sources of Livelihood of the Villages Most Potentially Affected by the Flood Control Project at Badung and Mati Rivers.

Description	Villages within Kuta Sub district that most potentially affected (total 3 villages)	Villages within Denpasar Barat Sub district that most potentially affected (total of 3 villages)
Demographic aspects:		
Number of population (persons)	16,847	61,140
Sex ratio (% of male over female)	110.5	105.8
Number of households	3,582	16,203
Population density (persons/km ²)	1,303	5,822
Education :		
No schooling	11.9 %	4.3 %
Still in elementary school	23.2 %	15.2 %
(E+M+H) graduate #)	62.6 %	75.8 %
University graduate	2.3 %	4.7 %
Main sources of livelihood:		
Agriculture	20.56 %	0.85 %
Trade	56.71 %	16.25 %
Industry	13.55 %	0.34 %
Transportation / communication	2.61 %	4.36 %
Government / Services	5.61 %	75.82 %
Others	0.96 %	2.38 %

Note: Source: computed from Sub district of Kuta in Figure, 2003, and from Sub district of Denpasar Barat in Figure, 2003; #) (E+M+H) = Elementary, Middle and High School.

(2) Important Activities Carried Out by Local Community Living Adjacent to the Site of Badung-Mati Rivers Flood Control Project

Badung River flows through the crowded city of Denpasar, a civic center of Bali Province and Mati River flows through Kuta area with a famous beach frequently visited by many tourists from various parts of the world. No wonder the dominant activities of the people living along the rivers are business and other services. A few people still sometimes used the rivers for fishing just for hobby and also to a limited extent especially at upper stream even for bathing and washing.

Flooding at these rivers occurs almost every year because of the following factors: garbage thrown to the river and drainage canals, changing uses of paddy land to other usage, the river body is used for planting certain kind of crops like banana, cassava, coconut trees, etc., and many buildings and houses protruding over both edges of the river completely ignoring the rule concerning river border. Both rivers are also polluted, and the major causes of river pollution are garbage, sewage disposal from small industries like garment, printing, automotive repair shop, and restaurants located very close to both sides of the rivers. River widening is impossible without resettlement and demolition of commercial facilities located at both sides of the rivers. Particularly near the bridge at Gajah Mada Street, there is important village temple and also about 50 m to the south from this bridge there is another small temple at Badung and Kumbasari Markets. Those temples are in fact located exactly at the edge of Badung River. So, the project activities mainly focus on excavation of the riverbed, strengthening, and heightening of river

embankment.

The existing free intakes of Mergaya and Batan Nyuh at Badung River would be adversely affected by the deepening of the riverbed because the river water according to the farmers would not enter the intakes especially during the dry season. The subaks drawing water from those intakes are worried if irrigation water supply would no more available, so that the farmers may lose their source of livelihoods.

The paddy lands located at upper stream and lower stream from Umadui Bridge have important role as temporary natural retaining basin for the Mati River. The lands are still productive for farming activities, but the surrounding paddy land areas are planned to be converted to housing or for other non farming purpose. Considering the high land price, it is worried that the owners of the lands functioning as retaining basin would be tempted to sell their lands under Land Consolidation (LC) program.

There are many subaks taking water from one of several existing weirs / small dams along the river courses of both rivers. The subaks' land areas have been declining significantly because of conversion to other uses brought about by rapid development of tourism and urbanization. For example, Mergaya Subak which formerly had 372 ha of rice lands, now its land area remains only 100 ha. Again, the land area of Tegalantung Subak at present remains only 35 ha from its earlier size of 150 ha. Meanwhile, Cuculan Subak from the former size of 200 ha has declined to become only 100 ha, whereas a drastic change occurred at Lobengan Subak which was from 200 ha, now remains only 5 (five) ha. The cropping pattern is generally paddy-paddy-paddy/*palawija* at Mergaya Subak in which the important *palawija* crops are soy bean, and vegetables. For both Tegalantung and Cuculan Subaks, the farmers here grow twice paddy and once secondary crop / *palawija* a year. The dominant *palawija* crops are soy bean and flowers. Other subaks such like Lobengan Subak grow three times paddy a year. Most farmers in the said subaks are generally more than 50 years old, since the younger farm family members prefer working off-farm especially in tourism sector.

The farmers from the above mentioned subaks complained about the inorganic garbage coming from upstream and polluted irrigation water brought about by garment industry. The garbage often blocked the irrigation canal which caused inundation at the surrounding area and the farmers were compelled to clean the canal many times which is really a burden for them.

(3) Characteristics of the Respondents

Since the study site is within the capital of Bali Province and its surrounding area, needless to say that trade and business undertaking / tertiary sector have become increasingly important as main source of livelihood of the people in this area. In other words, the role of agricultural sector has been declining significantly. More than 53 % of respondents get earnings from trading /business activities, while those who get earning form agriculture accounting to only 26 %. The average number of family members contributing to household earning is about 2.3 persons, whereas the size of family averages about 3.9 persons. As an average, each household has 1.6 units of motor bikes, 1.2 units TV sets, 0.8 bicycles. 0.7 unit bicycle, and 0.8 electric fans. Car is owned only by 10 respondents.

(4) Housing Condition and Sources of Energy Use

Brick for wall is used by about 60 % of respondents, concrete brick by more than 35 %, while woven bamboo by only less than 5 %. Meanwhile, as regard to the material for the floor, nearly 71 % of respondents use ceramic, and more than 28% use cement. As for the roof, almost 91.8 % use tile, the rest either use asbestos (6.4%), iron sheet (0.9 %) or coarse grass (0.9%). Only less than 11 % of the respondents still use firewood for cooking, but more than half (58.2 %) use gas, and kerosene is used by 50 % of them. Where as for lighting all respondents (100%) use electricity.

(5) Household Income and Consumption Pattern of the Respondents

The average of total family income for the whole sample amounts to RP 1,256, 000 or RP 317, 975 per capita per month. The average total household consumption expenditure per month accounts to around RP 1,092,090 or RP 280,023 per capita. Almost 87 % of total income was spent for consumption. Of the total consumption expenditures, slightly less than half (47.6 %) was allocated for food and drink.

Electricity and PDAM water expenditures comprise only 8 % and 1.4 % of the total expenditure respectively. In case of respondents representing poor group, the food and drink items consist of more than 50% of total consumption expenditure. (See Table-N.8.)

Table-N.8 Household Income and Consumption Expenditure per Month by Category of Respondents in Badung-Mati Rivers Study Site, 2005.

Description	Farmers	Local residents	Owners of land	Poor group	Total Sample
Family size (persons)	2.63	4.34	4.73	4.32	3.95
Average total household income (RP)	1,360,000 (517, 110 per capita)	1,381,563 (318, 332 per capita)	1,578,261 (333, 670 per capita)	674,000 (156,018 per capita)	1,256,000 (317, 975 per capita)
Average consumption expenditure (RP/month)	1,106,167 (81.3 % of total income) (420, 596 per capita)	1,180,625 (85.5 % of total income) (274,564 per capita)	1,416, 304 (89.7 % of total income) (288,430 per capita)	663,600 (98.4 % of total income) (153,611 per capita)	1,092,091 (86.9 % of total income) (280,023 per capita)
Consumption Expenditure by Category of Items (in % of total consumption expenditures)					
Food and drink	55.60 %	46.19 %	39.60 %	50.87 %	47.65 %
Transportation	14.55 %	15.22 %	11.51 %	17.36 %	14,33 %
Education	6.63 %	9.93 %	13.97 %	9.22 %	10.01 %
Health	4.99 %	2.81 %	2.70 %	1.69 %	3.23 %
Ritual	8.44 %	8.87 %	10.84 %	8.68 %	9.26 %
Telephone	4.14 %	6.64 %	10.21 %	0.09 %	6.01 %
Electricity	5.15 %	9.20 %	9.16 %	9.70 %	8.14 %
PDAM water	0.50 %	1.15 %	2.01 %	2.38 %	1.37 %
Total	100.0 %	100.0%	100.0 %	100.0%	100.0 %

(6) Health and Sanitation Condition

No respondent uses river water any more for washing and bathing because Badung and Mati Rivers are already polluted. A greater proportion of respondents use well (64.5 %) and PDAM water is used by more than 35 % for bathing and washing. As for cooking /drinking, 31.8 % use dug well, 31 % tube well, 33 % PDAM, and bottled water is used by 4.5 % respondents. The river water is still used as toilet by less than 2 % of respondents, and almost 98 % already used house toilet.

As regard to garbage disposal, more than 57 % of respondents burn it, about 43.6 % put it in a garbage basket at home to be taken regularly by garbage collector, 10 % treat garbage by other ways such as collecting or buried at the house yard.

The most common kinds of diseases often suffered by the respondent are cold (60%); fever (47%); flu (47%), and TBC/ cough (43%). They usually come to the nearest polyclinic (nearly 93%), to midwife (57%), consult a private doctor (66%), public hospital (15.5 %), and midwife (less than 14%) when they need medical services.

(7) Opinion /Attitude of Respondent towards the Project Plan

Only 11.8 % of total respondents have known about the planned project which is to be located at the rivers Badung and Mati for flood mitigation purpose. The majority (more than 88%) said they did not know yet about this project. Only 35.4% could understand, whereas the rest 64.6 % still did not understand the potential benefit of the project. Several possible benefit mentioned by the respondents are among others for flood mitigation, improve water quality for bathing and washing, increase irrigation water, new job opportunity, etc.

The greatest majority of respondents (77.3.2%) agreed with the planned project, whereas 22.7 % were still doubtful. Many respondents still worry about the project. Reasons for their worries are especially related to land acquisition, loss of job, unfair compensation, and pollution during construction phase. If

all of the factors that make them worry about the project plan could be overcome, the percentage of respondents who agreed become to more than 98 %. As for compensation of the lands, one of the following forms is accepted: cash money, exchanged with land of similar kind, exchanged with land of any type. Or, it depends on consensus among the owners. The land's value should range from RP 75 millions to RP 180 millions per m².

The major expectation of respondents is among others it must be beneficial to the local community, the project must be realized as soon as possible, heighten the embankment, increase irrigation water supply, excavation of riverbed, etc.

(8) Access to Public Facilities, Local Professional Organization, Gotong Royong Activity, and Security.

The planned project activities are along the urban rivers of Badung and Mati. Being located within the crowded city of Denpasar and its surrounding areas, needless to say that there are sufficient and convenience public utilities such like bank, village cooperative, market, shops of various kinds, hospital, polyclinic, public transportation, and many others. About 42.7 % of total sample have experienced in borrowing from the available banks/cooperatives. Of these, about 53 % use it for consumptive purpose, 34 % for productive purpose, 13 % for religious ritual, 8 % for education, and 8.5 for medical care and others. Almost no difficulty was encountered in assessing credit.

For purchasing daily basic needs, more than 70% of respondents use the nearby village markets, whereas the nearest retail shops are used by more than 34%. Of the 18 respondents who have fruits garden at their house yard, 66.6 % of them usually sell the product direct to consumers and the rest 33.4 % to village / sub district market.

The existence of local professional organization, and *gotong royong* activities, are generally almost similar with those in other places or villages in Bali as already described in other study sites both in the case of first social survey as well as in second social survey, so it will not be repeated here.

In many big cities of the world, crime is a common phenomenon. Denpasar and particularly Kuta have been "internationalized". The influx of tourists or visitors from various nationalities tends to create conflicts and crimes of various kinds. For example, in Denpasar City alone there occurred 1,652 cases of crime action in the year 2000, but it dropped to only 743 cases in 2003.

N-5 SOCIAL EVALUATION OF FEASIBILITY STUDY

In the implementation of the projects' plan, it is of primary important to take special attention to the potential social impacts of water resources development projects. Especially during pre-construction stage of the project, most impacts that need to be solved in order to facilitate smooth implementation of the project are social aspects in nature. Any development project should not only technically and economically feasible, environmentally friendly, but also must be acceptable and needed by local community. The four prioritized projects are Ayung Reservoir Multipurpose, Petanu River Raw Water Development, Badung-Mati Rivers Flood Control, and Sungai / Penet River Raw Water Development. Social evaluation of each project is described below based on information obtained from stakeholders' meetings and results of social survey in the study site where the project is to be located.

N-5.1.1 Ayung Reservoir Multipurpose Project

Ayung Reservoir Multipurpose Project is to be located at downstream of about 500 m from the confluence points of both Ayung River and Siap tributary at Banjar Buangga, Getasan Village. This is a multipurpose project to improve the supply of clean /drinking water for the central part of Denpasar Metropolitan Area known as SARBAGITAKU (Denpasar, Badung, Gianyar, Tabanan, and Klungkung regencies), irrigation, electricity, and environmental water. The project plan is welcome by most of the stakeholders and they seem to be very eager that the project should be realized soon provided that several critical issues and other potential negative impacts which make them worried about the project could be settled properly. This will be described below.

(1) Pre-construction phase

a) Land acquisition issue

The project requires about 73 ha for the project site which will be submerged when the reservoir is in operational. Concerning the land to be submerged, it still needs further identification with special regard to the precise location, size, and owners of the land. Further socialization and negotiation about the value or terms of compensation is still needed. However, a greater percentage (almost 58%) of the interviewed landowners wants other similar type of land. The rest of the respondents said that they just follow the other owners through consensus. In general, most of them are ready to give their land to be used for the project site. Since the land to be submerged mostly owned by the desa adapt (customary village), the land acquisition may not be so big a problem, if the head of desa adat would accept the compensation for the land acquisition. During the interview with the head of desa adat (Susut Village), he also expressed his readiness to allow the project take the land.

No problem of access road, since it is already available from Petang to Payangan (its width is about 6 m) not included the drainage canals of both sides of the road. In connection with the access road possibly no land or other assets acquisition is required.

Agreement or contract document between related villages' heads and project implementer concerning important matters such as compensation before the project get started, is of primary important as reference for its implementation.

b) Adverse affect to existing holy springs and other places with religious value

As described in Section M-3.2.2, there are several holy places in and around the site. Among these places, one holy spring located about 200 m below Tangluk Temple will be submerged. However, the local people can not decide whether or not the existing holy spring can be replaced by other springs which may not be submerged, unless a higher authority e.g. the Council of Hindu Religion and the high priest would guarantee the safe consequent of this replacement and yet this should be socialized to the community concerned. In fact as it was informed, there are about at least 7 other holy springs located at upper stream of the project site from which the local people used to take water for various kinds of religious rituals which would not be submerged, since they are rather far from the site. It is necessary therefore, prior to detail design, the Hindu Council of Gianyar, the head of desa adat (customary law village) of Susut, the local priest (pemangku) of Tangluk Temple, and the project planner altogether organize a meeting to get a consensus concerning this particular matter. Hopefully, there is still a great possibility that a consensus may be achieved through persuasion, to clearly inform about the benefit of the project, and be ready to accommodate needs and aspiration of local people.

c) Adverse effect to business activities

The area around as well as in the river is not used only for religious rituals, but also for certain business activities. Important activities are related to tourism such as rafting, and villa. There are found 3 rafting business: Bali Discovery, Bali Fantasi, and Bali Holiday. Being located at upper stream from the planned reservoir, all of them will be adversely affected. Particularly, in case of Bali Holiday, it has route starting from Kesianan Hamlet of Pangsan Village and finish at Buangga Hamlet of Getasan Village. It takes around one hour. There about 50 employees consisting of local residents of both hamlets mentioned above. The company gives contribution amounting to RP 150,000 per month to the Customary Village, and also RP 150,000 to be equally shared by the owners of land being used for passing through of its customers. The staff worry about the loss of job as the rafting business might be stopped. Accordingly, compensation is required to mitigate this adverse effect.

Two villas namely Ubud Hanging Garden and Vila Nandini are found close to the project site. These villas make best use of the view of the river side at the eastern part of the Siap tributary. These villas may not be adversely affected, especially if water surface will be below the foot of the bridge of Susut. On the contrary the view will even be better.

(2) Construction phase

a) Effects on tourism activity

Elephant safari for tourism is another important activity adjacent to Ayung River starting from Beng Hamlet, Carangsari Village passing the route through southward and back to the start line. Normally, there are about 200 tourists everyday. Donation by management of the company amounting to RP 200,000 per month to the Desa Adat of Buangga (Customary Village) and the same amount also to the Desa Dinas of Buangga (Administrative Village of Buangga). During construction stage this activity may be slightly affected due to transportation of the project. This should be further socialized and counter measure to minimize the adverse impact needs to be endeavored.

b) Effects on burial ceremony of the Chinese cemetery

Other important place related to the religion is a Chinese Cemetery located above the planned reservoir at eastern side of Ayung River (at the village of Payangan Desa, Gianyar). This cemetery belongs to about 72 Chinese households. These people worry about the project because during the construction stage particularly during rehabilitation of access road, it would potentially disturb the burial ceremony or other events related to their custom and tradition such as Cingbing around April for 7 days. Counter measures for mitigating this effect shall be endeavored.

c) Anxiety of local community concerning the recruitment of outside laborers

The project requires considerable number of workers mostly unskilled laborers. Local people want to be involved in the works. To accommodate the influx of outside workers requires new place or area. This new "settlement" may create various problems such as sanitation, security, conflict with local people due to friction among ethnics of different culture and tradition, etc. Project implementer shall make a good coordination with heads of the relevant sub districts, villages, and local Police Office how to minimize such potential adverse effects of the project.

d) Effects on the black and grey monkeys

Villagers living adjacent to the river worry about the effects of the project to the monkey's habitat. New habitat for the black and grey monkey at the surrounding area of the project site should be endeavored in order they will not disturb the existing fruit garden as well as the villagers themselves.

(3) Post-Construction Phase

a) Distribution effects of the project

Upstream communities are concerned about equity implication of the project that gets what. Accordingly, the equity dimension of project benefit in relation to the provision of electricity, PDAM water, and investment opportunity between the upstream and down stream community on the one hand and between Badung Regency and Gianyar Regency on the other, needs to be also properly taken into account to avoid conflict after project is already in operation. If this can be properly designed, it is likely the project will be sustainable from social consideration point of view.

b) Anxiety of local community concerning other adverse effects

The social survey at the project site revealed that there are many respondents still do not know about the project plan, so that most of them expressed their worries if the project would bring negative impacts to the local community. For example, they worry about the safety of the reservoir structure, the reduction of river discharge to the lower stream subak's intakes, landslides and erosion, etc. Further socialization concerning the project plan at least during the preparation of detail design may help them better understand especially its future benefit to Bali community in general and local residents in particular.

Judging from the above information, it can be concluded that the project may be quite acceptable by the local people as the counter measures to such issues that make the local people worry about the project which may adversely affect them could be endeavored to the extent possible.

N-5.1.2 Petanu River Raw Water Development Project

Petanu River Raw Water Development (East System of Denpasar Metropolitan Area Water Supply) is to be located at the River Mouth of Petanu River and its water treatment plant is nearby the River Mouth of the same river in the District of Gianyar. The water will be conveyed to Badung PT.TB and Gianyar PDAM. The stakeholders also quite welcome the project plan and since its location is at downstream its implementation will be not so difficult. However, a few minor problems still necessary to be clarified and solved such like holy springs, and land acquisition.

(1) Pre-construction phase

a) Land acquisition issue

Land acquisition problem will not be so serious. However, the land of about 0.75 ha located at Glumpang Hamlet of Sukawati Village to be used for the site of Water Treatment Plant (WTP) needs to be first informed to the landowners. Coordination with related parties like head of related subak, head of hamlet and head of the village should also be regarded as important to avoid misunderstanding and miscommunication.

b) Adverse affect to existing holy springs and other places with religious value

The local people are worried about the possibility of the existing holy springs to be submerged if intake is to be built. They suggested that the surface of river water should be kept at the same level as at the present condition. But as the intake is small size and not so high, it will not significantly affect the existing springs. This shall be clarified further prior to detail design.

(2) Construction phase

No serious adverse effects to the community except during the transmission pipe laying works along the roads, especially along crowded traffic of Bypass Sanur Highway which may disturb the regular traffic. But this shall be properly managed as described under environmental evaluation. Further more, since the intake and water treatment plant are located outside of human settlement, no significant potential adverse effect on the local residents due to noise, dust, and vibration.

The farmers of Sukawati Subak worried if their irrigation canal would be disturbed during construction work so that they would not be able to cultivate according to schedule. This matter shall be carefully taken into account.

(3) Post-Construction phase

The local people worried about the safety of the intake structure. The quality /strength of construction need to be guaranteed. It was informed that usually around the months of January, February and March every year especially during heavy rain, river water over flows up to Bridge of Pinda River.

No significant adverse effects being identified on the local community during operation of the project. It has potential effect on distribution of project benefit. During dry season the subak of Sukawati is in need of irrigation water. This subak requests a small share of the water from the project. During limited water discharge (dry season), it is worried if the project would disturb water supply of the upstream subaks through collusion with dam keeper. When the project has been already in operation, the local community would like to get contribution in form of clean water to the Er Jeruk Temple; donation from the project to Villages of Saba and Sukawati and Er Jeruk Temple; quick realization of the Master Plan for upstream areas and Unda River by clearly define the pattern of distribution and management of the available water among SARBAGITAKU.

It seems clear that most of the points mentioned above are just hope and expectation from the stakeholders, and no serious problem being found. Those requests and proposals may not be so difficult to fulfill by the project implementer and through good coordination with relevant agencies any adjustment could be made to suit the local condition.

Hence, this project is also socially feasible since quite acceptable by the stakeholders including the residents living close to the project site and the adverse effects are not significant.

N-5.1.3Sungi River Raw Water Development Project

Penet River Raw Water Development (West System of Denpasar Metropolitan Area Water Supply) the water intake of which is to be located at down Stream of Sungi /Penet River and its water treatment plant is not so far from the intake. In Phase I, water will be conveyed to Denpasar PDAM, but gradually will be returned to Badung PDAM. Since the project site is at downstream of the river, the project plan is quite welcome by most of the stakeholders especially the subaks and they seem to be very eager that the project should be realized as soon possible. Initially, the project was to be located at upper stream of the river but since many subaks opposed it, then the site is to be moved to the down stream.

(1) Pre-construction phase

a) Land acquisition issue

To build the water intake requires access road, but apparently it is not a problem. It can use the existing subak road that enters from the Mengwi -Tanah Lot Road direct to the site (Village of Mengening). The better alternative is to modify it in order to be straight rather than to exactly following the present subak road since it will become much shorter and no problem of house and family temple being adversely affected. It is about 2 km long and it may be used for public transportation but the rice fields surrounding the new road should be protected and prohibited to change it to other non farming uses. In other words, the “green space” policy needs to be implemented around this new road. In addition, the existing irrigation canals, water division structures and small rice field temples need to be carefully taken into consideration during making detail design in order not to become dysfunctional. The new road needs land acquisition, but this may not be a very serious problem, since the compensation can be negotiated with the owners of the land. The land of around 0.75 ha to be used as the site of the WTP belongs to the government and currently is tilled by 2 farmers, but they need compensation for loss of the job.

(2) Construction phase

During construction stage, it is proposed to use local workers according the skills they posses, and the planting schedule of the subaks should not be disturbed. Though several adverse effects may be developed due to problems related to the transportation of construction material during the construction of access road and the installment of transmission pipes, appropriate mitigation measures will be carried out.

(3) Post-Construction Phase

No significant adverse effects on the community after the project are in operational. The potential adverse effects seem to be related to social jealousy as a result of the share of the project's benefit. After completion of the project, the villagers surrounding the project especially from Cemagi and Munggu Villages need a share of the project's benefit in form of public clean water facilities to be placed at Banjar Hall, Temple, etc. The PDAM is expected to provide certain contribution either in cash or in kind during important event such as temple ceremony. Several other requests were raised by the stakeholders are listed below:

- A small road to a cemetery owned by Christian residents needs upgrading and widening, since it is used also by non Christian residents;
- A small road of about 200 m toward a small temple is needed. The local people are ready to give the land for that road, but assistance is required for its construction;
- The road to the beach is required for the procession of religious ritual, but needs widening.

Assistant from the project is required and this may be incorporated with the construction of access road to the project site;

As compared to Ayung Reservoir Multipurpose Project and Petanu River Raw Water Development Project, it seems likely that the Sungai River Raw Water Development Project is much easier to implement since almost no serious adverse effects being identified. Most of the requests as noted above could also be fulfilled through negotiation between local residents and project's implementer and related agencies.

In conclusion, the Sungai/Penet River Raw Water Development Project is feasible from the social point of view since it is supported by most of the stakeholders including the related subaks and the adverse effects are not so significant.

N-5.1.4 Badung-Mati Rivers Flood Control Project

This project mainly comprises of riverbed excavation of Badung River and Mati River. For Badung River, the excavation will take place between Buagan Weir and Gajah Mada Street, whereas for Mati River it will be between Gunung Soputan Street and Bypass Street to improve flow capability. Flooding from Badung and Mati Rivers almost occurs every year, so the people living in Denpasar and surrounding areas are expecting very much that the flood could be control or mitigated as soon as possible. Thus from the stakeholders' meetings it can be concluded that most of the people strongly support the project. However certain issues need to be noted.

(1) Pre-construction phase

a) Landuse regulation and other issues

The project requires landuse regulation for retarding basin for Mati River improvement of around 15 ha located at Umadwi. It was suggested that the matter needs to be tackled by related government agencies and socialization as well as negotiation with the landowners concerning the compensation problems for the regulation of their land should be carried out in such a way so that it can satisfy the owners. To the extent possible, land acquisition will be handled through negotiation in a transparent, accountable, fair and honest manner.

The subaks want that the intakes of Batannyuh, Buagan, and Margaya at Badung River should be kept functioning to irrigate the subaks' paddy fields drawing water from those intakes. At the same time efforts to minimize sedimentation need to be done.

As the project will focus on excavation for deepening river bed and other related activities such as strengthening and heightening of embankment, etc., without river widening, the adverse effects on resident settlement will not be found.

(2) Construction phase

There are some adverse effects to the community especially to the residents living adjacent to both sides of the river due to noise, dust, vibration, and traffic jam during the movement of trucks carrying out the dredged material. However, this will be managed properly as described under environmental evaluation to mitigate such disturbances.

The subaks taking water from the rivers of Badung and Mati worried about the possibility of the project to cut the irrigation water supply during the construction stage. Thus, to mitigate this, a temporary connection to the concerned subaks will be made.

During stakeholders' meetings some suggestions and requests related to river improvement activities were raised among others are as follows:

- To build a connecting canal from Tebe Creek to Badung River along Imam Bonjol Street;
- The land along River Mati from Bias Temple up to Pulau Roon Bridge (at Br. Pengiasan) needs acquisition so that river embankment construction can be continued until Pulau Roon Bridge;
- Other relevant garbage management improvement is needed, such like: installing "garbage trap"

at certain places; putting the sign prohibiting the throwing of garbage, at several point including the text of Government Regulation to be followed by intensive control and strict law enforcement; the lamps along the river should be kept functioning; the customary village (desa pakraman/ adat) administrators may be empowered by giving a role in controlling the behavior of the resident concerning garbage disposal; manpower, salary, and facilities of the Garbage Collecting Crew should be enhanced or improved; the land consolidation project (LC) at Semile, Melangi, and Mergaya should not block the irrigation canals of the existing subak; to record the river discharge at certain places during the normal condition; upstream of Mati River especially East of Br. Teges at Purnawira settlement needs stronger embankment.

(3) Post-Construction Phase

So far, almost no potential adverse effects of the flood mitigation project for Badung –Mati Rivers on the community are to be found or could be anticipated.

Thus, the Badung-Mati Rivers Flood Control Project can be considered as socially acceptable, being no one may likely reject this flood control project since it contains mostly activities of excavation, and embankment strengthening without widening so that no need for removal of human settlement. However, one crucial problem remains to be solved: whether or not the existing land which is required for retaining basin can be guaranteed not to be converted to non farming purpose. Further coordination efforts with related agencies such like Regional Planning Board, National Land Agency, Public Works, etc., is considered very important to confirm the future use of the concerned land. Local Government Regulation (Denpasar City) is needed to preserve the existing land functioning as natural retaining basin and therefore any effort to carry out Land Consolidation (LC) project in this area should not be tolerated; without retaining basin and under present condition it may be difficult if not impossible to solve the flooding problems in Denpasar and its surrounding areas in a sustainable manner.

Finally, for smooth implementation of any project, it is well recognized, that it is a common practice in Bali, during construction phase, the project implementer should first consult the high priest or persons regarded as competent in dealing with spiritual and religious matters. Prior to starting of construction, a ritual needs to be performed. The expert on this matter will give advice about what kinds of materials or kind of offerings should be prepared and what the best day to perform such ritual. Also, to change the use of paddy fields to non paddy farming and non agricultural purpose must follow the special ritual and this also needs advise from the priest or other competent persons. Neglecting this tradition and religious ritual according the belief of Hindu Balinese, may result in unexpected events that inhibit the smooth running of any activities carried out in the location.

Appendices

Appendix-1

Condition of Poor Group

APPENDIX-1 Criteria for Poor Family

There are two versions of criteria for determining poor family. These are:

1. Based on the criteria used by BKKBN (National Family Planning Coordinating Board of Bali Province, and
2. Based on the BPS (Central Bureau of Statistic), Bali Province.

BKKBN uses the following indicators as criteria for poverty:

No	INDICATOR
1	In general the family members take meal maximum twice a day
2	The family members have no separate cloth staying home, for working/going to school, and traveling
3	The greatest portion of the floor of the house is earth not ceramic or cement
4	The sick family member is not brought to policlinic or hospital for medical consultation
5	The family members do not eat meat, fish, or egg, for more than a week.
6	During the last one year, the family members only get one pair of clothing
7	The size of room for each family member is maximum 8 M ²
8	The child of 7-15 years of age does not enter elementary school

The BPS (Central Bureau of Statistic) of Bali Province uses the criteria as the following:

No	INDICATOR
1	The size of house floor is < 8 m ² per each family member
2	The type of material used for the floor is bamboo/earth/ cheap wood
3	House wall made of cheap wood, the wall without cement
4	No toilet / shares with neighbor
5	Source of lighting in the house is not electricity
6	Source of drinking water is well/ unprotected spring/river/ rain water
7	Source of energy for cooking is firewood/ charcoal / kerosene
8	No meat/milk/chicken consumption within a week
9	The family members only buy one pair of clothing per year
10	Take meal 1-2 times per day
11	Can not afford to pay the cost of medicine at policlinic
12	Sources of income are from farming with less than 0.5 ha of cultivated land, landless laborer, fisherman, semi skilled construction worker, or other jobs with wage under RP 600,000 per month
13	The highest level of education attainment of the household head only finish elementary school
14	The family has no saving or asset easily sold with the money value at least RP 500,000.

Note: The BKKBN since 2004 has been providing rice subsidy to the poor family (“rice for the poor” program) amounting to 10-20 kg per household per month with the price equivalent to RP 1,000 /kg. Meanwhile, the BPS since the end of 2005 providing assistance to the poor in form of direct cash payment as a replacement of BBM (gasoline) subsidy amounting to RP 100,000 per household per month and to be paid every three months.

APPENDIX-2 Number of Poor Households According to BKKBN and BPS by Regency in Bali Province

No	Regency	BKKBN (#)	BPS (@)
1	Jembrana	6,034	7,069
2	Tabanan	11,513	11,369
3	Badung	2,713	4,001
4	Denpasar	571	3,639
5	Gianyar	5,126	6,473
6	Bangli	12,717	10,449
7	Klungkung	8,658	6,948
8	Karangasem	33,336	32,328

9	Buleleng	39,568	36,171
	Total	120,236	118,447

Sources: (#) Information from a staff of BPS of Bali Province, 2005; @) information provided by a staff of BKKBN.

APPENDIX-3 Number of Poor Household at Selected Sub district According to BKKBN

No	Sub district *)	Regency/City	Number of household A	Number of Poor household B	Ratio of B/A (%)
1	Petang	Badung	7,218	250	3.46
2	Abiansemal	Badung	20,636	1,055	5.11
3	Mengwi	Badung	24,420	845	3.46
4	East Denpasar	Denpasar	26,056	186	0.71
5	Kediri	Tabanan	18,722	1,602	6.06
6	Payangan	Gianyar	10,407	631	8.56
7	Sukawati	Gianyar	18,585	380	2.04
8	Blahbatuh	Gianyar	14,626	872	5.96

Source: information provided by a staff of BKKBN;

Note: *) Several sub districts most potentially affected by the concerned projects.

JAPAN INTERNATIONAL COOPERATION AGENCY

**DIRECTORATE GENERAL OF WATER RESOURCES,
MINISTRY OF PUBLIC WORKS
PUBLIC WORKS SERVICE, BALI PROVINCE**

**THE COMPREHENSIVE STUDY
ON
WATER RESOURCES DEVELOPMENT
AND MANAGEMENT IN BALI PROVINCE
IN
THE REPUBLIC OF INDONESIA**

**FINAL REPORT
SUPPORTING REPORT**

[O] PCM-TRAINING

AUGUST 2006

**YACHIYO ENGINEERING CO., LTD.
NIPPON KOEI CO., LTD.**

THE COMPREHENSIVE STUDY ON WATER RESOURCES DEVELOPMENT
AND MANAGEMENT IN BALI PROVINCE
IN THE REPUBLIC OF INDONESIA

SUPPORTING REPORT (O)
PCM-TRAINING

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O-1 OUTLINE OF TRAINING COURSE

In the stakeholders' meetings which held in October and December 2004, and May 2005, some tools of Project Cycle Management (PCM) method and Participatory Rural Appraisal (PRA) were applied in order to collect broad opinions from all participants. The Counterpart Team was appointed to stakeholders meetings as facilitators for group meetings. Through the meetings, the Counterparts Team understood importance of applying participatory approach in the planning procedure and requested the Study Team to have training for participatory planning. Upon this request, the Study Team had a training course for PCM and PRA aiming to equip the Counterpart Team with theories and application of PCM and PRA.

The course introduced practical knowledge and skills of holding workshops with local residents, and the participants were expected to apply those tools to their work. Therefore, the course was designed to achieve the followings:

- To understand the outline and overall flow of the PCM method
- To examine how to apply the method to their own project

17 participants consisting of the Counterpart Team and other Sub-Dinas SDAPP staff participated in the training.

O-2 TRAINING CONTENTS AND RESULT

The training course consisted of lectures by moderator, group exercises using a case study, Q & A session and course review. Daily review and test are also conducted in order to deepen understandings. Agenda of the training is shown in Table-O.1.

Table-O.1 Agenda of Training

Date	Jun. 14	Jun. 15	Jun. 16	Jun. 17
AM	<ul style="list-style-type: none"> ▪ Introduction ▪ Case Understanding ▪ Stakeholder Analysis 	<ul style="list-style-type: none"> ▪ Problem Analysis 	<ul style="list-style-type: none"> ▪ Project Selection ▪ PDM Formulation 	<ul style="list-style-type: none"> ▪ Indicators & MOV ▪ Resources & Pre-conditions
PM	<ul style="list-style-type: none"> ▪ Info. Gathering Techniques <ul style="list-style-type: none"> ➢ Interview ➢ Visualization 	<ul style="list-style-type: none"> ▪ Objective Analysis 	<ul style="list-style-type: none"> ▪ Project Summary ▪ Important Assumptions 	<ul style="list-style-type: none"> ▪ Monitoring ▪ Q & A ▪ Course Review ▪ Test

As a case study, water issue in fictional metropolitan city named as "Mirai City" was selected since the participants were familiar with water related issues. In the group exercise, the participants were divided into two groups according to sex, age, and post.

Contents and result of the training course are as follows.

O-2.1 Opening/Introduction

After the opening by Sub-Dinas SDAPP and the Study Team, the training started from the self-introduction session. In the session, the Moderator asked the participants to write his/her name, main duties, expectation to the training, and what they do in holiday in cards as ice-breaking. Many of the participants expressed their strong will to learn the PCM method, and the class atmosphere become much relaxed when they knew about their class mates' hobbies and favorite things to do during holiday.

After the self-introduction, the Moderator briefly explained the outlines of the PCM method. The main contents were the characteristics of the method, meaning and benefits of participatory approach, as well as the roles of PCM workshop moderators.

O-2.2 Stakeholders Analysis

Stakeholders Analysis was explained as one of situation analysis focusing on people and organizations in the concerned area. The analysis was divided into two different levels and explained.

At first, the moderator explained how to list up all the stakeholders' names by using one card for one stakeholder. The listing-up exercise was done in a plenary session on one big board. After the 20-25 names were identified, some volunteers of the participants were requested to sort out the cards, which were demonstrated into three groups of "financial supporters to the project", "service providers" and "service receivers".

And then, the detailed analysis of stakeholders was explained and its exercise was done by a small group of 4 members. The items for the analysis were "Basic information," "Problems," "Strength /Good Points" and "Possible measures to be taken." Four groups chose one stakeholder each as they liked. However, later some of them found the data in the case materials not enough and changed the stakeholders for the detailed analysis.

The analysis was easily understood and the participants enjoyed the work. However, some groups took time in finding "the measures to be taken."

O-2.3 Information Gathering Techniques

The PCM method is based on participatory approach, by which the planners should understand the situation, realize the importance of real needs of people concerned such as target groups and involve the stakeholders in the project planning. In general, after each analysis of the PCM towards PDM formulation (project planning), the additional survey is required on information, which is found lack to proceed to the next analysis. When the stakeholders analysis was done in the previous session, the participants realized several important information was missing. Using this setting, the information gathering techniques of interviews and visualization were explained.

The 1st exercise was on interviews. The participants were asked to make question items on the missing information which were found in the stakeholders analysis. They also identified information resource (persons and organizations) to ask questions and prepared the 2nd questions by guessing the replays to the 1st questions in interview.

Then, as for the 2nd technique, they tried to draw diagrams or maps, choosing one among several tasks given;

1. Map of Mirai City
2. The water distribution flow with water purification plants
3. Complain of the slum people on shortage of water
4. Issues and problems of Water Supply Company (in Benn's diagram)
5. Campaign poster for saving water in the daily life
6. Daily activity with water on Bali life (daily time line)

The theory and issues taken in this session are from the PRA. Involvement and active participation of the people to project planning, especially target groups, were repeated with other principle thought of this method.

O-2.4 Problems Analysis

As for the Problems Analysis, the Moderator explained the logic of analysis, 'cause-effect', meanings of the Core Problem, how to write problem cards, and how to make a Problem Tree. The Core Problem 'Drinking water in Metro Mirai is lacked' was given by the Moderator to make the exercise start, while the moderator added an explanation that the Core Problem should be discussed by the participants in a real workshop thoroughly.

The participants first seemed to be confused at the logic of the Problems Analysis, and difficult to place problem cards with the relation of 'cause-effect'. Especially the Direct Effects of the Core Problem were firstly written illogically. However, with detail instructions from the Co-moderator and

discussions among the participants, they gradually came to understand the logic, and were able to formulate a Problem Tree properly at the end of the exercise.

Another particular tendency found in the exercise was the expressions of problem cards. The problem cards are suggested in a sentence like 'There is no water in the village' to clarify the problems. However, the participants tended to write them in a short phrase like 'No water'. It may be a grammatical matter that expressing problems in sentences is difficult in Indonesian language, although this may hinder deep analysis by the participants.

O-2.5 Objectives Analysis

The Objectives Analysis is to find out solutions to the problems on the Problems Tree. However, the moderator emphasized that it was not a simple process as merely changing problems cards with negative expressions to solution cards with positive ones. Five important points were explained when the Objective Tree was made from the Problem tree;

1. means-ends relationship (cause and effect relationship in the Problems Analysis)
2. desirable situation (negative situation in the Problems Analysis)
3. solution (problems situation in the Problems Analysis)
4. future (present situation in the Problems Analysis)
5. feasible (negative situation in the Problems Analysis)

And further the participants were said to add some solution cards when necessary or to omit the problem cards when there could not be corresponding objective cards which fulfill the above points.

This exercise was not so difficult for the participants, compared to the cause and effect relations on the Problem Tree. However, the analysis did not reach to the concrete solutions, which are usually shown in the cards of the third or fourth level downward from the core objective and which are compatible to "the activities" in PDM in the later process.

O-2.6 Project Selection

The Project Selection has some steps to follow, which may sometimes confuse the participants and loose the flow of the method. The points of this analysis were four;

1. The resource constrains are common for any kind of activities, projects and programs. Therefore selection process is inevitable from all needed solutions.
2. 1st selection process: This is rough and its conditions are usually given before the planning is started such as budget, the type and the field of project-to-be.
3. Clarification and agreement of selection criteria: The criteria are sometimes given to the planners. If not, clarification and selection of criteria are parts of the planners' work.
4. 2nd selection with decided selection criteria: This is more detailed and complex compared to 1st selection. The selection process should be properly recorded with facts and reasons for further discussion or improvement.

On the exercise, one approach was selected in each group in a short time, which was much less than expected by the moderators. In the real settings in the field, it often takes months to choose one for a project.

O-2.7 PDM Formulation and Project Summary

The moderator first introduced that a PDM (Project Design Matrix), which is often called a 'Logical Framework', is used by many other donor agencies. It would be very useful for the participants to communicate with such donors since PDM/Logical Framework related words can be regarded as a common language for project management worldwide.

The Moderator then explained that information such as a project name, duration, target group and area, etc. were to be filled at first in the PDM formulation. Putting a version number in the PDM was also emphasized since the number represents the modification of the PDM during the project period.

As for the Narrative Summary, definitions and points of each part in the Summary were explained. These parts in the column of the summary are interrelated in accordance with the logic of ‘means – ends’. The moderator explained how to shift the result of the Project Selection to the Narrative Summary as well.

During the exercise, the participants simply tried to copy the Objective cards into each column in the Narrative Summary. However, the Outputs, such as ‘the quality of water improved’ or ‘Quantity of water improved’ expressed in the Objective Analysis could not be changed into direct means to achieve the Project Purpose. Therefore, the participants rewrote these cards as ‘A range of water distribution widened’ and ‘Amount of water in household increased’. Through these exercise, the participants were able to grasp how to clarify the relation between Outputs and Project Purpose, and how to formulate a project plan at the stage of filling the Narrative Summary based on the result of the project selection.

O-2.8 PDM: Important Assumptions

This was explained as “external risks” with some examples. And the explanations on how to identify assumptions including the results of Project Selection on the Objectives Tree, how to express them and where to write (fill) them in PDM with vertical logical relationship were followed with the examples. In the group exercise, the participants learned the way to sort out the candidates of assumptions and to identify “killer assumptions”. The participants might feel very difficult in the concept of assumptions since they might not be familiar with ideas on risk itself and risk management. The concept would be more easily understood if they expose the concept of evaluation and feed-back of its lessons-learned.

O-2.9 PDM: Resources (Inputs) & Pre-conditions

The resources are drawn and calculated from each activity in the PDM. And after being identified on each activity, they are made total by items (personnel, facility, equipment and other budget) and divided into each resource provider such as donor, recipient country and NGOs. The participants were requested to do exercise on identifying major resources in two activities and to sum up by items.

On the Pre-conditions, its definition and the way to identify them were explained with the diagrams on the board. The group work for exercise was not done. It was emphasized that the common procedures on project contracts and implementation in general and the same items in PDM are not accepted as the pre-conditions, which should be specific for an individual project.

O-2.10 PDM: Objectively Verifiable Indicators (OVI) & Means of Verification (MOV)

First the Moderator explained the definition of OVI presenting a simple example. Several important points of OVIs emphasized were;

1. OVIs of Overall goal, Project Purpose, and Outputs can not be the same in accordance with the logic among the Narrative Summary.
2. Through setting OVIs, the contents in the Narrative Summary can be clarified.
3. Baseline data should be collected for setting OVIs.

There was a question from the participants asking if OVI should be set to each Output or it is possible to compile plural Outputs and set one OVI. The moderator answered that each Output has own OVI, and there can be more than one OVI to be set for one Output if necessary.

The moderator then gave an explanation about MOV, as the data source of OVI, and the participants began exercise. During the exercise, the participants tended to set rather unrealistic OVIs. The moderator suggested the participants set achievable OVIs using their own professional knowledge. Credibility of the MOV was also discussed among the participants, and they set several MOVs for one OVI.

After both groups completed the PDM, the participants presented each PDM. After the presentations, they wrote some points that could improve PDM of the other group. By doing this exercise, the participants learned that PDM (=project plan) can be improved by receiving other people’s opinions.

On the other hand, the characteristics of Indonesian or Balinese people with which they tend not to criticize others but to show an appreciation of each other's efforts, was prominent in the exercise.

O-2.11 Monitoring

Regarding monitoring of a project, the Moderator highlighted that it is the project implementers' responsibility to check if the project proceeds in accordance with the project plan, (the PDM) or not. At the same time, the Moderator added that monitoring should be done periodically and the PDM (project plan) would be modified as the result of monitoring. The idea of monitoring seemed familiar with the participants as they usually use a quality check list to monitor their daily work.

After explanation of monitoring, a brief explanation about a monitoring system followed. The Moderator emphasized that a monitoring system is a very important tool by which, information within the project, or information between the project and decision makers in Head Quarters would smoothly flow. Although there was no exercise for the session, the participants seemed to understand the importance of monitoring and monitoring system sufficiently.

O-2.12 Q & A Session and Course Review

In the review session, the moderator summarized the course contents by reviewing the planning process of all analytical steps with each key points such as the role of analysis, the position in the process and the relation from the previous and to the next steps. And again the participatory approach was emphasized as a very basic and important concept of all steps in PCM method. The some questions for clarification of the method were raised by the participants and answered.

O-3 RESULT OF THE QUESTIONNAIRE

At the end of training course, questionnaire survey on the training was conducted. As a whole, there were many participants who evaluated the course very favorable. Especially nearly all the participants answered 'yes' to the question about recommendation of the method their work and organization. The result presents that the participants recognized the effectiveness of PCM method and showed their strong intention to apply the methods to their work.

It also can be regarded from the result of evaluation that the choice of case material was appropriate. The case was very helpful to understand the method because the theme was about the problem of water distribution which was familiar with the participants.

Regarding self-evaluation of achievement level, most of the participants evaluated themselves that they fairly understood PCM & PRA method. On the other hand, some of them pointed out that it was difficult to write appropriate cards and place them with the logics of PCM during exercise even though they thought they understood the theory explained in the lectures.

Lastly, 15 participants out of 17 showed their strong interest in taking further training on the monitoring and evaluation parts. As mentioned above, it is sure that their understanding in PCM method will be much more enhanced and that they will be able to grasp a total image of PCM method if there is an opportunity to learn monitoring and evaluation or follow up course to review what they learned in near future.

O-4 CONCLUSION AND RECOMMENDATION

Participants were very cheerful and made the training atmosphere relaxed and easy. It showed that the Bali people are good at group discussion and making everyone participate in group. This characteristic of the people is one of most important attitudes of both participants and moderators to successful PCM workshop. In the group discussion, there were not the dominant persons who took over the group and the topic either by his/her position or seniority.

On the other hand, it looks like the participants were not so familiar with logical analysis such as

cause-effect and means-ends, and felt difficulty in formulation of the project to be built on the analytical steps. The reasons might be that the participants were government officials whose works are related to policy making or supervising level more than the daily activity level, or their projects or activities would be regulated and fixed routine and set by their higher authority. However, as these participants are highly expected to be key personnel who would work for water development planning and implementation, they should develop their capacity in building sustainable and effective plans on logical steps with real needs of the people.

After this training of PCM method, it is recommended that the participants should get further training and practice in real settings with the support of PCM experts. From the result of the written exam at the end of the course, it is estimated that the level of understanding among the participants in PCM contents and theory is about 60%. To make it higher, they do not need to repeat the training of the same level but try to learn its higher level of the method to review and deepen the basic.

According to interviews to participants afterwards, small scale rural development projects were carried out by national budget (APBN) in 2005. These projects were multi-sectoral projects and local residents participated in project formulating. Participants said experiences of the training were fully utilized in these projects formulating. It is expected that principle of participatory planning and PCM/PRA methods are entrenched and widely spread.

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**FINAL REPORT
SUPPORTING REPORT**

[P] STAKEHOLDER MEETING

AUGUST 2006

**YACHIYO ENGINEERING CO., LTD.
NIPPON KOEI CO., LTD.**

THE COMPREHENSIVE STUDY ON WATER RESOURCES DEVELOPMENT
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SUPPORTING REPORT (P)
STAKEHOLDER MEETING

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P-1 INTRODUCTION

Stakeholder meetings were held six times during the whole Study period as shown in Table-P.1.

Table-P.1 Schedule of Stakeholder Meetings

Meeting	Time	Study Stage	Main Programs
1st	Oct. & Dec. 2004	Beginning of the Study	<ul style="list-style-type: none"> ▪ Study Contents ▪ TOR of IEE
2nd	May 2005	Beginning of M/P formulation	<ul style="list-style-type: none"> ▪ Framework of Master Plan ▪ Alternatives of Projects
3rd	July 2005	Final of M/P Study	<ul style="list-style-type: none"> ▪ Master Plan ▪ Alternatives of Priority Projects
4th	Oct. 2005	Beginning of F/F Study	<ul style="list-style-type: none"> ▪ Plan of Feasibility Study ▪ Outline of priority projects ▪ Social consideration on priority projects
5th	Dec. 2005	Middle of F/S Study	<ul style="list-style-type: none"> ▪ Progress of F/S Study ▪ Critical social issues on priority projects
6th	Mar. 2006	Final of the Study	<ul style="list-style-type: none"> ▪ Study result

In the Master Plan Stage, meetings were held in 4 to 9 locations mainly capitals of regencies. On the other hand, meetings were held nearby locations of priority projects in the Feasibility Study Stage.

Bali Province independently implemented the stakeholder meetings with the supports from JICA Study Team. Especially, group meetings are hosted by facilitators assigned from the Counterparts Team. Briefings of the meeting procedures and review meetings in each location were held between the Study Team and the Counterparts in order to bluish up the meeting formats and capacity building of the Counterparts.

In this part, result of the meeting in each locations and recommendations to the next stakeholder meetings are described, while procedures, summary of the meetings' results, and conclusions are described in the Main Report. As for the sixth stakeholder meeting, outline and results of the each meeting are described in the Main Report Part I.

P-2 FIRST STAKEHOLDER MEETING

P-2.1 Meeting Result in Karangasem Regency

(1) Identified Problems / Issues and Prioritization

Several problems /issues /needs related to water resources development and management have been identified by the participants during SHM at Karangasem Regency. The four groups (Sub Meetings) seemed to have identified more or less similar problems/issues/needs although the priority given to each of them was slightly different (See Table-P.2). Water shortage both for drinking and irrigation, the decline of spring water, water conflict, and floods / inundation of river water and drainage canals may be directly or indirectly brought about by degradation of forest resources.

Table-P.2 Identified Problems/Issues/Needs with Their Respective Scores For Determining Priorities for Karangasem Regency

No	Identified Issues	Group I 12 ^{a)}	Group II 10 ^{a)}	Group III 10 ^{a)}	Group IV 13 ^{a)}	Priority
1	Lack of drinking water	X(19)	-----	X (13)	X (15)	First
2	Spring water at Telagawaja not yet optimally utilized	X (15)	X (5)	X (12)	-----	Third
3	Lack of irrigation water	X (12)	-----	X (20)	X (10)	Second
4	Inundation of drainage canals	X (2)	-----	-----	-----	
5	Water-use conflict	-----	X (15)	-----	-----	Fifth
6	Decline of spring water	-----	X (7)	-----	-----	
7	Poor condition of infrastructure for irrigation and drinking water	-----	X (2)	-----	-----	
8	Degradation of forest resources	-----	-----	X (2)	X (14)	Fourth
9	Drought at Kubu Sub district	-----	-----	X (3)	-----	
10	Water shortages for irrigation and drinking water @	-----	X (21)	-----	-----	
	Total	(48)	(50)	(50)	(39)	

Note: *) indicates number of participants; X signifies that the participants identified the issues and the number between Bracket indicates the scores given to the identified issues. @ This issue can be split into issue number 1 and issue number 3

Thus, from the above information, it can be said that Karangasem Regency seems to give high priority on the following important issues that need to be considered for planning purposes: (i) lack of drinking water, (ii) lack of irrigation water, (iii) spring water at Telagawaja not yet optimally utilized, (iv) degradation of forest resources, and (v) water use conflict. Unfortunately, the above information seems to be very inadequate in terms of the specific location of the problems/issues.

(2) Cause and Effect Analysis of the Prioritized Issues Problems

The prioritized issues were analyzed in terms of causes and effects, based on agreement among participants, but at least one of the identified issues having the highest priority should be analyzed. Based on the report made by the facilitators, the causes and effects of selected identified issues obtaining high priority can be summarized in Table-P.3.

Table-P.3 Causes and Effects of the Prioritized Issues for Karangasem Regency

No	Prioritized / Issues	Causes	Effects
1	Lack of drinking water :	-limited sources of water -limited rain water reservoirs -degradation of forest resources -lengthy dry season -bad condition of water pipes	-worsening health condition -social unrest -lack of community participation
2	The spring water at Telagawaja not optimally exploited	*lack of technical and managerial skill *lack of fund and of government interest/concern *difficult access to the location (about 300 m down below)	*limited water supply for drinking and irrigation *wastage of water *social dissatisfaction
3	Deforestation	#illegal cutting of trees # the changing uses of forest land for food crop cultivation # lack of control from forest authority # weak law enforcement # lack of reforestation	#land slides and erosions # decline of the spring water #floods during rainy seasons # water shortages during dry seasons
4	Lack of irrigation water	+ lengthy dry seasons + bad condition of irrigation infrastructure + inadequate maintenance of irrigation facilities	+irregular cropping pattern +water conflict +crop failures / low farm productivity
5	Poor condition of infrastructure for irrigation and drinking water	^ lack of maintenance ^ low quality of construction ^ lack of skill in O&M	^ unfair water distribution ^ high cost of O&M ^ loss of water due to leakages
6	Declining of spring water	@ deforestation @ limited forest area @ lengthy dry seasons	@water shortage for drinking and for irrigation
7	Water conflict	& water shortage for drinking and irrigation & irrigation canals cross over other territory & water is used by other territory	& water stealing & act of damaging water pipes and irrigation structures & social instability /social unrest

P-2.2 Meeting Result in Buleleng Regency

(1) Identified Problems / Issues and Prioritization

At Buleleng Regency there are about 10 issues related to water resources development and management as can be see from Table-P.4. These are (1) lack of irrigation water, (2) inundation of river water and drainage canals, (3) water conflict, (4) deforestation, (5) lack of clean / drinking water, (6) lack of water for animal husbandry, (7) poor condition of irrigation structures and infrastructure, (8) water shortage for irrigation and drinking water, (9) degradation of water quality, and (10) unutilized water source at the Spring of Taman Alit Temple. However, the issue number (8) can be equally split as issue number 1 and issue number 5, whereas issue number 6 may be included in issue number 5. This implies that the crucial issues for Buleleng Regency that need to be taken into account for water resources planning are as follows (in the order of priority): (i) lack of irrigation water, (ii) lack of drinking water, (iii) deforestation, (iv) inundation of river water and drainage canals , (v) poor condition of irrigation structure and infrastructure.

Table-P.4(1/2) Identified Problems/Issues/Needs with Their Respective Scores For Determining Priorities for Buleleng Regency.

No	Identified Issues	Group I 17 ^{a)}	Group II 19 ^{b)}	Group III 16 ^{b)}	Priority
1	Lack of irrigation water	X (61)	-----	-----	First
2	Inundation of drainage canals and river water	X (16)	X (18)	X (11)	Fourth

Table-P.4(2/2) Identified Problems/Issues/Needs with Their Respective Scores For Determining Priorities for Buleleng Regency.

No	Identified Issues	Group I 17 ^{*)}	Group II 19 ^{*)}	Group III 16 ^{*)}	Priority
3	Water conflict	X (16)	-----	-----	<i>Third Second</i>
4	Deforestation	X (13)	X (31)	X (15)	
5	Lack of clean /drinking water	X (7)	-----	-----	
6	Lack of water for animal husbandry /livestock	X (6)	-----	-----	
7	Poor condition of irrigation structures /infrastructure	X (0)	-----	X (29)	
8	Water shortage for irrigation and drinking water	-----	X (30)	X (25)	
9	Degradation of water quality	-----	X (11)	X (0)	
10	Unutilized spring water at Taman Alit Temple	-----	X (5)	-----	
Total		119	95	80	

Notes: *) indicates number of participants; X signifies that the participants identified the issue and the number between bracket indicates the scores given to the identified issues.

issue number 8 may be equally split into issue number 1 and issue number 5, whereas issue number 6 may be included in the issue number 5, so that the lack of irrigation water can be regarded as being given first, and lack of drinking / clean water as the second priority.

Compared to Karangasem Regency, the SHM at Buleleng Regency seems to provide relatively better information about the specific locations of the identified problems/issues. For example, water shortage especially for irrigation is found at many places in Buleleng Regency.

Within East Buleleng, the lack of irrigation water among others is encountered at several subaks drawing water from Penarukan River within Sawan Sub district, at Babakan Subak (Kubutambahan Village), and at many subaks within Tejakula Sub district. Within West Buleleng, it is found in many subaks such as Grokgak Subak, Pinyinan Subak, Sanggarlangit Subak, and many others.

Meanwhile, within Middle Buleleng it is found at many subaks drawing water from the Pangkung Dalem River, the Buleleng River, and the Banyumala River respectively; and at several other subaks located at the Villages of Banjar, Panji, Padang Bulia, and Tegallingah.

Lack of drinking water seems to be a common problem facing the people in many places of Buleleng Regency. Deforestation is found among others at the Tejakula Sub district particularly at the hills adjacent to Kintamani (in East Buleleng); at the Villages of Tiying Tali, Puncak Landep, Puncak Manik, and Tamblingan (Middle Buleleng); and at the Villages of Grokgak, Pangkung Paruk, and Busung Bui (West Buleleng).

It was mentioned that inundation of drainage canals often occurred in several places such as at the Villages of Tejakula, Bungkulan, Sangsit and Kerobokan (in East Buleleng); the City of Singaraja, Village of Banjar (Middle Buleleng); and the Villages of Telada, Titab, Celukan Bawang, and Tinga-Tinga (in West Buleleng).

Poor condition of irrigation structures and infrastructure that needs upgrading and rehabilitation is found in many subaks of West Buleleng such as those located at the Villages of Lokapaksa, Banjar Asem, Busung Bui, Intaran, Grokgak, and Sanggarlangit.

The participants from East Buleleng even proposed that the construction of a new dam at Tamblang should be soon realized to overcome the problem of water shortages for irrigation in East Buleleng.

(2) Cause and Effect Analysis of the Prioritized Issues / Problems

Table-P.5 summarized the results of the analysis of cause and effect of the identified issues having high priority for Buleleng Regency. Some of the identified issues being analyzed in term of cause and effect are lack of irrigation water, flood damages, deforestation, and poor condition of irrigation structure.

Table-P.5(1/2) Causes and Effects of the Prioritized Issues for Buleleng Regency

No	Prioritized Issues	Causes	Effects
1	Lack of irrigation water	- leakage of irrigation canals - high evaporation - a decline in discharge of river water - reduction of lake water -degradation of forest resources -dry climate / long dry season	-decline of cropping intensity -crop failures - low farm income

Table-P.5(2/2) Causes and Effects of the Prioritized Issues for Buleleng Regency

No	Prioritized Issues	Causes	Effects
2	Flood damages	+deforestation +inadequate drainages +heavy rain +uncontrolled garbage disposal	+ emergence of diseases that endanger the health condition of the people + loss of materials due to damages of roads, bridges, settlement and crops
3	Deforestation	# illegal logging #limited sources of income of the people #burning of forest on purpose by irresponsible men #lack of control from forest authority # weak law enforcement	#land slides and erosions #decline in water discharge of the rivers #floods during rainy seasons #water shortages during dry seasons
4	Poor condition of irrigation structures and infrastructure	^ inadequate structures and infrastructure ^ lack of maintenance ^ low quality of construction ^ lack of funds for proper operation and maintenance	^ unsmooth flow of the water ^ loss of water due to leakages ^ lowering farm productivity

P-2.3 Meeting Result in Jembrana Regency

(1) Identified Problems / Issues and Prioritization

At Jembrana Regency there were seven problems/issues addressed by participants of the SHM as can be seen in Table-P.6. Those issues are: lack of water especially irrigation water, poor condition of irrigation structures, degradation of forest resources, flooding / river water inundation, lack of drinking water, sedimentation of rivers, and conversion of paddy land to other uses. It is highly probable that the prioritized issues of the Jembrana Regency are as follows (refer to the explanation described in the footnotes of Table-P.6):

1. Lack of irrigation water,
2. Degradation of forest resources / deforestation,
3. Lack of clean / drinking water,
4. Poor condition of irrigation structures / damages of irrigation canals, and
5. Flooding / inundation of river water and drainage canals

Table-P.6 Identified Problems/Issues/Needs with Their Respective Scores For Determining Priorities for Jembrana Regency.

No	Identified Issues	Group I 6 ^{*)}	Group II 15 ^{*)}	Group III 12 ^{*)}	Priority
1@	<i>Water shortages for irrigation and drinking water especially for irrigation</i>	X (7)	X (32)	X (18)	<i>First</i>
2	Poor condition of irrigation structures / damages of irrigation canal	X (7)	-----	X (14)	<i>Fourth</i>
3	Degradation of forest resources /deforestation	X (6)	X (30)	X (9)	<i>Second</i>
4	Flooding of river water and drainage canals	X (4)	X (2)	-----	<i>Fifth</i>
5	<i>Lack of drinking water</i>	-----	X (8)	-----	<i>Third</i>
6	Sedimentation of rivers	-----	X (3)	-----	
7	Conversion of paddy land to other uses	-----	-----	X (7)	
	Total	(24)	(75)	(48)	

Notes: *) indicates number of participants; X signifies that the participants identified the issues and the number between bracket indicates the scores given to the identified issues.

@) issue number 1 can be partly categorized as issue number 5, so that it is highly probable that issue number 5 may become the third priority after degradation of forest resources.

Lack of irrigation water occurs in many subaks drawing water from Ijogading River, subaks within the villages of Mendoyo, Kaliakah, Penyaringan, Manistutu, Batu Agung, Nusa Sari, and also at several locations like Sub districts of Negara, Melaya.

Deforestation is found at many villages such as Pergung, Penyaringan, and Tukadaya. Lack of drinking water occurs at various villages like Berawantangi, Tuwed, Manistutu, Tukadaya, and Kaliakah. Flooding frequently occurred particularly at Sumber Sari, Mendoyo, Bilok Poh, Pergung, Kelatakan, Ijogading, Pekutatan, Negara, and Melaya. Poor condition of irrigation facilities/canals is found in many irrigation systems located at Pekutatan, Mendoyo, Lelateng, Petanahan, and Banyubiru.

(2) Cause and Effect Analysis of the Prioritized Issues / Problems

The results of cause and effect analysis of the prioritized problems/issues at Jembrana Regency can be summarized in Table-P.7. It is quite self explanatory so that it is not necessary to further elaborate here.

Table-P.7 Causes and Effects of the Prioritized Issues for Jembrana Regency.

No	Prioritized Issues	Causes	Effects
1	Lack of water especially irrigation water	-degraded forest resources /deforestation -changing uses of perennial crops to annual crops in upland areas -poor condition of irrigation facilities -increasing use of water for non agricultural purposes - lack of legal framework related to water rights	- drought of rice fields -decline of cropping intensity -crop failures / low farm productivity - reduce of community health - social unrest
2	Degradation of forest resources /deforestation	# illegal logging #limited sources of income of the people living at the surrounding forest area #lack of control from forest authority # weak law enforcement	#land slides and erosions #decline in water discharge of the rivers #floods during rainy seasons # water shortages during dry seasons
3	Flood damages	+ excavation of limestone, stones, and sands + deforestation + changing uses of paddy lands to non agriculture uses + inadequate drainage networks +low water absorption capacity of soil	+ damages of irrigation structures /facilities + inundation of watersheds + crop failures
4	Poor condition of irrigation structures/facilities	^ aging of the irrigation facilities ^ lack of maintenance ^ lack of funds for proper operation and maintenance	^ loss of water due to leakages ^ unequal water distribution ^ unsmooth flow of water ^ lowering farm production

P-2.4 Meeting Result in Tabanan Regency

(1) Identified Problems / Issues and Prioritization

The identified problems / issues / needs related to water resources for Tabanan Regency have been solely based on the results of the discussions from SHM held on 21 October 2004 at Werdhapura-Denpasar. About 17 stakeholders from Tabanan Regency participated in the discussions and all of them were grouped into Sub Meeting I. The results of their discussions are considered here to be relatively sufficient for problems identification purpose.

These 17 participants from Tabanan Regency agreed to raise the following problems / issues that need to be considered in the water sector planning: lack of clean water, lack of irrigation water, water conflict, lack of irrigation and drinking water infrastructure, and degradation of water quality.

The lack of clean water is found particularly at the City of Tabanan, and at other villages like Penatahan, Kediri, Selemadeg, Telon, and Tangun Titi. With regard to the lack of irrigation water, it is found at many subaks especially Dukuh Ancak, Aseman VI, Meliling, Ayung Cepaka, and several other subaks within the villages of Timpag, Baturiti, Penatahan, and Selemadeg.

Water conflict often occurred at Pama Palean Irigation Area, and Gembrong Soka Penebel, Luwus Carang Sari, Poyan Peneng, Batunya, Juwuk Legi, and Yeh Bakung Selabih.

Lack of irrigation and clean water facilities can be found at Telaga Tunjung, Merta Babahan, Selemadeg, and Mandung -Kerambitan. Degradation of water quality occurs at the Villages of Babakan Marga, Malkangin Dajan Peken, Kerambitan, and Palian Subak.

(2) Cause and Effect Analysis of the Prioritized Issues / Problems

The results of cause and effect analysis of the selected identified issues at Tabanan Regency can be summarized on Table-P.8. Of the five identified issues only three of them were analyzed in term of cause and effect. These are: lack of drinking water, lack of irrigation water, and water conflict.

Table-P.8(1/2) Causes and Effects of the Prioritized Issues for Tabanan Regency.

No	Prioritized issues	Causes	Effects
1	Lack of drinking water	-increasing demand for clean water, -decline of water discharge, - damage of water pipes, - forest degradation.	- social dissatisfaction, - worsening of the services provided by Local Gov. Water Enterprise (PDAM)

Table-P.8(2/2) Causes and Effects of the Prioritized Issues for Tabanan Regency.

No	Prioritized issues	Causes	Effects
2	Lack of irrigation water	+limited technical & managerial capability of the subaks, +increasing use of water by sectors other than irrigation	+drought of paddy fields + crop failures.
3	Water conflict	^ unclear water rights, ^lack of legal frameworks concerning water use.	^ conversion of paddy land to non agriculture uses

P-2.5 Meeting Result in Nusa Penida Sub district, Regency of Klungkung

(1) Identified Problems / Issues and Prioritization

Table-P.9 Identified Problems/Issues/Needs with Their Respective Scores For Determining Priorities for Nusa Penida Subdistrict, Klungkung Regency

No	Identified Issues	Group I 5 ^{*)}	Group II 11 ^{*)}	Group III 11 ^{*)}	Priority
1	Lack of infrastructure for the provision of drinking water	X (11)	-----	-----	Fourth
2	Saline water	X (2)	X (6)	-----	Second
3 [@]	Lack of water for animal husbandry	X (2)	-----	X (8)	First
4 [#]	Water shortage for irrigation and drinking water	-----	X (23)	X (19)	Fifth
5	Unexploited/unutilized sources of water especially spring water.	-----	X (4)	-----	Third
6 [@]	Lack of irrigation water	-----	-----	X (6)	
	Total	(15)	(33)	(33)	

Notes: *) indicates number of participants; X signifies that the participants identified the issues and the number between bracket indicates the scores given to the identified issues.

@) issue number 3 can be included in the issue number 4.

Issue number 4 can be partly categorized as issue number 6, so that it may quite possible that lack of drinking / clean water is the first priority and lack of irrigation water becomes the third priority issue.

Table-P.9 shows the results of problem identification / needs assessment of the SHM at Nusa Penida / Klungkung. The statements of “lack of water for animal husbandry” may be included in the issue of “lack of drinking/clean water” whereas “water shortage for irrigation and drinking water” may be split into “lack of drinking /clean water” and “lack of irrigation water”.

Thus, the top prioritized issues related to water resources raised by the participants seem to be as follows (based on the order of priority): lack of drinking /clean water, saline water, lack of irrigation water, and lack of infrastructure for the provision of drinking water.

Water shortage for drinking, irrigation, and animal husbandry have been prevalent in this sub district particularly at many villages such like Tangkan, Ped, Suana, Lembongan, Tanglan, Anta, Kutampi Kaler, Sekar Taji, Batumadeg, Saren, Pangkung Gede, Penutuk, and Pejukutan. Saline water is found for example at the Villages of Sakti, and Batu Nunggal.

Lack of water infrastructure seems to be a common problem for the Sub district of Nusa Penida which has also been assumed to be the cause of the problem of water shortage in this area. Unexploited water sources can be found at a number of villages particularly at Pengembangan, Guyangan, Batukandik, Batumadeg, Bunga Mekar, Suwahan, Ancang, and Sekartaji.

(2) Cause and Effect Analysis of the Prioritized Issues / Problems

The results of the cause and effect analysis of the prioritized problems for Nusa Penida can be seen in Table-P.10.

Table-P.10(1/2) Causes and Effects of the Prioritized Issues for Nusa Penida Sub district, Klungkung Regency.

No	Prioritized Issues	Causes	Effects
1	Water shortages for drinking, irrigation , and animal husbandry	- low rainfall - long dry season - lack of rainfall reservoirs - difficult access to the water sources due to topographical and transportation reasons - lack of government concerns	- poor health condition of the people - poor quality of animal products - low food crop productivity - low income
2	Lack of water infrastructure	+ high cost of investment in the water sector + low quality of human resources + inadequate government budget	+ water shortages + poor condition of community health + low agricultural productivity + low income of the people

Table-P.10(2/2) Causes and Effects of the Prioritized Issues for Nusa Penida Sub district, Klungkung Regency.

No	Prioritized Issues	Causes	Effects
3	Saline water	^ infiltration of sea water to the fresh water sources ^ no mangrove tree at the beaches ^ the location of the springs very close to the sea	^ water shortages for drinking, irrigation, and animal husbandry
4	Existing water sources not optimally utilized	# difficult access to the water sources due to topographical and transportation reasons (very deep location) # lack of water infrastructure	# water shortages

The cause and effect analysis seems to indicate that the core problem facing Nusa Penida Sub district is water shortages. However, in addition to the low rainfall and long dry season, lack of water infrastructure, saline water, and unexploited water sources are also responsible directly or indirectly for the problem of water shortage at Nusa Penida Sub district.

P-2.6 Meeting Result in Denpasar Municipality

(1) Identified Problems / Issues and Prioritization

The stakeholders of Denpasar Municipality identified eight issues as listed on Table-P.11. However, the issue on "water shortage for drinking water as well as for irrigation" (issue number 6) actually covers both the issue number 1 ("lack of irrigation water") and the issue number 5 ("lack of drinking water").

Table-P.11 Identified Problems/Issues/Needs with Their Respective Scores For Determining Priorities for Denpasar Municipality

No	Identified Issues	Group I 13 ^{*)}	Group II 12 ^{*)}	Group III 9 ^{*)}	Priority
1	<i>Lack of irrigation water</i>	X (24)	-----	-----	<i>Third</i>
2	Degradation of water quality	X (19)	X (10)	X (12)	
3	Drainage system not properly functioning	X (14)	-----	-----	<i>Fifth</i>
4	Inadequate land conservation measures	X (5)	-----	-----	
5	<i>Lack of drinking / clean water</i>	X (3)	-----	X (13)	<i>Second</i>
6 @	<i>Water shortages for drinking and irrigation</i>	-----	X (19)	-----	
7	Inundation/flooding of drainage canals	-----	X (7)	X (9)	
8	Declining recharge areas	-----	-----	X (7)	<i>Fourth</i>
9	Lack of water resources data base	-----	-----	X (4)	
	Total	(65)	(36)	(45)	

Notes: *) indicates number of participants; X signifies that the participants identified the issues and the number between bracket indicates the scores given to the identified issues.

@ issue number 6 can be equally split into issue number 1 and issue number 5, which means that lack of drinking / clean water might be the second, whereas lack of irrigation water might become the third priority.

Thus, it can be concluded that the high prioritized issues are: degradation of water quality, lack of clean water, lack of irrigation water, inundation /flooding of drainage canals, and drainage system not properly functioning.

Most of the rivers within Denpasar Municipality such like Ayung River, Badung River, Mati River, and Ngenjung River have poor water quality. Degradation of water quality along irrigation canals is also found in many subaks drawing water from Praupan Dam, and Margaya Dam.

Almost the whole City of Denpasar is lacking of drinking / clean water. Many subaks are lacking of irrigation water especially during the dry seasons. Among others are the Subaks of Pugutan; Lungatad; Sidakarya; Renon; Petangan; Pakel; and Peguyangan.

Many subaks getting water from the Dam of Oongan I and the Dam of Oongan II are also experiencing water shortage to irrigate their paddy lands

(2) Cause and Effect Analysis of the Prioritized Issues / Problems

The results of cause and effect analysis on the prioritized issues for Denpasar Municipality can be seen at Table-P.12.

Table-P.12 Causes and Effects of the Prioritized Issues for Denpasar Municipality.

No	Prioritized issues	Causes	Effects
1	Lack of irrigation water	- increasing demand for clean water, - decline of water resources, - exploitation of river water by PDAM and bottled water company - dysfunctional of irrigation canals due to LC project	- disturbance of cropping pattern - paddy fields getting dry - crop failures -declining agric. production
2	Degradation of water quality	+ sewage from households and industries (garments) + intrusion of sea water	+ pollution of river water + environmental degradation + worsening of community health condition
3	Water shortages for drinking and irrigation	^ limited water resources ^water use exceeds water supply ^long dry season ^increasing use of ground water ^ deforestation	^ declining health condition of community ^declining agric. production
4	Declining recharge areas	*rapid increase in house construction (conversion of paddy lands for human settlement)	* inundation of drainage canals * falling water table of ground water

P-2.7 Meeting Result in Bangli Regency

(1) Identified Problems / Issues and Prioritization

Some of the important issues raised by the stakeholders of Bangli Regency are among others lack of drinking water, lack of irrigation water, water pollution /degradation of water quality, ground water resources not yet optimally utilized, and low discharge of spring water (See Table-P.13).

Table-P.13 Identified Problems/Issues/Needs with Their Respective Scores For Determining Priorities for Bangli Regency.

No	Identified Issues	Group I 7 ^{*)}	Group II 10 ^{*)}	Group III 6 ^{*)}	Group IV 7 ^{*)}	Priority
1	Lack of drinking water	X (11)	X (14)	X (9)	X (7)	First
2	Lack of irrigation water	X (4)	X (10)	X (11)	X (13)	Second
3	Low discharge of spring water	X (5)	-----	-----	-----	
4	Ground water resources not yet optimally utilized	X (8)	-----	-----	-----	Fourth
5	Inundation of drainage canals	-----	-----	-----	X (1)	
6	Conflict in the use of water resources	-----	-----	X (3)	-----	
7	Water pollution	-----	X (6)	X (1)	-----	Third
	Total	(28)	(30)	(24)	(21)	

Notes: *) indicates number of participants; X signifies that the participants identified the issues and the number between bracket indicates the scores given to the identified issues.

The stakeholders of Bangli Regency seem to have selected several priority issues. In order of priority these are: lack of clean water, lack of irrigation water, and water pollution / degradation of water quality, and ground water not yet optimally utilized

Lack of clean water is being experienced by the people of Kintamani and Bangli Sub district and those living at many villages like Antungan, Tambahan Bakas, Tambahan Tengah, and Tambahan Kelod, Kayu Bihi, Pengotan, Galiran, Sama Undisan, Sama Geria, Pasekan, and Penibungan. The shortage of irrigation water is being experienced by farmers from subaks located at Kintamani Sub district for example Yeh Mampeh and Batur Subak and many other subaks as follows: Batuaji, Umabata, Tambahan, Penibungan, Tungkad Batu, Tampak Daha, and Subak-gede Taman. The location of water pollution was not clearly specified but one participant informed that it is found at Jehem Village.

(2) Cause and Effect Analysis of the Prioritized Issues / Problems

Table-P.14 summarizes the results of cause and effect analysis of the prioritized issues by the stakeholders at Bangli Regency.

Table-P.14 Causes and Effects of the Prioritized Issues for Bangli Regency

No	Prioritized issues	Causes	Effects
1	Lack of drinking water	-difficult access to location of water sources (very deep about 100 m down to the river) - high cost to lift the water up - limited technology - damages of water pipes - rapid population increases - low water discharge - ground water not optimally utilized	- decline in community health condition - high price of clean water - limited water for animal husbandry
2	Lack of irrigation water	*damages of irrigation canals * existing water resources are used by Local Gov. Water Enterprise (PDAM) * low discharge of river water * irrigation canals are being covered by landslides * lack of irrigation infrastructure * deforestation	* the delay of planting time * paddy fields getting dry * land became idle/ unproductive * farmers are compelled to apply rotation method
3	Degradation of water quality/ water pollution	+sewage from households drained to irrigation canals + waste from pig and chicken raising drained to irrigation canals	+ canal water can not be used for bathing and washing +the spread of skin diseases (itch)
4	Available ground water not optimally utilized	^ limited technical capacity ^ limited funds for exploitation ^ deep ground water	^available water becoming idle ^ existing ground water is used by other Regency

P-2.8 Meeting Result in Gianyar Regency

(1) Identified Problems / Issues and Prioritization

The participants of Stakeholder Meeting at Gianyar Regency identified a number of issues namely: lack of irrigation water; lack of clean / drinking water; degradation of water quality; internal conflict between upstream and downstream subaks drawing water from the same source concerning fee to be contributed for the expenses of temple ceremony; landslides and erosion; drainage canals are not optimally used; declining water discharge; inefficient use of water resources; water use conflict between farmers and villagers at the Village of Melinggih; pollution of surface water / degradation of water quality; inundation of drainage canals within Ubud Sub district; and existing water resources not optimally used (See Table-P.15)

Table-P.15 Identified Problems/Issues/Needs with Their Respective Scores For Determining Priorities for Gianyar Regency.

No	Identified Issues	Group I 13 ^{*)}	Group II 7 ^{*)}	Group III 9 ^{*)}	Group IV 9 ^{*)}	Priority
1	Lack of irrigation water	X (33)	X (11)	X (6)	X (11)	First Fourth
2	Conflict between upstream and downstream subaks on fee for temple ceremony #					
3	Landslides /erosion	X (18)	-----	-----	-----	Second
4	Lack of clean water	X (7)	-----	-----		
5	Drainage canals not optimally utilized	X (5)	X (4)	-----	X (10)	
6	Degradation of water quality ^{@)}	X (2)	-----	-----	-----	
7	Declining water discharge	-----	X (6)	X (5)	-----	Fifth
8	Inefficient use of water	-----	-----	X (4)	-----	
9	Conflict in the use of water resources	-----	-----	X (13)	-----	
10	Pollution of surface water ^{@)}	-----	-----	X (8)	-----	Third
11	Inundation of drainage canals within Ubud Sub district	-----	-----	X (6)	X (7) X (9)	
12	Potential water resources not yet optimally utilized	-----	-----	-----	X (8)	
	Total	(65)	(21)	(42)^{**)}	(45)	

Notes: *) indicates number of participants; X signifies that the participants identified the issues and the number between bracket indicates the scores given to the identified issues.

***) of the 9 participants only 7 involved in giving scores.

@) not clearly defined and it seems indicates the same issue

#) it is not directly related to water resources but quite internal in character so that it may be solved by both conflicting parties internally through dialogue and the outsider can only act as facilitator or mediator.

Apparently the issue on pollution of surface water and degradation of water quality were not clearly defined and it seems both indicating the same issue. Referring to the footnotes of Table-P.15 it should be assumed that there are four prioritized issues for Gianyar Regency. These are in order of priority: lack of irrigation water, lack of clean water, degradation of water quality / water pollution, and conflict between upstream and downstream subaks regarding fee for temple ceremony.

The subaks which are lacking of irrigation water are among others Masceti, Medahan, Blahbatuh, Perang, Sada, Penda, Banda and Tegalalang. Degradation of water quality is being observed along irrigation canals within Tegalalang Sub District, River Ayung and the Villages of Blangsinga and Saba. Villages of Pupuan and Taro within Tegalalang Sub district are lack of clean water. The water of Petanu River is considered to be not efficiently used. And many hotels in Gianyar Regency are reported to be using water inefficiently.

(2) Cause and Effect Analysis of the Prioritized Issues / Problems

The results of the analysis of the cause and effect of the selected prioritized issues during the Stakeholder Meeting at Gianyar Regency are listed in Table-P.16.

Table-P.16 Causes and Effects of the Prioritized Issues for Gianyar Regency

No	Prioritized issues	Causes	Effects
1	Lack of irrigation water	- decline of water resources / falling water discharge - exploitation of river water by PDAM and bottled water company - dysfunctional of irrigation canals due to construction of road joining Tohpati and Kusamba - damages of irrigation canals - long dry seasons	- planting time getting late - paddy fields getting dry - falling cropping intensity - crop failures -declining agric. production - farmers are forced to apply rotation method - water conflict
2	Lack of drinking water	^ decline of water discharge ^ leakage of water pipes ^ population increase ^ locations of the springs are difficult to access (very deep) ^ deforestation	^ spread of diseases such as cholera ^ social dissatisfaction
3	Pollution of surface water/ degradation of water quality	+ sewage from households and industries (garments) + lack of people awareness towards environmental health	+ environmental degradation + worsening of human health + the flow of water in the canals is getting disturbed
4	Conflict between upstream and downstream subaks	* lack of coordination among subaks drawing the same water source. * rejection of downstream subaks to pay contribution for ceremony at Mengening Temple	* the persons in charge for Mengening Temple management getting frustrated * the use of existing water resources might be partly transferred to Local Government Water Enterprise (PDAM) for drinking water provision

P-2.9 Meeting Result in Badung Regency

(1) Identified Problems / Issues and Prioritization

Lack of irrigation water, lack of clean water, pollution of surface water, inundation of drainage canals, water use conflict, and non existence of river management authority are some water related issues that identified during the Stakeholder Meeting at Badung Regency as listed in Table-P.17.

Table-P.17 Identified Problems/Issues/Needs with Their Respective Scores For Determining Priorities for Badung Regency.

No	Identified Issues	Group I 15 ^{b)}	Group II 12 ^{b)}	Group III 9 ^{b)}	Priority
1	Lack of irrigation water	X (44)	X (9)	-----	First Third Second Fourth Fifth
2	Lack of clean water	X (3)	X (21)	-----	
3	Pollution of surface water	X (9)	X (12)	X (22)	
4	Inundation of drainage canals	X (4)	X (13)	X (7)	
5	Water use conflict	-----	X (5)	X (9)	
6 ^{@)}	Water shortage for clean and irrigation (lack of raw water)	-----	-----	X (20)	
7	Non existence of river management authority	-----	-----	X (7)	
	Total	(60)	(60)	(65)	

Notes: *) indicates number of participants; X signifies that the participants identified the issues and the number between bracket indicates the scores given to the identified issues.

@) can be split into issue number 1 and issue number 2.

Table-P.17 seems to indicate that the issue number 6 (water shortage for drinking and for irrigation) actually can be split into two separate categories namely as issue number 1 and issue number 2. Thus, for Badung Regency the following five issues need to be given top priority in the Water Master Plan. These are: (i) lack of irrigation water, (ii) pollution of surface water, (iii) lack of clean water, (iv) inundation of drainage canals, and (v) water use conflict

Many subaks within Sub districts of Petang, Abian Semal, Mengwi, and Kuta are lacking of irrigation water such as the Subaks of Babakan Sobangan, Babakan Bengkel, Balangan, Gerana, Latu, Sandakan, Petang, and Mengwi. Many places within the Regency of Badung need clean water such like Petang, Abiansemal, Mengwi, Badung, Pecatu, Labuhan Sait, Sobangan, Ayuan, Kuta, Budak, Uma Kepuh, Uma Candi and many others. Meanwhile, the pollution of surface water is observed at many rivers within Badung Regency and also is being experienced by the people living at Kuta, Legian, Seminyak, and Peti Tenget. The problem of inundation of drainage canals is found for example at Baduk, Dalung, Kerobokan, Kunti, Seminyak, Kuta, Petang, Kapal, and Sobangan.

(2) Cause and Effect Analysis of the Prioritized Issues / Problems

The three issues related to water resources that given top priorities by Badung Regency are lack of irrigation water, pollution of surface water, and lack of drinking water. However, the analysis of causes and effects were not being focused on those three issues only but the other less prioritized ones as well (See Table-P.18).

Table-P.18 Causes and Effects of the Prioritized Issues for Badung Regency.

No	Prioritized Issues	Causes	Effects
1	Water shortages for irrigation	- declining water discharge - damages of irrigation canals - increasing use of water resources for drinking water by PDAM - degradation of forest resources	- decline in food crop production - change in cropping pattern
2	Pollution of surface water	+ sewage from households, home industry (garment, printing, auto repair shops, hotels, and restaurants + garbage thrown into the rivers and irrigation canals +low people awareness on the important of environmental health + lack of socialization on environmental preservation +weak low enforcement	+ many fishes and crops died + inundation of irrigation and drainage canals + water shortages for drinking, and for animal husbandry + high cost of clean water provision + widespread of diseases + sedimentation of drainage canals
3	Lack of drinking water	*lowering of groundwater table *inadequate PDAM facilities *inadequate provision of drinking water	*lowering human health * conflict in water use among Subaks and other water users
4	Inundation of drainage canals	# drainage system not functioning properly # irrigation canals are used for drainage # flat topography #garbage thrown into drainage canals # difficulty in getting land acquisition for drainage construction	# degradation of environmental health # transportation is getting disturbed # damages in public utility # lowering human health
5	Water use conflict	@ lack of community-base water policy @ lack of legal framework on water use right	@ conflict of interest among water users @ social instability
6	Non existence of River Management Authority	& many organizations / agencies are engaged in river management	& unfair river water allocation among users; &quality of river water can not be guaranteed; &OM is not optimized; & no coordination among separate agencies in managing river water

P-2.10 Recommendations to Next Stakeholders Meetings

Some of the important recommendations are provided below.

- Providing incentives to the participants of the Stakeholder Meeting particularly those from the community level, for example in form of transportation fee seems to be necessary in order to increase the attendances of the meetings.
- Relevant members of Parliament need to be invited to participate in the next Stakeholder

Meetings since they are representing the interests of the people. Otherwise, the Study Team might be blamed for being neglectful especially when the project is to create social unrest. Inviting relevant members of Parliament was also proposed by a participant of Stakeholder Meeting at Bangli Regency.

- Since the facilitators seem to play a great role for the success of the Stakeholder Meetings, it is important to emphasize that for the rest of Stakeholder Meetings they should be more active in encouraging the participants to create more lively and stimulating discussions.
- Since many of the stakeholders who will be invited to attend the Stakeholder Meeting might have inadequate knowledge and information about water issues, not alone about particular matters to be discussed during the meeting, a brief guideline about the points to be discussed in the coming meeting should be attached along with the letter of invitation. This will enable them to have a better preparation for the discussions so that the meeting may proceed with minimum shortcoming and bottleneck.
- Problem identification and need assessment through participatory workshop has a good point in the sense that the participants can express their opinions and aspirations freely without hesitation by writing on a piece of paper rather than orally. Such method gives equal opportunity for everyone to raise his / her needs and problems without being dominated by someone else as often happen in case of oral discussion. However, there is a minor thing that needs to be taken care of. If similar workshop with participatory approach through Stakeholder Meeting of this kind is to be conducted in the future and the main objective of which is to identify problems / issues / needs of the stakeholders, the following matters need to be taken into consideration:
 - A method of self-introduction if still be needed in attempt to create friendly atmosphere should be best suited to the local culture where the stakeholder meeting is being conducted.
 - Asking the participants to specify where, when, who, and how (to what extent/ indicator) for each issue/ problem being raised seems to be time consuming since many stakeholders may not have good knowledge and information on certain issues. Due to the time constraint, it would be just sufficient if such inquiry be limited only for the prioritized issues.
 - In effort to categorizing various issues / problems raised by participants, the active role of facilitators is of prime important. The facilitator should confirm to each participant by asking them whether the problems categories have been appropriate. Care must be taken of, since a single category may be better split into two categories or two core problems. On the other hand two statements of core problems may in fact indicate just similar problem and accordingly may be combined into a single category or a single core problem.
 - To save time, it is necessary to request the participants to give alternative solutions for the problems /issues given top priority only, rather than for each of the identified problems. The main purpose is to enable us to verify or to cross-check the consistency of the results of causes and effects analysis.
- In order to provide a greater opportunity for the public to get involve in expressing their opinions with regard to water resources related issues in Bali it seems necessary to cooperate with a mass media and Radio Broadcasting by releasing briefly the outline of master plan particularly the alternatives and priority projects. It will make it possible for project implementer to get feedback from much wider stakeholders for project plan adjustment and thus might lessen the risk of a project being rejected.

P-3 SECOND STAKEHOLDER MEETING

P-3.1 Meeting Result in Karangasem Regency

(1) Comments / Suggestions / Issues Raised During Plenary Session

The following points are comments/suggestions/ issues raised by participants during plenary session:

- Data on water sources /springs at Karangasem Regency are available. There are about 106 springs scattered around 8 Sub districts with the total water discharge almost reaches 5000 liters per second. If needed The Study Team can take and use the data for the improvement of Master Plan. Karangasem might not be lacking of water if these water sources could be accessed by subaks as well as by PDAM.
- Water sources at Karangasem are also used by other regencies. The governor of Bali should be responsible for water resources development of cross-regency river basin.
- JICA is expected to use Karangasem Regency as a pilot project for water resources development and management in Bali.
- The people of Karangasem should be included as the beneficiary of Gunaksa Estuary dam.
- Subaks tend to refuse to give water to PDAM, because the burden of the subaks in conserving water resources through rituals is not shared by PDAM; so far PDAM spends almost RP 1 billion per year just to pay electric bill, and due to high cost of operation and maintenance PDAM is still suffer financial loss; why not this amount is used for subsidizing subaks in conserving the water sources?
- Rain harvesting needs to be considered as an alternative for solving water problem in Karangasem.

(2) Other Additional Alternative Projects Proposed by Participants

Several other additional projects were proposed by the participants, but they just used the water issue as the title of a project like flood control, and river basin conservation. Moreover, it is necessary to stress here that although they proposed other names of projects it did not necessarily mean that they disagreed with the projects offered by the Study Team. The expected /alternative projects proposed by participants in Karangasem Regency can be listed below:

- Reservoirs at upstream Unda River and its surrounding areas;
- River flood control;
- Normalization of street drainages;
- River basin conservation

(3) Project Selection Criteria and Prioritization of Alternative Projects

(a) Project Selection Criteria

The result of project selection criteria including project activities of the expected / alternative projects as made by the participants can be summarized at Table-P.19 but will not be discussed into detail since it is self explanatory.

Table-P.19 Selection Criteria and Project Activities for Alternative Projects in Karangasem Regency

Water Related Issues and Alternative Projects	Project Selection Criteria				Project Activities	
	Target area	Input/cost	Negative impact	Operation and maintenance capability		
A	(1) Spring water development	Almost the whole Regency of Karangasem	Large amount (RP 215 milliards)	Rafting activity may be disturbed especially at Telagawaja River.	High	Survey; design; construction; OM
	(2) Groundwater development	Manggis, Kubu, Karangasem, Antiga, Candidasa.	Medium (RP 7.0 milliards)	Sea water intrusion	Low (because high cost of water treatment)	Survey; feasibility study; making pilot project at Tirtagangga, Tauka, Telaga Tista, and Yeh Hee.
	(3) Reservoirs at upper stream of Unda River and its surrounding area (8 new embung/reservoirs including pgrading of Embung Seraya	Karangasem Regency and also other neighboring Regencies	Very large amount (RP 670 milliards)	Erosion; change in water flows	High	Socialization; making access road, land acquisition; design; construction; OM
B	(1) River intake development	Sub districts of Bebandem and Sidemen	Large amount	No significant negative impact	High	Building dams and irrigation facilities
	(2) Spring water development	Whole springs at Karangasem Regency	Medium	No significant negative impact	High	Revitalization of springs (reforestation, re-greening, and conservation)
	(3) Ground water development	Abang and Kubu Sub districts.	Large amount	No significant negative impact	High	Drilling; and building underground reservoir
C	(1) River flood control	Buhu River, Daya River, and Betel River. (Antiga, Manggis, Nusu)	Large amount	No significant negative impact	High	Build retarding dam; upgrade check dam; raising dykes of Betel River; making by pass channel
	(2) Normalization of street drainage	Manggis and Kubu Sub districts	Medium	Traffic jam	High	Widening of rain drainage at Tulamben and Kubu villages; widening the street drainages.
E	(1) River basin conservation	All Sub districts of Karangasem Regency except Sidemen and Manggis.	Very large amount	None	High	Reforestation, re-greening of people's estate crop land; protection of springs.
	(2) Erosion control	The whole Karangasem Regency	Large amount	None	High	Re-greening of farmers' land; reforestation; build check dam at steeply sloping areas; building small reservoirs at upper stream of the rivers; making terrace on farmers' lands; making absorption wells

Note: (A) Domestic and Non Domestic Water Supply; (B) Irrigation Water Development; (C) Flood Control; (D) Water Quality Improvement; (E) River Basin Conservation

P-3.2 Meeting Result in Buleleng Regency

(1) Comments / Suggestions / Issues Raised During Plenary Session

Several comments and suggestions raised by participants in this regency are as following:

- Many springs in Buleleng are located at or close to the sea; water spring at Air Sanih , East Buleleng and water spring at Mumbul, Singaraja are not yet utilized but they just flow to the sea;
- Ground water has been used for tourism industry, but care must be taken to avoid sea water intrusion;
- European Economic Community supporting ground water development but did not include conservation program;
- The conflict on water allocation between subaks along Buleleng river and PDAM should be solved as soon as possible;
- Grokgak dam was completed in 1997 and planned to irrigate 560 ha. But then the PDAM is taking water source at the upper stream so that water discharge at the dam declined. The Subak-gede of Grokgak was frustrated and proposed that it should be better to turn the existing paddy fields into dry land / rain fed sawah;
- There is misinterpretation about autonomy. Based on autonomy, people of certain regency recklessly cut the forest trees without taking into consideration on the adverse negative impact upon other regencies;
- Tourism sector in Buleleng often ignored the environmental consequent of its activities; the project implementer should first consult the local people / local government to avoid the potential negative impact of the project. For example, the construction of villas at the steeply hill such as “Bukit Berbunga” may result in erosion and degradation of water resources;
- The Lake water is now decreasing. Might it be due the fact that “holy sacrifice” ceremony used to be performed every 5 years at the lake temple, has never been done since the last 15 years , because of declining role the Sedahan -agung in subak affairs?

(2) Other Additional Alternative Projects Proposed by Participants

No additional expected project was proposed by participants in Buleleng Regency. But they did not reject the alternative projects as proposed by The Study Team.

(3) Project Selection Criteria and Prioritization of Alternative Projects

(a) Project Selection Criteria

Table-P.20 Selection Criteria and Project Activities for Alternative Projects in Buleleng Regency

Water Related Issues and Alternative Projects		Project Selection Criteria				Project Activities
A	(1) Spring water development	Selected areas of Buleleng Regency among others: Anturan and Banyuning Villages	Medium	Reduction of lake water; declining water discharge	High	Survey; design; land acquisition; construction; OM
	(2) Groundwater development	Air Sanih, Ponjok Batu, Tejakula, Kubutambahan, etc.	Large amount	No significant negative impact	High	Survey; socialization; feasibility study; design, construction; OM
	(3) Hydrological monitoring system development	Air Sanih, Buleleng and Saba Rivers	Medium	No significant negative impact	High	Socialization; making design
B	(1) River intake development	The Villages of: Sanda, Titab, Banjar, Grokgak	Large amount	Land acquisition	High	Survey; design; construction; OM
	(2) Spring water development	The villages of: Tukad Sumaga, Sumber Kima, Patas, Sangarlangit, Musi, Pengabengan, Puncak Sari	Medium	Conflict among water users	High	Survey; design; construction; OM
	(3) Ground water development	Grokgak, Tejakula, Sawan, Kubutambahan, Tegallindah	Large amount	Land acquisition, intrusion of sea water	High	Survey; design; drilling;
C	(1) River improvement	Anyar River at Tejakula; Banyuasri River; Buleleng River; Saba River	Large amount	No significant negative impact	High	Arranging demarcation areas of rivers; excavation; lining the steep embankment with Concrete.
	(2) Retarding basin	Rivers passing through the Cities	Medium	Land acquisition;	High	Building check dams;
	(3) Flood warning and evacuation system	Buleleng Regency	Medium	No significant negative impact	High	Rainfall monitoring; dam's gate monitoring
E	(1) Reforestation and greening of critical lands	Protected forests; production forests; people's lands, and other critical lands.	Medium	No significant negative impact	High	Rainfall monitoring; dam's gate monitoring
	(2) Erosion control in steep mountainous areas	Erosion-prone areas such as: Wanagiri, Pancasari, Tejakula, Madenan, Pakisan, Sidetape, Cedmpage, Sepang, Pemuteran, Banyu Poh, Tukad Sumaga, Pangkung Paruk, Ungahan	Large amount Large amount	No significant negative impact No significant negative impact	High High	Seed provision; planting of seeds; taking care of the growing plants. Re-greening of people's estate crop land; making terrace on farmers' lands;

Note: A, Domestic and Non Domestic Water Supply; B, Irrigation Water Development; C, Flood Control; D, Water Quality Improvement; E, River Basin Conservation

(b) Highly Prioritized Alternative Projects

Table-P.21 Highly Prioritized Alternative Projects by Participants in Buleleng Regency

Water issues	Highly Prioritized Alternative Projects First, Second, and Third Priority reading from above	Reasons for Prioritizing
A	1. Spring development 2. Ground water development 3. Hydrological monitoring system development	* For A.1 because water is unutilized but just flows to the sea, water discharge is large (600 l /sec), and supported by local government. A.3 as last priority because it would be handled by BMG
B	1. River intake development 2. Spring water development 3. Ground water development	* B.1. is to be highly prioritized because water resource potential is adequate.
C	1. River improvement 2. Retarding basin	* The selection of C.1.and C.3 is greatly needed.
E	1. Reforestation and re-greening of critical lands 2. Erosion control in steep mountainous areas	* Highest priority for E.1 because 60% of forest area has been degraded, the decline of river discharge, and frequent erosion.

Note: A, Domestic and Non Domestic Water Supply; B, Irrigation Water Development; C, Flood Control; D, Water Quality Improvement; E, River Basin Conservation; D issue was not discussed by participants.

P-3.3 Meeting Result in Jembrana Regency

(1) Comments / Suggestions / Issues Raised During Plenary Session

In case of Jembrana Regency, the issues raised by the participants are summarized below:

- Since the establishment of Subak- gede Jero Gentuh (subak federation) in 1986, the 11 member subaks could grow paddy twice and once secondary crop per year until 1997; but since 1997 due to declining river water flow the farmers only grow once paddy a year. This means that basin conservation is a must;
- The construction of Benel Rservoir should be realized as soon as possible; about 12 ha land is still needed and the resettlement must soon be accomplished.

(2) Other Additional Alternative Projects Proposed by Participants

The expected projects proposed by participants in Jembrana Regency are as following:

- Surface water development ;
- River intake development and upgrading of irrigation network

(3) Project Selection Criteria and Prioritization of Alternative Projects

(a) Project Selection Criteria

Table-P.22 Selection Criteria and Project Activities for Alternative Projects in Jembrana Regency

Water Related Issues and Alternative Projects	Project Selection Criteria				Project Activities	
	Target area	Input/cost	Negative impact	Operation and maintenance capability		
A	(1) Spring water development	Sub districts of: Melaya, Manistutu, Tukadaya, Yeh Embang, and Mendoyo	Large amount	Water use conflict among subaks	High	Socialization; survey; design; land acquisition; construction; OM
	(2) Groundwater development	Mendoyo and Melaya sub districts	Large amount	No significant negative impact	High	Survey; check water discharge; socialization; design; drilling.
	(3) River intake / surface water development	Mendoyo and Yeh Embang Sub districts	Large amount	No significant negative impact	High	Socialization; survey; design; land acquisition; construction; OM
	(4) Hydro-logical monitoring system development	Mendoyo and Negara Sub districts	Medium	None	High	Provision of hydrological equipments, regular data collection.
B	(1) River intake development (The following reservoirs were proposed: +Brangbang, + Gelar , + Penyarangan , + Pulukan , + Yeh Leh + Yeh Sumbul + Upgrading of temporary weirs into permanent ones)	Subaks at Jembrana Regency	Large amount	Decrease in forest land	High	Building dams and irrigation facilities; upgrading of existing weirs.
	(2) Ground water development	Subaks and households in Jembrana Regency	Medium	Reduction of surface water; intrusion of sea water	High	Preliminary survey; market survey; feasibility study; drilling
	(1) River improvement	Several rivers in Jembrana Regency such as: Payangan, Yeh Lebah, Bilok Puh, Ijogading, Kaliakah, Aya, Melaya, etc.	Large amount	Erosion around the dams; land acquisition.	High	Excavation of sediment; raising dykes; widening of rivers.
C	(2) Retarding basin	The rivers of: Ijogading, Kaliakah, Aya, Melaya.	Large amount	Possible loss of certain areas of lands;	High	Install stones covered with barbed wire at the rivers having fast current; pumping out river water during flood occurs.; building waterways diversion.
	(3) Flood warning and evacuation system	Jembrana Regency as a whole	Large amount	No significant negative impact	High	Organizing the Command Post for Flood Mitigation
E	(1) Reforestation and re-greening of critical lands	Penyarangan Villages and other critical lands, river embankment, and forest areas of Jembrana Regency.	Large amount	Erosion around the areas just re-forested / re-greened	High	Socialization; planting the trees
	(2) Erosion control in steep mountainous areas	All river basins in Jembrana	Medium	No significant negative impact	High	Making terraces on steep sloping areas; planting suitable variety of perennial crops /tree for strengthening the terraces.

Note: A, Domestic and Non Domestic Water Supply; B, Irrigation Water Development; C, Flood Control; D, Water Quality Improvement; E, River Basin Conservation; D issue was not discussed by participants.

(b) Highly Prioritized Alternative Projects

Table-P.23 Highly Prioritized Alternative Projects by Participants in Jembrana Regency

Water issues	Highly Prioritized Alternative Projects (First, Second, and Third Priority reading from above)	Reasons for Prioritizing
A	1. Ground water development 2. Surface water development 3. Spring development	A.1. because quite needed during dry season, supported by many people, and land is available. A.2, the plan has been ready, budget available, expected by the community, land is available. Supported not only by the community but also by local government. The reason for selecting A.3 was nearly similar with that of A.2.
B	1. River intake development 2. Ground water development	First priority for B.1 because it would be easier to operate and land is available.
C	1. River improvement 2. Retarding basin	No specific reason given for C.1 and C.2 but they assumed that both are necessary to mitigate floods and erosion disaster.
E	1. Reforestation and re-greening of critical lands 2. Erosion control in steep mountainous areas	First priority for E.1 because forest has important function for preservation of catchments area but now has been degraded; No specific reason given for E.2 but they assumed that both are necessary to mitigate floods and erosion disaster.

Note: A, Domestic and Non Domestic Water Supply; B, Irrigation Water Development; C, Flood Control; D, Water Quality Improvement; E, River Basin Conservation; D issue was not discussed by participants.

P-3.4 Meeting Result in Tabanan Regency

(1) Comments / Suggestions / Issues Raised During Plenary Session

The comments from the Tabanan stakeholders are as follows:

- Coffee plantation area especially at Baturiti Sub district has been declining and has been changed into vegetables, thus reforestation in this area is needed;
- Conservation of upstream catchments area needs special attention since lake water as well as river discharge downstream has been declining;
- Integrated river basin management from upstream until downstream is needed to minimize conflict among users along the river courses. River basin Conservation should also be included in Master Plan for Tabanan Regency;
- River pollution tends to increase. “Polluters pay” principle needs to be applied;
- Telaga Tunjung reservoir at Ho River should be realized as soon as possible;
- Small reservoirs need to be constructed to tap small water sources at several intermittance rivers during rainy season to be used during dry season; the construction of Embung Singin must be completed as soon as possible;
- Water should be used more efficiently; Institutional aspects of water resources should concern on both “wet” subak (irrigated paddy farmers association) and “dry” subak (subak abian/ estate crops farmers association) as well (integration of upstream and downstream);
- Water use conflict between subaks and PDAM must be solved, but how?

(2) Other Additional Alternative Projects Proposed by Participants

In Tabanan Regency, the participants proposed some additional projects as follows:

- Munggu Reservoir at Penet River, Embung /small scale reservoir Singin, and Embung Balean, (all are related to for clean water supply as well as irrigation water development)
- Land and water conservation (for protection of catchments area)

(3) Project Selection Criteria and Prioritization of Alternative Projects

(a) Project Selection Criteria

Table-P.24 Selection Criteria and Project Activities for Alternative Projects in Tabanan Regency

Water Related Issues and Alternative Projects	Project Selection Criteria				Project Activities	
	Target area	Input/cost	Negative impact	Operation and maintenance capability		
A	(1) Munggu dam at Penet River	Kediri, Tanah Lot, Nyitdah, Kedungu and Braban	Large amount	Conflict of land acquisition; farmers' unrest due to unavailable water during construction; adjustment of cropping schedule;	High	Survey; design; socialization; land acquisition;
	(2) Small reservoir (<i>Embung</i>) Singin	East and West Selemadeg Sub district	Medium	Conflict of land acquisition	High	Socialization; making access road, land acquisition; design; construction; OM
	(3) Embung at Balean River	West and Middle Selemadeg Sub district	Large amount	Conflict of land acquisition	High	- ditto-
	(4) Land and water conservation	Baturiti, Penebel, and Pupuan Sub districts	Medium	No significant negative impact	High	Socialization; survey; Planting trees at the upstream of rivers.
B	(1) River intake development	Baturiti, Penebel, Kerambitan, east and west Selemadeg	Large amount Large amount	Temporary cut of irrigation water. Temporary cut of irrigation water.	High	Land conservation; Building the small reservoir; irrigation network construction
	(2) Spring water development	Penebel, Gembrong, Rianggede, Klepud, Kemetug, Klepud Dalang.	Medium	No significant negative impact	Very high since local people can do the maintenance	Construction; and maintenance.
	(3) Ground water development	Kediri, Kerambitan, Selemdeg, Tabanan	Large amount	Sea water intrusion	High	Drilling; irrigation channel construction, OM

Note: :(A) Domestic and Non Domestic Water Supply;(B) Irrigation Water Development

(b) Highly Prioritized Alternative Projects

Table-P.25 Highly Prioritized Alternative Projects by Participants in Tabanan Regency

Water issues	Highly Prioritized Alternative Projects First, Second, and Third Priority reading from above	Reasons for Prioritizing
A	1. Land and water conservation 2. <i>Embung</i> /small scale reservoir: Singin 3. Munggu Reserv. at Penet River	First priority was for A.1 because of land is available, enhancing water sources, and seeds for reforestation are available.; A.2 was selected as the second priority because land is available, survey and investigation already conducted, and highly needed; A.3 still require land acquisition
B	1. River intake development 2. Spring water development 3. Ground water development	B.1 as the first priority because it would restore the function of the forest as catchments area, would store water during rainy season to be used at dry season; B.2 was more preferable than B.3 in order to stabilize water sources.

Note: A, Domestic and Non Domestic Water Supply; B, Irrigation Water Development;

P-3.5 Meeting Result in Klungkung Regency

(1) Comments / Suggestions / Issues Raised During Plenary Session

- The Master Plan should not be limited only to the survey/study; most importantly is the follow up and quick action after the SHM; Klungkung Government has already provided the land for Gunaksa Estuary Project, so the project should be realized as soon as possible;
- There is a need to integrate the development for the three water sources of Telaga Waja at Karangasem, Unda River itself, and water source at Tembuku in Bangli;
- Although the river flooding is not a very serious problem at present, but due to rapid expansion of development in tourism sector which may degrade the upstream catchments area, preservation measures of catchments area upstream need to be taken. More over, such conservation /preservation measures are crucial for increasing water source potential at downstream of Unda River. In fact, river discharge at downstream has been significantly declining.

(2) Other Additional Alternative Projects Proposed by Participants

In Klungkung Regency, the participants proposed some additional projects as follows:

- Ground water and spring development ;
- River intake development and upgrading of irrigation network;

(3) Project Selection Criteria and Prioritization of Alternative Projects

(a) Project Selection Criteria

Table-P.26 Selection Criteria and Project Activities for Alternative Projects in Klungkung Regency

Water Related Issues and Alternative Projects	Project Selection Criteria				Project Activities	
	Target area	Input/cost	Negative impact	Operation and maintenance capability		
A	(1) Gunaksa Estuary Dam at Unda River	Klungkung, Denpasar, Badung, Gianyar Karangasem	Very large	Illegal settlement due To workers from outside Bali	High	Feasibility study; detail design; socialization of the project; land acquisition;
	(2) Ground and spring water development	Nusa Penida	Large amount	No significant negative impact	High	Hydrologic survey; feasibility study; detail design; socialization.
	(3)Hydrological monitoring system development	Klungkung Regency	Medium	None	High	Survey and site investigation; installment of equipment; monitoring
B	(1) River intake dev. & upgrading of irrigation network	Klungkung Regency: (Rivers of Unda, Bubuh, Melangit, Jinah)	Medium	No significant negative impact	Very high	Constructing dam/weir; rehabilitate irrigation network; O&M
	(2) Spring water development	Nusa Penida	Large amount	No significant negative impact	High	Survey/data collection; design; construction; and OM
	(3) Ground water development	Klungkung , Banjarangkan, Dawan, Nusa Penida	Very large amount	No significant negative impact	High	Drilling/installing tube; installing pipes; OM
D	(1) Community education on sanitation;	Urban and rural community especially along River course	Medium	None	Very high	Socialization; training.
	(2) Water quality monitoring system improvement	Along river courses at Klungkung Regency	Medium	None	High	Taking water for sample ; Laboratory testing; Reporting of the test

Note: :(A) Domestic and Non Domestic Water Supply;(B) Irrigation Water Development; (D) Water Quality Improvement;

(b) Highly Prioritized Alternative Projects

Table-P.27 Highly Prioritized Alternative Projects by Participants in Klungkung Regency

Water issues	Highly Prioritized Alternative Projects (First, Second, and Third Priority reading from above)	Reasons for Prioritizing
A	1. Gunaksa Estuary Dam at Unda River 2. Ground water and spring development 3. Hydrological monitoring system development.	A.1 was given first priority because it is the community's need; land acquisition no longer required; support the Regency's program; and avoid the quarrying. A.2 was put on a second priority because further preparation still yet needed and A.3 is not yet so urgently needed.
B	1. River intake dev.& upgrading of irrigation network 2. Spring water development 3. Ground water development	B.1 got first priority because would meet irrigation water requirement, may increase agricultural productivity; needs upgrading because heavy damage of irrigation network. B.2 was preferable than B.3 because B.3 needs high technology.
D	1. Water quality monitoring system improvement 2. Public education on water quality improvement and sanitation 3. Motivation for collective treatment of industrial wastewater.	First priority for D.1 because water is daily basic need of the people, its quality is below standard, and community awareness toward sanitation is still low. Regarding D.2 and D.3 no specific reason was given.

Note: A, Domestic and Non Domestic Water Supply; B, Irrigation Water Development; D, Water Quality Improvement;

P-3.6 Meeting Result in Denpasar Municipality

(1) Comments / Suggestions / Issues Raised During Plenary Session

- Projection up to 2025 is too long considering the fact that data often change within a short period of time which consequently need constant adjustment;
- Problem of coordination among agencies needs to be arranged in Provincial Government Regulation; and
- River Basin Conservation was proposed as another important issue.

(2) Other Additional Alternative Projects Proposed by Participants

The participants in Denpasar Municipality proposed some additional projects as follows

- Estuary dam at Petanu River;
- River flood control;
- River Flushing;
- Absorption well;
- Waste management ;
- Increasing community participation in water quality improvement;

(3) Project Selection Criteria and Prioritization of Alternative Projects

(a) Project Selection Criteria

Table-P.28 Selection Criteria and Project Activities for Alternative Projects in Denpasar Municipality

Water Related Issues and Alternative Projects	Project Selection Criteria				Project Activities	
	Target area	Input/cost	Negative impact	Operation and maintenance capability		
A	(1) Buangga Reserv. at Ayung River	Denpasar City; Badung Regency	Very large	Environment degradation and limited water during construction stage	High	Preconstruction; Construction; O&M
	(2) Gunaksa Estuary Dam at Unda River	Denpasar, Badung, Gianyar, Klungkung, Karnagasem	Very large	Environment degradation	High	-ditto-
	(3) Munggu Reserv. at Penet River	West Denpasar	Large	ditto-	Very high	- ditto -
	(4) Ground water development	Almost the whole Denpasar City	Medium	Intrusion of sea water	High	-Survey and investigation; - Drilling - O&M
	(5) Spring water development;	Almost the whole Denpasar Municipality	Medium	No significant negative impact	High	-ditto-
	(6) Hydrological monitoring system development.	Public Works; Meteorology and Geophysics of Bali Province; Environment Office	Small	None	Very high	Collecting data; Analyzing data
	(7) River Flushing	Denpasar City	Small	Bad smell, garbage, dust.	Very high	-Open dam's gate; -Announce the time schedule to the citizen.
	(8) Estuary dam at Petanu River	South Denpasar; East Denpasar	Large	Traffic jam; environment degradation	High	-Preconstruction; -Construction; - O&M
C	(1) Absorption well;	Whole Denpasar	Small amount	No significant negative impact	Very high	Making local govern. regulation govern. regulation
	(2) Waste management	Whole Denpasar	Medium	No significant negative impact	Very high	Flushing, building channel and by-pass; and maintenance of water channel
	(3) River flood control	Large amount		Human resettlement (socially difficult)	High	River basin conservation; drainage construction; normalization of rivers (Badung and Mati)
D	(1) Water quality monitoring system improvement	Whole Denpasar	Small amount	No significant negative impact	High	Collecting data; Analyzing data;
	(2) Increasing community participation in water quality improvement	Whole Denpasar	Medium	No significant negative impact	Very high	Information dissemination; home visit; building waste disposal places; installing prohibition boards.

Note: :(A) Domestic and Non Domestic Water Supply; (C) Flood Control; (D) Water Quality Improvement;

(b) Highly Prioritized Alternative Projects

Table-P.29 Highly Prioritized Alternative Projects by Participants in Denpasar Municipality

Water issues	Highly Prioritized Alternative Projects (First, Second, and Third Priority reading from above)	Reasons for Prioritizing
A	1. River Flushing 2. Estuary dam at Petanu River 3. Buangga Reservoir at Ayung River	For A.1, because it will improve drainage flows, and help minimize inundation.; For A.2 because it can partly meet domestic and non domestic water demand. or A.3 because it will encompass wide beneficiary (subak, consumers of PDAM, tourism sector, and electricity consumers);
C	1. River flood control (only one project is selected)	Supported by policies of Central as well as Provincial Government.
D	1. Increasing community participation in water quality improvement 2. Water quality monitoring system improvement	Both D.1 and D.2 are greatly needed and assumed to be quite feasible. But D.2 seems to be more preferable

Note: :(A) Domestic and Non Domestic Water Supply; (C) Flood Control; (D) Water Quality Improvement;

P-3.7 Meeting Result in Bangli Regency

(1) Comments / Suggestions / Issues Raised During Plenary Session

- Water sources that have been utilized by subaks should not be taken for other usage because subaks themselves are still lacking irrigation water;
- Concerted effort needs to be done to solve water crisis at Kintamani, particularly how to build a reservoir to raise water source at Songan Village;
- Inundation mitigation in the City of Bangli should also be included in Master Plan 2005

(2) Other Additional Alternative Projects Proposed by Participants

The participants in Bangli Regency proposed the following additional projects:

- Rehabilitation of PDAM' s distribution network ;
- River intake development and upgrading of irrigation network

(3) Project Selection Criteria and Prioritization of Alternative Projects

(a) Project Selection Criteria

Table-P.30 Selection Criteria and Project Activities for Alternative Projects in Bangli Regency

Water Related Issues and Alternative Projects	Project Selection Criteria				Project Activities	
	Target area	Input/cost	Negative impact	Operation and maintenance capability		
A	(1) Rehabilitation of PDAM's distribution network;	Rural drinking water distribution network within Bangli Regency	Large amount	No significant negative impact	High	Survey; design; installing new pipes/distribution network
	(2) Ground water development	Rural and urban area in Bangli Regency	Large amount	No significant negative impact	High	Survey; design; drilling;
	(3) Spring water development	Rural and urban area of Kintamani Sub district	Large amount	Reduction of irrigation water; Conflict with subaks?	High	Survey and site investigation; detail design; construction; OM
B	(4) Hydrological monitoring system development	Rivers, lake and paddy fields in Bangli Regency	Medium	No significant negative impact	Very high	Survey/data collection; installing equipments;
	(1) River intake dev. and rehabilitation of irrigation network	Sub districts of: Bangli, Susut, Tembuku, and Kintamanani	Large amount	Land acquisition, competition in water use	High	Constructing new small reservoir and dam at Tembuku Sub district; rehabilitate dam at Bunutin.; upgrading irrigation network;
	(2) Spring water development	All Sub district in Bangli Regency	Large amount	No significant negative impact	High High	Campaign on river basin conservation; and land conservation
	(3) Ground water development	All Sub district in Bangli Regency	Large amount	Lowering ground water table ;		Survey; drilling;
D	1) Community training /education on water quality	Community living along river courses in Bangli Regency	Small amount	None	High	Socialization; training/education
	2) Water quality monitoring system improvement;	Rivers; lake; groundwater; and springs in Bangli Regency	Medium	None	High	Field testing; build laboratory; laboratory testing;
	3) Community motivation for collective treatment of industrial wastewater	Business and industrial community in Bangli Regency	Medium	Social unrest	High	Socialization; constructing waste treatment plan

Note: :(A) Domestic and Non Domestic Water Supply;(B) Irrigation Water Development; (D) Water Quality Improvement;

(b) Highly Prioritized Alternative Projects

Table-P.31 Highly Prioritized Alternative Projects by Participants in Bangli Regency

Water issues	Highly Prioritized Alternative Projects (First, Second, and Third Priority reading from above)	Reasons for Prioritizing
A	1. Rehabilitation of PDAM' s network 2. Spring development; 3. Hydrological monitoring system development.	A.1 got highest rank because large potential of water sources, highly needed at present, , small diameter coupled with leakage of pipes, and support Regency Government program. No reason was given for prioritizing A.2 and A.3. Meanwhile ground water development was not prioritized due to high cost and its low potential.
B	1. River intake dev.& upgrading of irrigation network 2. Spring water development 3. Ground water development	B.1 was highly prioritized because poor condition irrigation network urgently need rehabilitation/upgrading. B.2 was higher priority than B.3 because B.3 is only for areas not assessable by irrigation network.
D	1. Motivation for collective treatment of industrial wastewater. 2. Public education on water quality improvement and sanitation 3. Water quality monitoring system improvement	Highest priority for D.1 because by providing waste treatment plant /facility the people may be easier motivated, and environment will not be degraded. The participant seemed to be indifference to D.2 and D.3 without any clear explanation.

Note: :(A) Domestic and Non Domestic Water Supply; (B)) Irrigation Water Development; I; (D) Water Quality Improvement;

P-3.8 Meeting Result in Gianyar Regency

(1) Comments / Suggestions / Issues Raised During Plenary Session

During the plenary session only one participants suggested that besides the multipurpose reservoir development project at Ayung River, several intakes (small dam) should also be built at selected points e.g. at Melinggih Village where springs are not yet utilized.

(2) Other Additional Alternative Projects Proposed by Participants

The participants in Gianyar Regency proposed the following additional projects:

- Buangga Reservoir at Ayung River;
- Gunaksa Estuary Dam at Unda River ;
- Estuary Dam at Petanu River;
- Ground water and spring development;
- River intake development and upgrading of irrigation network

(3) Project Selection Criteria and Prioritization of Alternative Projects

(a) Project Selection Criteria

Table-P.32 Selection Criteria and Project Activities for Alternative Projects in Gianyar Regency

Water Related Issues and Alternative Projects	Project Selection Criteria				Project Activities	
	Target area	Input/cost	Negative impact	Operation and maintenance capability		
A	(1) Gunaksa Estuary Dam at Unda River	Sub districts of Sukawati, and Blahbatuh	Very large	Land use conversion	High	Building reservoir; Land acquisition; Installing pipes& water treatment plants.
	(2) Ground and spring water development	Sub districts of Gianyar, Blahbatuh, Tampak siring	Medium	Declining water table of surrounding projects; intrusion of sea water	High	Survey and investigation; - Drilling - O&M -springs conservation
	(3) Estuary dam at Petanu River	Sub district of Gianyar, Sukawati, Blahbatuh , southern part of Denpasar and Badung	Large amount	Land use conversion and resettlement	High	Building reservoir; Land acquisition; Installing pipes& water treatment plants
A	(4) Buangga Reserv. at Ayung River	Payangan, Ubud, Tegal Lalang Sub district; Denpasar and Badung.	Large amount	Land use conversioz	High	Preconstruction; -Construction; - O&M
	(5) Hydrological monitoring system development	The whole of Gianyar Regency	Small amount	None	Very high	Survey/data collection; Installing equipments;
B	(1) River intake dev. & upgrading of irrigation network	Subaks: Siangan, Bonjaka, Bija, Pekarangan, Saraseda	Medium	Land acquisition; Limited water for paddy cultivation during construction stage.	Very high	Survey; design; building new small intakes; upgrading of channel, tunnel, and division structures
	(2) Spring water development	Subaks: Umadesa, Tegal Suci, Pekerisan, Siangan, and Saraseda	Medium	No significant negative impact	Very high	Survey/ inventory of springs; design and construction; OM.
	(3) Ground water development	Subaks: Abian Mawang, Calo Pupuan, Siangan, Saraseda, Alas Tengkulak	Large amount	Lowering ground water table at the surrounding projects	Not so high	Drilling; installing Pipes; OM
D	(1) Public education on water quality improvement and sanitation	Rural and urban people of whole regency of Gianyar	Small amount (RP 200 millions)	None	Very high	Dissemination/extension and training.
	(2) Water quality monitoring system improvement;	Rural and urban people of whole regency of Gianyar	Medium (RP 500 millions)	None	Very high	Improvement of drinking water distribution network; Water sample investigation(test laboratory)

Note: :(A) Domestic and Non Domestic Water Supply;(B) Irrigation Water Development; (D) Water Quality Improvement;

(b) Highly Prioritized Alternative Projects

Table-P.33 Highly Prioritized Alternative Projects by Participants in Gianyar Regency

Water issues	Highly Prioritized Alternative Projects (First, Second, and Third Priority reading from above)	Reasons for Prioritizing
A	1 Estuary dam at Petanu River 2 Buangga Reserv. at Ayung River 3 Gunaksa Estuary Dam at Unda River	The reasons given are not so clear, but all these projects are to be prioritized because of high potential of water resources and not yet being utilized properly and optimally
B	1 River intake dev.& upgrading of irrigation network 2 Spring water development 3 Ground water development	To utilize the unused water flowing to the sea during dry season and avoid floods during rainy season; and spring water was preferable compared to ground water development because the later needs very higher operational cost.
D	1 Public education on water quality improvement and sanitation; 2 Water quality monitoring system improvement	No ranking of priority was given and they assumed both projects were of equal important

Note: (A) Domestic and Non Domestic Water Supply; (B) Irrigation Water Development; (C) Water Quality Improvement; (D) Water Quality Improvement;

P-3.9 Meeting Result in Badung Regency

(1) Comments / Suggestions / Issues Raised During Plenary Session

- Clean water for tourism and domestic is still needed but Estuary dam at Benoa which is managed by PDAM still owes RP 35 billion; it is not only Badung Government's problem but Central Government's problem as well;
- Sidang reservoir for North Badung should be developed soon since it needs only small amount of fund;
- Lepud Subak drawing water from Sugi River asked the possibility for the subak members themselves to do re-greening of the critical land owned by Government in order to conserve the water sources along the river ; in order to realize this the guidance from Forestry Office is needed.

(2) Other Additional Alternative Projects Proposed by Participants

Badung Regency's participants proposed the following additional projects:

- River intake and spring water development (along the Rivers of: Ayung , Sayun, Kilap Petang, Penet, and the villages of Munduk Babakan) for irrigation;
- River flood control.

(3) Project Selection Criteria and Prioritization of Alternative Projects

(a) Project Selection Criteria

Table-P.34 Selection Criteria and Project Activities for Alternative Projects in Badung Regency

Water Related Issues and Alternative Projects	Project Selection Criteria				Project Activities	
	Target area	Input/cost	Negative impact	Operation and maintenance capability		
A	1)Buangga Reserv. at Ayung River	Denpasar City; Badung; and Gianyar Regency	Large amount	Resettlement ; changing use of land; erosion of groundwater.	High	Survey; design; socialization; land acquisition; construction; - O&M
	(2) Gunaksa Estuary Dam at Unda River	Denpasar, Badung, Gianyar Klungkung,	Large amount	Change in income sources of local people	High	- ditto -
	(3) Munggu dam at Penet River	Kuta; and West Denpasar	Medium	No significant negative impact	High	-ditto-
	(4) Spring water development;	Abiansemal; Mengwi; Tangkup; and Petang	Small amount	No significant negative impact	High	-ditto-
	(5) Hydrological monitoring system development	Kuta; Mengwi; Abiansemal; Petang; Badung;Mati River; Penet River	Small amount	None	High	Collecting data; Analyzing data
B	River intake and spring water development along the Rivers of: Ayung , Sayun, Kilap Petang, and Penet., and the villages of Munduk Babakan	Badung Regency	From Medium to Large amount	During construction stage, planting schedule might be disturbed	High	Building tunnel about 300 m long at Sayan Village; improvement of river embankment at Semana; making connecting channel from Bangkung River to Mangkong River about 1.5 km; building water tunnel and connecting channel from Canging Dam at Sayun River to Lepud Subak; tunnel rehabilitation (7 km) and constructing reservoir of Dangus , Blong, and Sulangai springs at Kilap Petang River; building new division structures and upgrading of water channels and water gate regulators for each subak drawing water from Penet River.
C	Flood control	Flood problems often occurred at: Mati river, Badung River, Uluwatu, Jimbaran, Nangka River, Land under consolidation program, and Kuta drainage	Not discussed	Not discussed		Not discussed
D	Community motivation for collective treatment of industrial wastewater	South Kuta ; South and North Badung	Medium	Social dissatisfaction because of the operational funding taken from their own pockets	High	Socialization; training; community based sanitation.
E	Reforestation and re-greening of critical lands	Slum areas within Badung Regency	Large amount	Potential illegal logging after the project when the trees getting old.	High	Planting trees on the private lands and on protected forest lands; fencing mangrove forest to limit the illegal cutting of the trees.

Note: A, Domestic and Non Domestic Water Supply; B, Irrigation Water Development; C, Flood Control; D, Water Quality Improvement; E, River Basin Conservation;

(b) Highly Prioritized Alternative Projects

Table-P.35 Highly Prioritized Alternative Projects by Participants in Badung Regency

Water issues	Highly Prioritized Alternative Projects (First, Second, and Third Priority reading from above)	Reasons for Prioritizing
A	1 Munggu Reserv. at Penet River 2 Buangga Reserv. at Ayung River 3 Gunaksa Estuary Dam at Unda River	A.1 as a priority because it can cope with the water scarcity at Badung, detail design has been made, and highly needed; A.2 is supposed to meet water requirement for North and Central Badung; A.3. is to increase water supply for South Badung.
B	River intake and spring water development (along the Rivers of: Ayung , Sayun, Kilap Petang, Penet., and the villages of Munduk Babakan)	It was preferred because it is technically possible, its cost might be affordable and highly feasible. (Other alternative projects were not discussed and ground water development was not recommended due to high cost and the source of water from springs might be enough).
C	C.6. River flood control	<i>Sub Meeting of Flood Control issue only proposed one big project just to be called River Control project but without assigning selection criteria. They only discussed causes of flood problem</i>
D	Motivation for collective treatment of industrial wastewater.	This was chosen because it can support river basin conservation and water quality improvement downstream .
E	Reforestation and re-greening of critical lands ;	It can contribute to the conservation of catchments area and improvement of water quality;

Note: A, Domestic and Non Domestic Water Supply; B, Irrigation Water Development; C, Flood Control; D, Water Quality Improvement; E, River Basin Conservation;

P-3.10 Recommendation for Next Stakeholders' Meetings

- The same person / individual /government official /stakeholders to be invited to participate in each Stakeholders' Meeting should be always the same in order to avoid difficulty for him /her to follow or understand the content of the meeting in a continuous manner, so long as the materials /agenda to be discussed constitute a continuation of the former meeting (this was proposed by the some participants).
- Better preparation for the next Stakeholders' Meetings especially the briefing to the facilitators concerning the contents and objectives of the meeting including the methods of discussion in order to crop a much better result is highly required;
- In order to enable the participants to better prepare for themselves for the next Stakeholders' Meetings it seems necessary to attach brief information about matters to be discussed along with the letter of invitation; a time lag of about 3-4 days is required prior to the beginning of the meeting.
- To arrive at a consensus concerning the position of the Sedahan Agung it seems necessary to add a special agenda to discuss this matter at the next Stakeholders' Meeting, or to especially organize intensive dialog and workshop first among related government agencies and then followed by a workshop involving wider participants from various stakeholders.

P-4 THIRD STAKEHOLDER MEETING

P-4.1 Karangasem Regency

(1) General Comments and Suggestions Raised by Participants During Plenary Session

The followings are some important comments/suggestions raised by participants from Karangasem Regency:

- Data on the total land area of Karangasem Regency should be rechecked and revised in order to show the correct figure in the Master Plan;
- Public Works Office has made detail design for Telagawaja' s water sources. Is there any budget to be allocated for detail design in 2005?
- Master Plan should be implemented for the benefit of the people of Karangasem irrespective

of from which sources the fund comes from (APBD, APBN, or loan).

- The same day and time with this SHM, a forum consisting of various component of Karangasem people called “Forum SEKAR”, is also conducting a meeting to discuss various aspects of regional development of Karangasem Regency including water resources problems. Hopefully they would be able to formulate a recommendation with regard to water resources development and management for this region and it might be useful as reference for JICA Team Study in improving the Mater Plan.
- The basic philosophy of TRI HITA KARANA in developing and managing water resources should not be forgotten. How to protect the water sources, and how to protect the users to ensure the equity and sense of fairness among users; Religious ritual and local wisdom in protecting the water sources should not be neglected; Water sources need to be protected technically, ecologically, and socio-culturally; Water sources have degraded because we have forgotten the local knowledge once used by our predecessors in preserving the water sources;
- Downstream water users should contribute or give compensation to the preservation efforts done by the upstream community which are usually the farmers themselves.
- With regard to the transfer of water from Telagawaja amounted to about 0.5 m³ / sec. for developing Denpasar Metropolitan Water Supply, most participants did not accept it; they prefer to develop embung/ micro reservoir to supply water for Kubu and Selat Sub districts.
- Before it is too late, it should be better first of all to form a Water Resources Council to discuss carefully concerning how to cope with water problems in Karangasem Regency.

(2) Expected Projects with Their Specification

Table-P.36 Expected Projects with Their Specifications in Karangasem Regency

Expected Projects		Project Specifications	
		Location	Activity
Flood Control / River Improvement	MP	Buhu, Krekuk, Bahapi, Jangga, Kates, Peningsungan, Batunini, Daya, Karobelahan, and Amed Rivers.	GS, NC, RbP, KC; CD and lava pocket bank construction
	AP	Rivers: Tiis, Toyo, Jangga ; Nusu	CD; CN
Spring Protection	MP	Tumbu, Tirta, Pucuk, Jaga Satru, Pesucian, and Ababi Springs.	
	AP	+Upstream river basins; and Bebandem Sub district; # Canging , Jaga Satru , Telaga Tista, Muncan , Jungutan , Ababi and Telaga Tista springs; ^ Besakih, Pempatan, Menanga Villages	+Reforestation #Protection /conservation ^ Reforestation and re-greening
Embung /Micro- reservoir Development	MP	.	Feasibility study of + AMDAL 4 units embung.
	AP	Sebudi, Besakih, Pempatan, Menanga, and Buana Giri Villages	Embung construction
Irrigation improvement	MP	Subaks: Lebu, Bale Punduk, Cau Yasi, Nagasungsang, Rendang, Subangan I, Selat , Timbrah, Tebola Dauh Desa, Tangkup, Embah Api, Tirtagangga, Yeh Masin.	Rehabilitation of irrigation networks; Dam construction (Selat and Timbrah).
	AP	Subaks:Perasi (5 km); Lanson (8km); Bambang Biaung (3 km); Gantalan I+II, Sibetan , Tebola	Rehabilitasi of irrigation canals
Raw Water Supply Development	MP	Yeh Kori, Telagawaja, and Bungaya Villages;	+Construction (for Yeh Kori+ Bungaya); Detail Design (Telagawaja); and Supervision + construction (Telagawaja)
	AP	+Seraya, Ulakan, Datah, Jungutan, Buana Giri, Padang Tungga, Sorga, Sebudi, Pura; # Telagawaja	+Cubang (rain harvesting structures) construction; # Clean water supply for whole Karangasem + irrigation water for Seraya and Kubu Sub districts
Beach Protection	MP	Ujung Beach	Construction for beach revetment
	AP	Sari, Bugbug, and Amed beaches	Beaches revetment
Infiltration Well	MP		Study and planning; construction
	AP	Pempatan, Besakih and Menanga Villages	Construction
Groundwater	MP		Rehabilitation of irrigation networks, MEE Office, tube well exploration.
	AP	+Bukit Village (Seraya Sub district) ; # Near Batumadeg Temple	+Pump replacement (15 lt/sec); depth: 250 m) ; # Drilled well (300 m ; 15 lt/sec)

Note: MP= expected projects as listed by Study Team ; AP= additional expected projects as proposed by stakeholders; GS= Ground sill; CN= Channel normalization; RbP= River bank protection; KC= crib construction; CD= Check dam; AMDAL= environmental impact assessment/EIA; MEE= European Union

P-4.2 Buleleng Regency

(1) General Comments and Suggestions Raised by Participants During Plenary Session

The participants from Buleleng Regency raised the following comments and suggestions:

- A technology of harvesting water during the rainy season needs to be introduced so that it can be used during dry season;
- Who will be responsible for managing water resources in Buleleng Regency? In this context it seems necessary to establish Water Resources Council and Sedahan Agung might be attached to this body;
- To protect spring water should not only mean the protection from its use but also more important is how to conserve or preserve it so that it can be utilized in a sustainable manner through reforestation and re greening of upstream watershed;
- Absorption/infiltration well needs to be constructed at certain areas or if possible at each house yard to reduce / minimize the surface run off. The government regulation to enforce each household or a group of households to make infiltration well within his or their house yards might be necessary;
- Micro reservoir (embung) needs to be also built to minimize the loss of river water that directly flowing to the sea;
- Flood control measures should not only focused on the physical construction measures like check dam, groundsill, embankment, etc, but not less important is through public education how to properly manage domestic waste disposal, because garbage thrown into the drainage and rivers may result in river flooding and street inundation such as occurred almost every year along the road near Sukasada.

(2) Expected Projects with Their Specification

Table-P.37 Expected Projects with Their Specifications in Buleleng Regency

Expected Projects		Project Specifications	
		Location	Activity
Flood Control / River Improvement	MP	Bengkala, Banyumala, Buleleng, Saba, Genggeng, and Grokgak Rivers.	GS, CN, RbP, KC; CD .
	AP	+Upstream watersheds; # Bakti Seraga gorge (urgently needed) > Bangka River, Anyar, Yeh Alang, Bantas, and Daya Rivers.	+Reforestation+ law enforcement of illegal cutting of forest trees. # and > : RbP; CN; and construct water divider near the weir for Bangka River
Spring Protection	MP	.Sudamala, Beji Pura Taman, Batu Bolong, Yeh Salak, Pura Taman Pakisan, Tanah Barak, Banyu Poh Gading, and Lemah Uma Jero Springs.	
	AP	Bakti Seraga, Pamaron, Banjar Jawa, Air Sanih, and Banyu Alit Springs	Development for irrigation
Embung /Micro- reservoir Development	MP	.	FS+ detail design 5 units <i>embung</i> ,
	AP	Anturan, Tegal Linggah, Selat, Kayu Putih, Melaka, Banjar (for Yeh Panes Subak), Gitgit (for Pangkung Dalem Subak); Sembiran, Tunjung, Depeha.	Construction
Irrigation Improvement	MP	Subaks:Tegal, Penarukan, Gitgit, Joanyar, Ambengan, Bulian	Rehabilitation of irrigation networks;
	AP	Subaks: Grokgak , Sanggar Langit, Bulian (100 ha), and Tejakula (200 ha).	Rehabilitation of irrigation networks.
Raw Water Supply Development	MP	Villages of: Sembiran, Kedis, Busungbiu, Munduk, Bestala (Seririt Sub district)	Supervision + construction
	AP	Julah, Tembok, Maduran	Piping
Beach Protection	MP	Air Sanih, Singaraja, Bukti, Pabean Sangsit	Construction for beach revetment; Pabean Sangsit is urgently needed
	AP	+Pajarakan, Sumber Kima Vilages; # Banyu Poh, Kalisada, Br.Asem, Loka Paksa, and Pengastulan Villages, Banjar, and along the beach of Skip until Penimbangan; Sambirenteng (2 km); * Along Pacung and Tembok (13 km)	+Mangrove conservation #Beach revetment; * Revetment urgently required
Infiltration Well	MP	Grokgak and Buleleng Sub districts.	Study and planning + construction
	AP	At many locations of Buleleng Regency	Regulation on : limitation of changing house yard to concrete; and enforcement to community to build infiltration wells.
Dam / Reservoir Development	MP	Sorga dam, Storage dam Titab and Tamblang, Saba River long storage.	FS , action plan and model test, AMDAL, supervision+ construction (Sorga); AMDAL, construction + action plan and model test (Titab); Construction (Tamblang); Supervision+ construction (Saba)
	AP	-----	-----
Groundwater	MP		Rehabilitation of irrigation networks, MEE Office, and tube well exploration
	AP	Villages within Tejakula Sub district	Operation and maintenance of tube well

Note: MP= expected projects as listed by Study Team of; AP= additional expected projects as proposed by stakeholders; GS= Ground sill; CN= Channel normalization; RbP= River bank protection; KC= crib construction; CD= Check dam; FS= Feasibility study; AMDAL= environmental impact assessment/EIA.

P-4.3 Jembrana Regency

(1) General Comments and Suggestions Raised by Participants During Plenary Session

Some important comments/suggestions raised by participants from Jembrana Regency are listed below:

- Reforestation of mangrove is needed to protect the beaches in Jembrana;
- There are still plenty of additional projects that need to be proposed but could not be identified yet now since heads of villages who were expected to participate and have adequate information , in fact they did not come in this SHM;

- Interconnection project is required not only within Jembrana Regency but also from other neighboring regencies , i.e., water surplus sub district should share water to other water scarce sub districts and water surplus regency should also share water with water deficit regencies;
- River mouth or estuary of big rivers need to be protected by constructing embankment .protection./river revetment;
- The geographical border between Jembrana and Tabanan Regency as shown in the map needs correction / revision; the border should be the Yeh Leh River.

(2) Expected Projects with Their Specification

Table-P.38 Expected Projects with Their Specifications in Jembrana Regency

Expected Projects		Project Specifications	
		Location	Activity
Flood Control	MP	Aya Timur, Yeh Embang, Pergung Mendoyo, Melaya, Yeh Sumbu, Ijogading, Biluk Poh, Sebuah, Kaliakah, and Sowan Daya Barat Rivers	RbP, CN, GS , CD, KC.
	AP	+Melaya Sub district; *Yeh Lebah, Yeh Leh, and Gumbrih rivers	+Reforestation and re-greening of production as well as protected forest ;To install barbed wire filled with stone at Aya River; * RbP and CN
Beach Protection	MP	Segara Rupek, and Cupel Beaches	
	AP	+Along the beach of Sowan (Tuwed Village of Melaya Sub district); < Candikusuma Beach (Melaya); > Delodbrawah beach –Penyaringan-- -Yeh Embang; #Along the beaches from Yeh Satang until Selabih River	+Rehabilitation of mangrove forest (50 ha) ; < Beach revetment; > Beach revetment (25 km); # Reforestation of mangrove (15km).
Raw Water Supply	MP	Poh Santen Village	
	AP	+Tukadaya and Tuwed Villages of Melaya Sub district; ^ Yeh Embang	+Piping (5 km and 1 km each); ^ WTP and replacement of transmission pipes .
Irrigation	MP	Subaks of: Tegal Gede, Sebuah, Telepus, Petanahan, Tibubleng, Pangkung Medahan II, Yeh Satang, and Pulukan.	Rehabilitation of irrigation networks
	AP	+Puspasari Subak (Melaya Sub district); # Pangkung Srangsang Subak	+Tunnel upgrading (1.5 km); # Reservoir construction at Medewi River to irrigate subak area (51 ha).
Groundwater	MP		Rehabilitation of irrigation networks, MEE Office, tube well exploration.
	AP	+Villages within Melaya Sub district; # Along the beach of Tegal Badeng	+Terracing of village-owned land; and Construct drilled wells for domestic water supply + for glass house; # Construct monitoring wells
Storage Dam	MP	Benel dam, Gelar dam	Construct access road and office; Construction (stage 1,2,3 of Benel dam); FS for Gelar dam

P-5 FOURTH STAKEHOLDER MEETING

P-5.1 Meeting Result

P-5.1.1 Penet River Raw Water Development Project

Table-P.39 summarizes the identification of some important characteristics of the stakeholders especially with regard to their needs/problems, worries about the project, their expectation to the project, what they can contribute to the project, and their recommendation for the smooth running of the project implementation. However since it is self explanatory it will not be described into detail here. Suffice it to say that from the comments and suggestions raised during plenary session and also from the results of identification of stakeholders' characteristics during the Group Discussion / Sub Meeting, several important points may be noted as follows:

1. Most stakeholders including the subaks welcome the project plan provided that it will not take the existing water sources already used by the subaks. In other words, the intake should be at the

lowest stream of the river/river mouth. The subaks representatives in particular strongly opposed the project if it would reduce the irrigation water supply to the existing subaks.

2. Although the intake will be located at the mouth of Penet River and its water treatment plant will be not so far from the intake so it would not create conflict with the subak, the followings points needs to be considered:
 - *Conservation of upstream river basin needs to be integrated with the project because the unsustainable water sources will make the project idle since only limited river water will flow to the intake;*
 - *The needs to listen to the opinion of the village heads and the residents of Munggu and Cemagi where the intake is to be located ;*
 - *The need to build access road to the site of water treatment plant;*
 - *The need to build micro dam (“embung”) upstream to stabilize river flow downstream that can be used by the subaks;*
 - *The need to establish a legal framework for sustainable river basin management;*

Table-P.39 Identification of Stakeholders’ Characteristics in Relation to Penet River Raw Water Development Project

Important Characteristics of Stakeholders	Identification
<i>Needs</i>	+ clean/drinking water has become basic daily needs; + watershed conservation; + water shortage during dry season for PDAM and subaks; + pest and insect attacking rice crop; + water conflict among users;
<i>Worry about the project</i>	> environmental degradation; > mobilization of non local workers; > disturbance of daily activity of community; >horizontal and vertical conflict; > land acquisition;
<i>Expectation to the project</i>	< sustainable clean water supply; < taking only the water unused by subaks; < job opportunity for local people; < enhancing the welfare of the community; < access roads for farmers; < harmonious cooperation among stakeholders;
<i>Stakeholders’ contribution</i>	^ As supplier of construction materials; ^ Employment & income generation for the community; ^ Give information to other member of local community about the project; ^ Assist in monitoring and controlling project implementation;
<i>Recommendation</i>	* Heads of villages of Munggu and Cemagi needs to be informed and asked their opinions about the project; * Do not take water at upstream since it will create conflict with subaks; * Construction of villas and houses along the river bank of Sungai and Penet River should be prohibited/minimized; * Socialization to Cemagi community should be conducted; * Conservation of catchments area is very important; * Access road to the site of Water Treatment Plant needs to be built; * Licensing of springs for business purpose should be strictly controlled; * Micro dam needs to be built at upstream to stabilize water flow downstream; * Legal framework for sustainable river basin management is highly required.

P-5.1.2 Badung and Mati Rivers Flood Control Project

In connection to the plan of Badung and Mati Rivers Flood Control Project, some results of identification concerning the stakeholders’ characteristics is shown in Table-P.40. From this table and also from several comments and discussion during plenary session

it can be derived the following important information:

1. River inundation problem occurs almost every year due to several reasons among others: garbage disposal by the households, drainage canals are not properly functioning such as the case of the canals from Ulun Tunjung and Seminyak Subaks, heavy sedimentation, the use of river body for growing certain crops like banana, etc. Thus, flood control project plan for both Badung River and Mati River *is of extremely important and mostly welcome by all stakeholders;*
2. Since many human settlements are found along both sides of the rivers, *river widening will not be tolerated.* The main activity of the project is therefore should be in form of river bed excavation and bank improvement coupled with soft measures *specially clean river environment and proper garbage treatment campaign.*
3. The project plan should take the following matters into consideration:
 - *The need to build access roads to the work sites at certain points of Mati River;*
 - *The need to protect the existing temples near the project sites;*

- The need to mitigate or avoid the negative impact of noise, dust, and traffic jam;
- The need to continuously supply irrigation water to the subak during the construction stage;
- The need to coordinate with related agencies particularly concerning the utilization of land areas expected by the project to be used as retarding basin;
- The need to conduct intensive dialog with the owners of land to be used as retarding basin prior to construction stage/ before detail design;
- The need to utilize locally available potentials such as skilled and unskilled workers, construction materials and trucks needed for the transfer of excavation materials;
- The need to consult and report to the related banjar / village heads when mobilizing non local workers;

Table-P.40 Identification of Stakeholders' Characteristics in Relation to Badung and Mati Rivers Flood Control Project

Important Characteristics of Stakeholders	Identification
<i>Needs</i>	+flooding every year; + sedimentation; + uneven width of the river ; +need land acquisition; +garbage disposal; + traffic jam due to flooding; + at certain points of Mati River no access road to the project; + routine excavation is needed but no fund; + socialization is needed; + pollution due to home industries; +people grow crops on emerging land at the river; +irrigation canal at subaks Ulun Tunjung and Seminyak are not functioning
<i>Worry about the project</i>	> removal of temples; > non local labor use; > low quality of construction; > noise, dust, safety; > sedimentation; >no access road to the project; > traffic jam; > the use of river body for cultivation;
<i>Expectation to the project</i>	< flood mitigation; < environmental health; < river as a place for recreation (canoeing, etc); < river water flows smoothly; < ensure clean river water; < does not disturb the existing subaks; < river can be used for fishing;
<i>Stakeholders' contribution</i>	^ Providing land with compensation; ^ permission of place for storing materials; ^ assist the socialization of the project; ^ provide information required for project design; ^ participate in campaigning clean river environment and garbage treatment.
<i>Recommendation</i>	* Socialization prior to implementation of project; * Coordination with related agencies/stakeholders because land areas expected to be used for retarding basin have been included in Land Consolidation Project (LC); * Village heads need to be informed if non local labors are to be used; * Excavation should be done regularly and simultaneously ; * Riverbank improvement must take the dikes into account; * Canals constructed in layers must take topography and existing intakes into account; * Local workers, local materials, local trucks, etc must be used as could as possible; * Soil / sand from excavation should be given free to those who need it; * Social, cultural, and environment must be preserved; * Quality of construction must be maintained. * The planner should talk with the owners of lands to be used for retarding basin;

P-5.1.3 Ayung Multipurpose Development Project

From the discussion during plenary session it be concluded that most participants support the project plan of Ayung Reservoir as a multipurpose project although several issues still need to be taken into consideration as can be derived from Table-P.41. These are summarized as follows:

1. The need for environmental impact assessment (hotels, rafting, biodiversity, socio-cultural, etc);
2. Possible conflict if non local workers are to be mobilized;
3. Problems of land acquisition, thus intensive socialization to land owners is deemed necessary;
4. Possible threat to certain temple' holiness, sacred cave, rare species, and holly spring;
5. The need to guarantee employment and income generating activity to local community;
6. The need to avoid the removal of existing settlement;
7. The guarantee that subaks still be able to draw water from their intakes and during construction stage cropping calendar is not to be disturbed;
8. The need for compensation for any damage brought about by the project;

9. The use of river water must consider the conservation of upstream watershed;

10. The upstream residents should also be able to gain benefit from the project;

Table-P.41 Identification of Stakeholders' Characteristics in Relation to Ayung Multipurpose Development Project

Important Characteristics of Stakeholders	Identification
<i>Needs</i>	+ Need for environmental impact assessment (hotels, rafting, biodiversity, socio-cultural, etc); + Landslides and erosion control; + Environmental preservation; + Preservation of cultural heritage such as Temples of Tangluk, Tegal Suci, etc; + Susut Subak lack of water; + Re-greening at upstream is required; + The monkey and cave bat need protection; + Improvement of standard of living; + Safety during and after construction; + Need more information about the project
<i>Worry about the project</i>	> recruitment of non local workers; > deforestation; > environmental degradation; > the use of non local laborers may create social conflict ; > threatening temples' holiness; > disturbing cropping schedule; > local climate change; > removal of existing settlement; > loss of job of local people if rafting is disturbed; > the dam broken down; > social unrest; > social jealousy; > increasing future water demand may exceed supply;
<i>Expectation to the project</i>	< the project should bring benefit not only to downstream but to upstream residents as well; < make good use of local potentials (local workers, materials, vehicles, etc); < adequate clean water and electricity; < sustainable project; < fair/rational compensation of land acquisition; < increase economic welfare of local community; < clean water requirement can be fulfilled; < sustainable job opportunity;
<i>Stakeholders' contribution</i>	^ Labor, materials for construction, information, etc; ^ access road for transportation to the project site; ^ Give retribution for the use of raw water; ^ Help to control and monitor the project implementation; ^ Ready to assist at any activity if needed;
<i>Recommendation</i>	+ Intensive socialization to residents and land owners; + Local rule and tradition should be take into account; + Project should guarantee employment and income generating activity of local people and environmental conservation at the upper stream; + Intensive socialization to local community especially the landowners is highly needed; + The project must not remove the existing settlement; + Water for subaks/irrigation should be guaranteed; + Compensation to owners of land used for access road ; + There should be a guarantee of compensation for any damage brought about by the project ; + The use of river water should also consider the conservation of upstream river basin; + The project should also consider the equity impact of upstream and downstream community; + AMDAL must be objective and informed to local people; + It is necessary to establish a Board of Management for Ayung Reservoir; + Conservation upstream river basin should be the first priority; + Access road to Ayung River must be made permanent; + The function and usefulness of Ayung Dam should be clearly informed to the community.

P-5.1.4 Petanu River Raw Water Development Project

Almost similar with Ayung case, from the discussion during plenary session it can be concluded that the project plan is quite welcome by stakeholders since it would meet the demand for clean water of the community in general and the resident of Saba Village and Sukawati Sub district in particular and at the same time it may reduce the taking of irrigation water by PDAM.

Table-P.42 Identification of Stakeholders' Characteristics in Relation to Petanu River Raw Water Development Project

Important Characteristics of Stakeholders	Identification
<i>Needs</i>	+ the need of long run clean/ drinking water; + Saba Village and Sukawati Sub district need drinking water; + land acquisition; + maintenance of subaks' temple (Er Jeruk Temple) will be neglected because land areas of subaks have converted to other usage;
<i>Worry about the project</i>	> socio-cultural and environmental impact; > landslides and erosion; >changing use of land; > reducing river discharge downstream; > threatening temples' holiness; >disturbing springs already used by local community; > disturbing village facilities for bathing and washing; > degradation around river mouth; > Petanu river is believed to be sacred, proper ritual is needed prior to project implementation;
<i>Expectation to the project</i>	< water for subak, hamlet, and villages; < to meet the demand for clean water; < job opportunity for local people/farmers; < source of revenue for the Village Office; < reduce water conflict; < reduce the taking of irrigation water for clean water; < financial support for the maintenance of subaks' temples ; < clearly defined distribution and management of the water among SARBAGITAKU
<i>Stakeholders' contribution</i>	^ Surrounding community will participate in controlling project implementation; ^ To provide information and data if required; ^ To share distribution networks of existing PDAM; ^ Assist in socializing the project; ^ To provide local workers;
<i>Recommendation</i>	* The following stakeholders should be invited for next meetings: leaders of hamlets, subaks, administrative villages, and customary law villages. #####) * Coordination between related institutions should be made; * The JICA team should conduct survey from downstream to upstream and inform to stakeholders and landowners about the project site; * Local workers should be used as could as possible; * The project should be realized as soon as possible. * Village administrators should be involved in controlling the project .

Note: #####) *They were actually invited, but did not attend.*

However, several points need further consideration as can be deduced from Table-P.42. These are summarized as follows:

1. *Possible degradation around river mouth;*
2. *Possible disturbance of springs already used by local community;*
3. *Possible disturbance of bathing and washing facility of local community*
4. *Possible landslides and erosion at upper stream of the reservoir;*
5. *Possible threat to the temples' holiness;*
6. *Strong belief of the local community that the project site is a sacred place which implies that special ritual is extremely important prior to construction;*
7. *The need for definite pattern of distribution and management of the available water among SARBAGITAKU.*
8. *The need for project's contribution to the maintenance of subaks' temple called Er Jeruk Temple at Sukawati Sub district.*

P-5.2 Recommendation to Next Stakeholders' Meeting

To improve the findings of the Stakeholders' Meeting it is necessary to take the following steps:

- Much earlier preparation for the next SHM such as the guidelines for the facilitators, the main objectives and contents of the stakeholders meeting, the selection of the relevant stakeholders to be invited, the confirmation of the venue, schedules of the meeting, and provision of materials to be used;

- Invitation to the stakeholders should be directly delivered to the persons concerned or to the agency being given responsibility for this particular duty with clear indication of the lists of stakeholders expected to participate;
- A rather large scale geographical map of the project sites needs to be provided to make it easier for participants to exactly indicate the important issues on the map.

P-6 FIFTH STAKEHOLDER MEETING

P-6.1 Meeting Result

All of the *project plans were welcome* and the participants were very eager that the project be realized as soon as possible provided that several critical issues like compensation for land acquisition, and holy spring would have been already settled. The findings of the Fifth Stakeholders' Meetings for each of the project plan are described below.

P-6.1.1 Sungai River Raw Water Development Project

1. **Access road to the project site.** It is possible by using the existing subak road that enters from the Mengwi –Tanah Lot Road direct to the site (Village of Mengening). The better alternative is to modify it in order to be straight rather than to exactly following the present subak road since it will become much shorter and no problem of house and family temple being adversely affected. It is about 2 km long and it may be used for public transportation but the rice fields surrounding the new road should be protected and prohibited to change it to other non farming uses. In other words, the “green space” policy should be implemented around this new road. In addition, the existing irrigation canals, water division structures and small rice field temples should be carefully taken into consideration during making detail design in order not to become dysfunctional.
2. **Land acquisition.** The new road needs land acquisition, but this may not be too big a problem, since the compensation can be negotiated with the owners of the land. The land of around 0.75 ha to be used as the site of the WTP belongs to the government and currently is tilled by 2 farmers, but they need compensation for loss of the job.
3. **The share of project benefit for local resident.** After completion of the project, the villagers surrounding the project especially from Cemagi and Munggu Villages need a share of the project in form of public clean water facilities to be placed at Banjar Hall, Temple, etc. The PDAM is expected to provide certain contribution either in cash or in kind during important event such as temple ceremony.
4. **Other requests from the participants.** Several proposals were raised by the participants. Among others:
 - (a) *A small road to a cemetery owned by Christian residents needs upgrading and widening, since it is used also by non Christian residents;*
 - (b) *A small road of about 200 m toward a small temple is needed. The local people are ready to give the land for that road, but assistance is required for its construction. Hopefully the project can do something during the construction stage of the access road to the project site.*
 - (c) *The road to the beach is required for the procession of religious ritual, but needs widening. Assistant from the project is required and this may be incorporated with the construction of access road to the project site.*
 - (d) *During construction stage, it is proposed to use local workers according the skills they posses.*
 - (e) *During the construction stage the project should not disturbed the planting schedule of the subaks.*

P-6.1.2 Badung and Mati Rivers Flood Control Project

1. **Retaining basin.** No meaningful opinion concerning what shall be done about the area proposed to be used for the retarding basin. It may be because none of the owner of land located at that area

was present during the stakeholder meeting. The participants opined that this issue shall be tackled by related government agencies and socialization as well as negotiation with the landowners is highly needed.

2. **Acquisition of land for retarding basin.** Most participants seem to be reluctant to raise their opinion regarding acquisition of land for the retarding basin since it seems very contentious issue. There was a sharp criticism about the former practice of compensating the land acquisition for a price determined by government. The owners were “compelled “ to let their lands be used for the project under disguise of public interest, but in fact the lands were not used according to the promise. Instead, their lands were used for housing. The participants opined that this land acquisition issue for the retaining basin shall be tackled by related government agencies. Socialization as well as negotiation with the landowners is highly needed for consensus concerning the methods of land acquisition in such a way so that it can satisfy the owners and will not make them always as a “loser” or “victim” of the project.
3. **Acquisition of land for river bank widening (if any).** At certain points along the river bank, widening may be required. In this case, the participants are ready to free their land as long as there is appropriate compensation (including the trees and shrines).
4. **Intakes of Batannyuh and Margaya at Badung River.** These intakes should be kept functioning to irrigate the subaks’ paddy fields drawing water from those intakes. At the same time efforts to minimize sedimentation should be carried out. The same treatment should apply for **Buagan Dam** because subak still requires irrigation water from this dam.
5. **Ulun Tanjung Dam.** There were two different opinions concerning whether or not it is necessary to demolish the existing Ulun Tanjung Dam. From one group it was informed that since there is no more paddy fields being found within the subak taking water from this dam, the demolish of the dam will be all right. But another group informed, the dam should be preserved since there are farmers who still need water from the dam. Anyway, such information needs to be rechecked to confirm the accuracy of the data/ information. It needs to be done during making detail design.
6. **The flooding problem.** If heavy rain occurs only for one day, the inundation at retarding basin area can reach about 1.25 m and take about half a day. But if heavy rain takes more than one day, the figures might be more. *The flooding on December 12, 2005* has resulted of around more than 400 houses were inundated and one person died. The height of inundation reached around 2m for about four hours duration. Unfortunately not sufficient information regarding the kinds of damages, where they occurred and the estimated value of the damages was obtained from the stakeholder meeting. *Important factors responsible for the floods are said to be as following:*
 - *People living along both sides of the river usually throw garbage to the river; in addition many people also used to throw garbage to the drainage canals;*
 - *Changing uses of paddy land for non farming purposes such housing, and other facilities;*
 - *The river body is used for planting certain kind of crops like banana, cassava, coconut trees, etc.*
 - *Many buildings and houses protruding over both edges of the river completely ignoring the rule concerning river borde;*
7. **Causes of river water pollution.** Besides garbage, the major causes of river pollution are sewage disposal from small industries like garment, printing, automotive repair shop, and restaurants located very close to both sides of the river. The polluted river is also affecting the irrigation water thus it is harmful to the farming activities.
8. **Clean River Program (PROKASIH).** So far, Prokasih only tackled the down stream problem, lack of control, and weak enforcement of existing regulation. It was proposed that *Prokasih* should cover the entire river, not only at lower stream but also the upper stream as well.
9. **Measures need to be taken.** The participants of Stakeholder Meeting proposed the following measures that need to be taken *in relation to the flood and pollution issues.*
 - *Connecting canal from Tebe Creek to Badung River along Imam Bonjol Street needs to be constructed to avoid inundation at the surrounding area. Formerly this creek was used for irrigation canal, but now it is not functioning since the surrounding area has become human settlement (Seblanga Village). Residents of Batannyuh and Tenten are willing to free around 1.0 m of their land if there is any improvement of Tebe Creek to minimize inundation.*

- *River excavation to removing sedimentation should be done in continuous and periodic manner;*
- *River excavation is also needed from Abian Base Village to Monang Maning;*
- *Land along River Mati from Bias Temple up to Pulau Roon Bridge (at Br. Pengiasan) need acquisition so that river embankment construction can be continued until Pulau Roon Bridge;*
- *River widening at Abian Timbul Village is impossible. Thus, only making the embankment a little bit higher is required and with dike at the backside to support it for safety reason.*

10. **Other relevant garbage management improvement requirement.** The participants also proposed the steps need to be taken to improve the present garbage management:

- *To install “garbage trap” which can be operated manually at certain places e.g., between Mandala Wangi Bridge and P. Biak Bridge, at the north of Tente Bridge, and near Mergaya intake.*
- *To put the sign prohibiting the throwing of garbage, at several point along the river bank including the text of Government Regulation. Intensive control and strict law enforcement with sanction to the offenders are required.*
- *The lamps along the river should be kept functioning. If the lighting is not sufficient it will encourage people to throw garbage at will.*
- *The customary village (“desa pakraman”) administrators may take important role in controlling the behavior of the resident concerning garbage disposal, particularly informing the “outsiders”(citizens who come from outside Bali), about the rule and regulation of the desa pakraman.*
- *Manpower, salary, and facilities of the Garbage Collecting Crew should be enhanced or improved.*

11. **Other proposals from participants.** Some other proposals raised during group interviews may be summarized below:

- *The land consolidation project (LC) at Semile, Melangi, and Mergaya, should not close irrigation canals of the existing subaks.*
- *It is necessary to record the river discharge at certain places during the normal condition in order comparison can be made with flooding condition.*
- *The condition of access road from Imam Bonjol Street to Buagan Dam is now seriously bad. Since after the completion of the project the road has never been upgraded. Its improvement is deemed necessary, and this must be realized soon.*
- *Upstream of Mati River especially East of Br. Teges at Purnawira settlement needs stronger embankment*
- *About 6 ha of land at Tegal Lantang Subak is not yet under LC project. The LC here is needed because at the surrounding area the LC has been accomplished.*
- *Construction of building along Badung River to the South is developing rapidly, but in fact without having license for the construction. Strict enforcement of regulation must be implemented.*
- *Ulun Tanjung Subak needs drainage canal because the water channel to Badung River has been closed.*

P-6.1.3 Ayung Multipurpose Development Project

1. **Rafting activity.** Rafting activity at upper stream of submerged area may be affected. The workers employed by the Holiday Rafting Company are afraid of losing their jobs. When the project is completed, the company should be given priority to open new business activity around the reservoir, for example “water tourism” such as canoeing. Those who will lose the job are expecting compensation or at least the project would like to provide job for them during construction as well as after construction stage.
2. The **land to be submerged** still needs further identification with special regard to the precise location, size, and owners of the land. Further socialization and negotiation about the value or terms of compensation is still needed.

3. ***Access road to the project site.*** During the meeting held at Kesianan Hamlet of Petang Sub district, no information regarding detail specification of expected access road was obtained, since most of participants live far away from the project site. According to them the people living at the Susut Village-Gianyar might know better where is the shortest or the best road to the project site. But the existing village road may need widening. Land acquisition may not be a problem. A fair compensation through negotiation with the owners of the land may be necessary. At any how, socialization to the resident of living very close to the site is very important since they are directly affected by the project. From the meeting held at Melinggih Village in Gianyar, it was revealed that no problem of access road, since it is already available from Petang to Payangan (its width is about 6 m) not included the drainage canals of both sides of the road. In connection with the access road possibly no land or other assets acquisition is required.
4. The fair ***sharing of project benefit*** should be guaranteed between upstream and down stream resident on one side, and between resident of Badung Regency and Ginyar Regency on the other.
5. ***Holy spring used for religious ritual located at small cave at the edge of the river.*** The people of Kesianan Hamlet do not know about this spring, since it is located at lower stream. Again, the local people at Susut and Melinggih Villages in Gianyar also could not give any decision whether or not it can be replaced by another spring located some where along the river course. They did not like to take responsibility of any consequence of their decision. They want to hear the explanation from the competent persons or authority on this difficult matter. The participants opined that it is necessary to consult the high priest, religious leaders, and the appropriate authority like Office of Religious Affairs, Council of Hindu Religion, and so on, if this spring should have to be dysfunctional, particularly concerning whether or not it can be reallocated, where, and what is the procedure which needs to be followed.
6. ***Other important issues raised by participants.*** A number of important issues raised during the interviews can be summarized as follows:
 - *The steeply sloping riverbank nearby the reservoir should be strengthened.*
 - *The road connecting Petang and Ubud should be realized as soon as possible.*
 - *Information about the possibility of landslides along both sides of the river should be widely informed so that the people feel secure and safe.*
 - *If there is land to be submerged, the owners must be given fair compensation and the project should assist in the process of land certification.*
 - *The habitat of monkeys may be affected. The loss of monkey's habitat will make the move to the surrounding garden and may eat the fruit crops of the villagers. Re-greening and reforestation subsidy is needed at the upper stream with fruit trees so that the monkeys can live there.*
 - *Conservation of the elevated land should not be neglected. Local species of trees need to be planted for conservation.*
 - *The project should assist the provision of a place near the river for ritual related with cremation. i.e., throwing ashes of the cremated corpse and other materials ("Nganyut"). This kind of place is needed by the residents of Pangsan, Sekar Mukti, and Getasan Villages. The place should be equipped with parking place, and road along the river side for transportation.*
 - *After the completion of the project, the business opportunity should not be licensed only to investor from outside but the local people should be given assistance to start a kind of community-based business undertaking presided by capacity building for local people.*
 - *Safety of working environment during construction phase should be guaranteed by the project implementer.*
 - *Quality assurance is required so that the reservoir can sustain for many years to come.*
 - *Agreement or contract document is required between related community and project implementer concerning compensation before the project get started; during construction stage, local workers according to the skill they possessed should be*

employed. At least 60 % of total job requirement should be recruited from local people.

- When the project is already functioning, the project is expected to provide some kind of contribution to the local people.
- Any activity to be carried out near the project should be informed to the Office of Police Sector (“Polsek”) and Military Headquarters at Sub district level (“Koramil”), and Village Security Forces (“Bankamdes”).

P-6.1.4 Petanu River Raw Water Development Project

Since the site of the project will be located at the lowest stream of the Petanu River, no subaks may be adversely affected. The project is planned to only utilize the unused river water, so that it will not disturb the existing subaks. *The participants welcome this project but suggested the following matters to be taken into consideration:*

1. **Land acquisition.** The land of about 0.75 ha located at Glumpang Hamlet of Sukawati Village to be used Water Treatment Plant (WTP) should be informed to the landowners and compensation be negotiated carefully. Coordination with related parties like head of related subak, head of hamlet and head of the village should also be quite necessary to avoid misunderstanding and miscommunication. The procedure must be carried out in a transparent, accountable, fair, and honest manner. If possible, the land should be valued according to market price.
2. **Holy springs.** There are about 3 springs usually used by local people for religious ceremony (one located at the South of Saba Cemetery). If the intake is to be built, the people are afraid that these holy springs may be submerged. It is recommended that the surface of river water should be kept at the same level as at the present condition.
3. **Water quality.** River water seems to be polluted because of waste disposal from Sosro Tea Plant Company as indicated by bad smell. The tea plant is located in front of a Vihara (a Buddhist Temple). The validity of this information is yet to be verified or rechecked. If it is true, proper action should be made and it should be strictly controlled and sanctioned according to the prevailing regulation. A routine inspection on river water quality needs to be carried out.
4. **Quality of construction.** For safety purpose, the construction must be strong enough. It is to be stressed that usually around the months of January, February and March every year especially during heavy rain, river water over flows up to bridge of Pinda River.
5. **Local workers.** During construction stage, the local workers should be given priority as long as the skill is fulfilled.
6. **Irrigation water for downstream subak.** During dry season the subak of Sukawati is in need of irrigation water. This can be overcome if a small share of the water from the project is also to be contributed to the subak. In addition to this, the waste product of WTP might be used for irrigation (?????).
7. **Upstream subaks.** During limited water discharge (dry season), the project should not disturb water supply of the upstream subaks through collusion with dam keeper.
8. **Spiritual and religious matter.** As a common practice in Bali, during construction phase the project implementer should first consult the high priest or persons regarded as competent in dealing with spiritual and religious matters. In particular, prior to starting of construction, a ritual needs to be performed. The expert (usually the high priest) will give advise about what kinds of materials or kind of offerings should be prepared and what the best date to perform such ritual. Also, to change the use of paddy fields to non paddy farming and non agricultural purpose must follow the special ritual and this also need advise from the priest.
9. **Irrigation canal.** During construction work, the irrigation canal should not be disturbed so that the planting schedule can proceed as usual.
10. **Contribution of the project to local community.** When the project has been already in operation, there should be certain kind of contribution to the local community in form of:
 - Clean water to the Er Jeruk Temple ;
 - If possible, additional irrigation water to Subak-gede of Sukawati;

- *Donation from the project to Village of Saba and Sukawati and Er Jeruk Temple;*
11. **Other needs expressed by participants.** The followings are a few other request raised during the meeting:
- *PDAM urged that the Master Plan for upstream areas and Unda River soon be realized;*
 - *Drainage is needed from Gelumpang Hamlet toward Petanu River and Oos River to minimize the inundation problem.*

P-7 RECOMMENDATION FOR FURTHER ACTION

1. It is necessary to consult the religious leaders, and the appropriate authority like Office of Religious Affairs, Council of Hindu Religion (PHDI) and so on, if the holy springs especially at Ayung River should have to be submerged, particularly concerning whether or not it can be replaced by other spring somewhere else and what is the procedure which needs to be followed.
2. Provincial Regulation is needed to preserve the existing land functioning as natural retaining basin and therefore any effort to carry out Land Consolidation (LC) project in this area should not be tolerated; without retaining basin and under present condition it may be difficult if not impossible to solve the flooding problems in Denpasar and its surrounding areas.
3. As a common practice in Bali, during construction phase, the project implementer should first consult the high priest or persons regarded as competent in dealing with spiritual and religious matters. Prior to starting of construction, a ritual needs to be performed. The expert (usually the high priest) will give advice about what kinds of materials or kind of offerings should be prepared and what the best date to perform such ritual. Also, to change the use of paddy fields to non paddy farming and non agricultural purpose must follow the special ritual and this also need advise from the priest or other competent persons.
4. The validity of the information about the source of water pollution at Petanu River needs to be verified or rechecked. If it is true that the Sosro Tea Plant is responsible for it, proper action should be made and it should be strictly controlled and sanctioned according to the prevailing regulation.
5. The conflicting information about the utilization of Ulun Tanjung Dam needs to be rechecked to confirm the accuracy of the data/ information. It needs to be done by the sub contractor of Social Survey II, or during the preparation of detail design.
6. The JICA Study Team should investigate the existence of the holy spring nearby the project site of Petanu River Raw Water Development Project to confirm whether or not they will be submerged when the intake is built.