From Table 5.12, seems that the erosion on rice field land is between 0,06 – 4,67 ton/ha/year, settlement is between 10,58 -649,22 ton/ha/ year, mixed plantation is between 26,14 – 658,18 ton/ha/year, dry land 2,37 – 117,59 ton/ha/year, thick forest 28,12 – 70,76 ton/ha/year, coffee plantation 13,68 - 1528,36 ton/ha/year, bush 42,35 ton/ha/year, and forest 2,85 – 12,50 ton/ha/year. If it is compared with the permitted erosion, land use, settlement, mixed plantation, coffee plantation, dry land, and thick forest, the erosion prediction value is more than the tolerated erosion. It means that if it is ignored, the land will become critical.

5.1.4 Hydrology

1. Water Resources Potential

The river system in Bali flows from the north to south as the consequence of the division of Bali by the mountain, which stands along from tha eastern – western part of this island. Those rivers, which are, located in the southern part of the mountain flows to the southern which have length two times than the rivers that flow to the north in the northern mountain. There are 401 rivers and 162 tributary that flows into the seas.

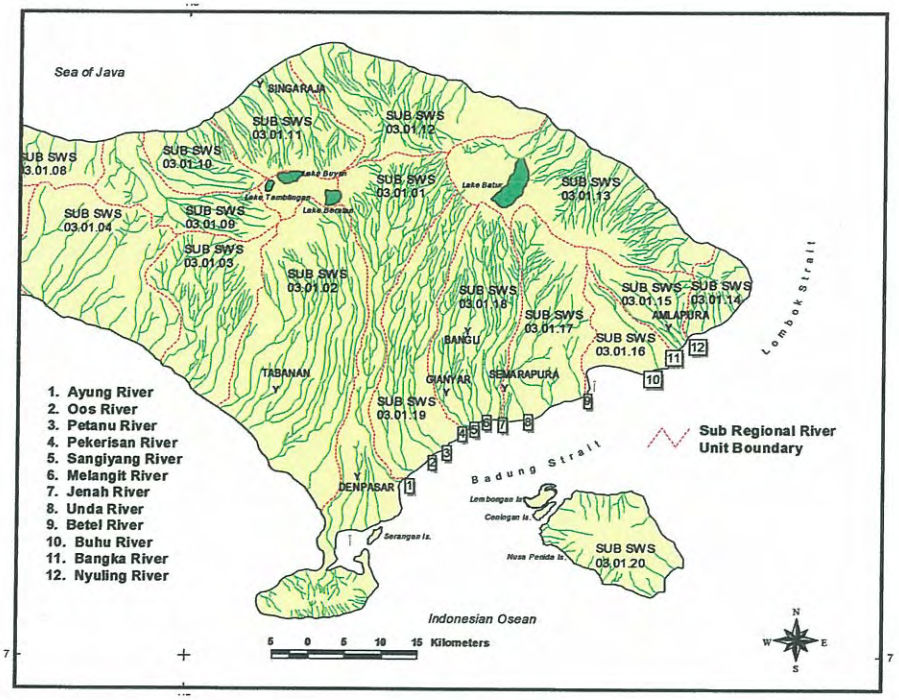

Figure 5.3 Rivers Figures Around the Study Area

Rivers in Bali are already grouped into River Basin System (SWS), which have 20 sub-River Basin. Meanwhile the rivers that empty into South Eastern Bali coastal area are seven sub-Regional River Unit. (ICM, 2001).

Ayung is the biggest river in Bali, for its length or its width. The length of Ayung River, from the source to the sea is 62, 5 km, with catchments area of 303 km^2. The width has two really different parts. Obviously can be divided into Buangga's upstream, the canal system is tributarying, high rainfall, and the topography are not suitable for big scale watering, although the 3500 km wide are watered by the canal system.

At Buangga's downstream, only a few of the tributaries join the main river. By looking at some big irrigation sluice, the canal can be assumed as the branching. Apparently, the canal system is very complicated because of the repeatation of using the irrigation division and only a few of the canal flows go back to Ayung River.

Table 5.13 The rivers characteristic, which empties into Southeastern Bali coastal area

No	River	Regency/ City	Length* (km)	C.A.** (km2)	C.H. Annual** (mm)	R Annual ** (mm)	Water Vol**) (10^6 m3)	Dependable disch**) (l/dt)	Mini Disch. in estuary (l/dt)**)
1.	Mati	Badung	12,0	46	1740	619	28,481	-	103
2.	Badung	Denpasar	17,0	42	1692	577	24,236	-	50
3.	Ayung	Denpasar	62,5	303	2191	1042	315,715	210	300
4.	Oos	Gianyar	44,0	131	2217	1066	139,678	140	175
5.	Petanu	Gianyar	38,1	96	2464	1298	124,646	1400	1761
6.	Pekerisan	Gianyar	36,5	72	-	-	-	-	0
7.	Sangsang	Gianyar	32,5	83				-	140
8.	Melangit	Gianyar	34,5	48				-	125
9.	Bubuh	Klungkung	29,5	62				310	612
10.	Jinah	Klungkung	32,5	51	2312	1155	58,910	140	271
11.	Unda	Klungkung	20,0	229	2500	1332	305,003	220	444
12.	Manggis	Karangasem		12				-	15
13.	Bedih	Karangasem	12,2	10				-	0
15.	Kerkul	Karangasem	14,0	14				-	5

*Source : *) : Badan Pusat Statistik Propinsi Bali, (1999)*

***) : Public Works Service of Bali Province (2000)*

Explanation: C.A. = *catchment area*

R.F. = rainfall

R = run-off

water volume : annual quantity

Rainfall, run-off, and water volume are calculated with Isohyet's Method.

Ayung River is proposed for Ayung dam site, which its river density, ratio between the total river length towards the watered area wide is 0, 75 with the main river length of 62, 5 km. This quite high-density value indicates the hilly area and high rainfall, so that generally can give fast reaction towards every rain that can produce flood.

Ayung River always has water, even in dry or in rainy season, so that it can be categorized into perennial stream. The river morphology is quite wide with a relatively big declivity, so the water flow is rather swift. Generally, the river base is rocky, so in the areas where the river right and left sides are not hilly areas and the land is stable or formed as rock, the erotions often occurs on the steepy sloping riverbank.

Ayung River has a flow pattern or drift area in form of bird feather, with some curves on the main river. With this kind of drift, generally, if the rain falls on all of the catching area, it is relatively small, but it happens in long term. But, considering the length of the river and the drift with a quite big declivity more or less 1,6 %, if the rain falls in part of its area, there could be temporary flood and flash flood (if the rain falls on the upstream).

Designed rainfall is a data about the biggest rainfall with a particular repeating period. The selection of the designed rainfall analysis method much depends to the adjustment of the statistic parameter from the relevant data, or it is chosen based on other technical considerations. To plan a dam, it requires flood possibility estimation at the dam plan location.To recognize the flood pattern situation, it requires a quite long river flow situation-monitoring period, in oreder to make the estimation of the possible discharge will come near to the fact.

The total irrigation areas from Ayung River are about 14.500 ha. Almost 24% of it is not technical and done by the subak around. The main semi-technique irrigation areas are at the Buangga's downstream, where the big two systems are known for 64% of total areas that are watered by this area.

For the resources evaluation requirement, catching area is considered into Buangga's upstream and downstream. Buangga measurement station was established in 1973, and has catching area of 221 km^2 wide. The irrigation system at the catching area upstream, mostly are non-technical, so that kind of water division monitoring are impossible.

Based on the data, it is known that the flood discharge monitoring data at the dam plan location is only one year. That is why to consider the number of possible flood discharge; it will be estimated based on the rain data. Results of the calculation of banjir rancangan recapitulation are as followed:

Tabel 5.14 Recapitulation of Calculation Result of Designed Flood Discharge with Nakayasu Method.

Jam	5 Tahun	10 Tahun	25 Tahun	50 Tahun	100 Tahun	PMF (m^3/det
0	0,000	0,000	0,000	0,000	0,000	0,000
1	31,361	33,649	36,267	38,070	39,764	36,267
2	174,176	186,880	201,424	211,434	220,843	212,450
3	308,531	331,029	356,798	374,518	391,176	421,888
4	302,384	324,428	349,674	367,037	383,356	482,098
5	279,335	299,708	322,998	339,050	354,124	484,020
6	252,757	271,206	292,256	306,785	320,446	464,105
7	212,770	228,305	246,015	258,247	269,754	401,343
8	169,343	181,707	195,804	205,540	214,698	315,550
9	137,284	147,307	158,737	166,629	174,053	252,921
10	112,635	120,857	130,236	136,711	142,801	205,865
11	93,240	100,239	108,019	113,389	118,439	198,973
12	78,401	84,124	90,653	95,160	99,398	142,559
13	65,917	70,729	76,218	80,007	83,571	119,859
14	55,421	59,466	64,082	67,267	70,264	100,774
15	47,488	50,954	54,909	57,639	60,206	85,759
16	41,040	44,036	47,454	49,813	52,032	73,705
17	35,660	38,263	41,234	43,283	45,211	63,806
18	31,134	33,406	36,000	37,789	39,472	55,593
19	27,323	29,317	31,593	33,163	34,640	48,779
20	23,990	25,741	27,739	28,118	30,415	42,829
21	21,264	22,601	24,356	25,566	26,705	37,605
22	18,494	19,844	21,385	22,448	23,448	33,018
23	16,239	17,424	18,776	19,710	20,558	28,991
24	14,258	15,299	16,486	17,306	18,076	25,454

Dependable discharge is included to get the quantitative discharge value, which is provided all year, in the dry or rainy season. The general method that is used to calculate the dependable discharge is the *basic year* plan. The basic calculations are as followed:

1) The provided annual discharge data is arranged from the big data to the small one
2) To calculate the average annual data, then grouping it into dry season discharge and wet season discharge. Tahun kering is if the annual discharge is less than the average annual discharge value, and wet season is if the discharge is more than the average annual discharge.
3) The probability for wet season and dry season is calculated with the Weibull equation.
4) Generally, for the dependable discharge calculations are determined in 80% (Q80), it means the risk of the less discharge than the dependable discharge is 20% of the monitoring.

Dependable discharge analysis on Ayung dam is using the balance of the rain toward DAS transformation model with Mock modification. This way is done, because the limited recorded data at Ayung Dam plan site. The calculation of dependable discharge with Modificated Mock method is shown on table 5.15 below. While the calculation of dependable discharge will be calculated by using 80 % dependable chance as shown on Table 5.16 The simulation model for Buangga flow area with KATMOD hydrology simulation is used to extend the data of river flow at Buangga. This kind of model is very suitable with kind of high baseflow river uses calibration model.

The irrigation system at Ayung River has about 26 irrigation systems with the total of 14500ha, which is provided by the main river to the tributaries.

As the increasing of the settlements around Denpasar, Badung Regency, and Gianyar Regency, so the big decreasing will keep going on the areas that are watered by the downstream Ayung irrigation system. The lost of the rice fields will lose the water that is nowadays used for drinking water.

The need of water for agriculture activities and balanced for others, such as drinking water and industries, causes the change of streamflow availablity balance at Ayung River. In Bali water resources study for settlement area (PPKT, 1989), we got that by using the SOIL BAL method with the standard design of DGWRD which used the daily rainfall data, during the rainy season was always bigger than the effective rainfall value which was estimated on the design method compared to the dry season which have result of the requirement of peak water is higher for land storing.
From the cultivate production model's point of view that is based on the FAO worksheet no 33 about irrigation and drainase, the result towards water which connects the plants result towards theclean water through some plants growth steps. For the irrigation areas aroun Ayung River, the kinds of plants that are recommended are rice plant and crops.

Table 5.15 Half-month discharge data with Mock modification method

No	Tahun	Jan		Peb		Mar		Apr		Mei		Jun		Jul		Ags		Sep		Nop		Des		Total	Rata²
		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	(m^3/dtk)	(m^3/dtk)
1	1981	1,79	6,95	4,00	3,20	2,60	1,35	0,91	1,72	0,50	0,11	0,05	0,02	4,33	1,81	0,30	0,21	3.21	2,41	4,81	5,98	6,27	5,34	59	4,92
2	1982	4,04	3,84	2,66	2,19	1,64	1,81	1,15	0,19	0,08	0,03	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,03	0,01	6,50	7,73	32,74	2,73
3	1983	0,32	2,44	5,89	3,51	1,59	3,58	0,82	0,88	0,15	6,22	0,63	0,25	0,10	0,01	0,01	0,01	0,01	0,53	4,26	8,10	0,73	2,24	56,2	4,68
4	1985	2,00	3,39	2,05	2,02	5,55	9,67	2,66	0,60	0,58	0,13	0,05	0,02	0,01	0,01	0,03	0,01	1,76	1,97	0,39	2,01	3,21	2,41	40,88	3,41
5	1986	3,90	3,22	5,90	6,19	3,20	4,69	0,63	0,25	0,15	0,05	0,19	0,02	0,01	0,01	0,01	0,01	0,01	0,01	3,95	5,57	3,62	3,51	43,19	3,60
6	1987	7,34	5,98	4,75	3,78	3,28	1,38	4,18	1,22	0,27	0,11	3,58	6,89	0,78	0,31	0,13	0,05	0,02	0,01	6,32	3,97	0,59	1,03	57,05	4,75
7	1988	2,65	9,15	2,95	4,15	0,60	3,06	0,37	0,15	0,06	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	2,05	4,38	6,86	2,92	44,15	3,68
8	1989	8,38	6,59	3,47	1,13	3,75	6,02	0,37	0,29	5,58	0,61	0,24	0,10	0,04	0,02	0,01	0,01	0,01	0,01	0,19	3,94	0,39	0,84	37,15	3,10
9	1990	8,30	8,99	1,76	2,90	6,01	4,49	0,66	0,26	0,11	0,04	1,93	1,63	0,22	0,09	2,08	2.25	0,28	0,01	0,33	0,13	5,95	5,96	59,94	5,00
10	1991	1,84	7,85	6,09	2,49	6,63	5,95	0,82	0,33	0,13	0,05	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	6,92	10,89	56,6	4,72
11	1992	4,89	1,99	10,56	5,89	0,92	1,74	7,71	2,11	0,46	0,18	0,07	0,03	0,01	0,01	0,01	0,01	0,01	0,01	2,95	5,89	2,77	6,61	51,81	4,32
12	1992	5,07	7,30	8,48	8,41	6,77	4,52	2,90	0,83	0,43	0,17	0,07	0,03	0,01	0,01	0,01	0,01	0,01	0,01	1,51	7,34	4,99	0,76	83,21	6,93
13	1993	5,07	4,99	4,18	3,39	5,91	0,73	2,06	0,29	0,12	0,05	0,02	0,01	0,01	0,01	0,01	0,01	0,01	4,45	2,19	6,97	9,38	7,52	68,93	5,74
14	1994	9,15	10,81	5,19	3,43	4,33	7,87	0,95	0,38	0,15	0,06	0,02	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	3,91	0,38	46,76	3,9

Source: Consultant's Calculation Result

Table 5.16 Dependable Discharge in 80 % Probability

No	Data		Tahun diurut	Debit	Probabilitas	Keterangan
	Thun	Debit (m^3/dt)		(m^3/dt)		
1	1981	4.92	1992	6.93	0.07	
2	1982	2.73	1993	5074	0.13	
3	1983	4.68	1989	5	0.20	
4	1984	3.41	1981	4.92	0.27	
5	1985	3.6	1986	4.75	0.33	
6	1986	4.75	1990	4.72	0.40	
7	1987	3.68	1983	4.68	0.47	
8	1988	3.10	1991	4.32	0.53	50%
9	1989	5.00	1994	3.9	0.60	
10	1990	4.72	1987	3.68	0.67	
11	1991	4.32	1985	3.6	0.73	
12	1992	6.93	1984	3.41	0.80	80%
13	1993	5.74	1988	3.1	0.87	
14	1994	3.90	1982	2.73	0.93	

The present usage of Ayung River water is for irrigation (agriculture) even in upstream or in the downstream. In several space of the river are also use for tourism activities such as rafting, trekking, hiking, and bird watching. Some people in both side of the river are also use for taking consumption water. Water quality analysis of Ayung river indicating suitable water conditions for agriculture requirement.

2. Water Quality

According to the Indonesian Government Regulation number 82 / 2001 about Water Quality Management and Water Pollution Controll it is stated that water is an important environment component for living and human being. That is why it is need to implement Water Quality Management and Water Pollution Controll wisely in regarding to present and future generation requirement and so the ecologycal balance. Based on that regulation, Ayung River aquatic environment is need to be investigated and analyzed to know its quality.

According to the filed observations, it is found that along the rafting course there are several hotels waste water outflow that contribute to the water pollution in Ayung River. Water quality is clasified into 4 categories those are: first class is water suitable for potable water; second class is water for water recreation facilities and infrastructure, fresh water fishery, water for irrigation, and livestocks. Third class is water for water recreation facilities and infrastructure, fresh water fishery, water for irrigation, and livestocks fourth class is water for plant watering.

coliform feces and (*Shigella dan vibrio cholera*). This mater is related to the domestic waste water that polluted the river body. Whether the river is already polluted by feces and patogenic *coliform* or not.

Tabel 5.17 Water Quality Measurement on Ayung River

No	Parameter	Unit	Cat B	Cat C	Upstream	Dam Location	Downstream
1	Temperature	0C	Normal	Normal	25	26	26
2	Dissolved solid substance	Mg/L	1000	1000	185	294	465
3	Turbidity	Unit	-	-	0.4	1.1	1.2
4	Quicksilver	Mg/L	0.001	0.002	0.00	0.00	0.00
5	Free amoniac	Mg/L	0.5	0.02	0.12	0.12	0.16
6	Arsen	Mg/L	0.005	1.0	0.00	0.00	0.00
7	Iron	Mg/L	5.0	-	0.14	0.16	0.16
8	Kadmiun	Mg/L	0.01	0.01	0.00	0.00	0.00
9	Chloride	Mg/L	600	0.003	0.5	0.5	0,8
10	*Krom heksavalen*	Mg/L	0.05	0.05	0.00	0.00	0.00
11	Nitrate	Mg/L	10	-	11.2	12.3	12.8
12	Nitrit	Mg/L	1.0	0.06	0.02	0.02	0.02
13	Dissolved oxygen	Mg/L	>6	>3	12.5	12.8	13.2
14	BOD-5	Mg/L	-	-	8.5	8.7	8.8
15	COD	Mg/L	-	-	12.2	14.5	15.2
16	pH	Mg/L	5-9	6-9	7.2	7.3	7.2
17	Cyanide	Mg/L	0.1	0.02	0.00	0.00	0.00
18	Sulphate	Mg/L	400	-	25	44	48
19	Lead	Mg/L	0.1	0.03	0.00	0.00	0.00
20	Fenol	Mg/L	0.002	0.001	0.0	0.0	0.0
21	Oil	Mg/L	Nihil	1	0.00	0.00	0.00

Table 5.18 Microbiologi Inspection of Ayung River

No	Paramtr	Unit	Cat A	Cat B	I	II	III	IV	V
1.	Total Coliform	MPN/100 ml	3	10.000	4600	7500	2765	2400	2400
2.	Fecal coli	MPN/100 ml	Nihil	2000	0	60	145	600	600
3.	Shigella	-			negative	negative	negative	negative	negative
4.	Vibrio Cholera	-			negative	negative	negative	negative	negative

location I : Streamflow at North Petang
location II : Streamflow di Br. Buangga
location III : Br. Karangdalem,Bongkasa
location IV : Br. Susut Buahan
location V : Br. Buahan Kaja

Coliform or other diseases germ with coli form is an indicator of phrone area where diseases germ easy found or multiply. If that indicator is highly found, then that aquatic environment is said containt good environment nutrition. In other words, it could be said that organic pollution has already happen on that aquatic environment. Analysis found that at mostly sampling point the pollution is not yet hazard (Coliform 2400 MPN/ 100 ml).

From microbiological point of view (Total *coliform and Escherichia coli*) indicating that water of Ayung River is suitable for raw water supply (B Class) but it needs to be cooked previously. It could be compared with standard Quality of environment (Guvernor Bali Province Decree No. 515 / 2000).

Table 5.19 Standard Quality of Water Microbia

Standard Quality of Water Category A	**3**	**0**
Standard Quality of Water Category B	**10.000**	**2000**
Standard Quality of Water Category C	**No qualification**	**No qualification**
Standard Quality of Water Category D	**No qualification**	**No qualification**

Faecal coli appearance is an indicator of polluted water by people and animal. The existence of this diseases germ in aquatic area driving high risk on which containt diseases germ from human or animal colon. Existence of this vector is also indicating posibilities of patogenic vector in that aquatic area.

Shigella is one of patrogenic vector that caused disentry baciliaris. In the study area, all samples show negative appearance of the vector, so there are no pathogenic vector indicating on this river.

Vibrio cholera is patogenic vector caused Cholera, with it sympthon is diarrhea. Therefore, water quality on that river, tributary and its out flow canals need to be managed and appreciate individually so then pollution could be minimized.

Analysis from water sample shows that Ayung River water is still suitable to be threat for drinking water (standard quality A class). There is no indicated domestic waste water found.

Some projects integrated water potential in Southern Bali (Public Works Service Bali Province,2000) which organize surface water such as Tukad Unda, Tukad Sangsang, Tukad Petanu and Tukad Oos) in the name of USPO System; IPA Nyanyi system and others single project.

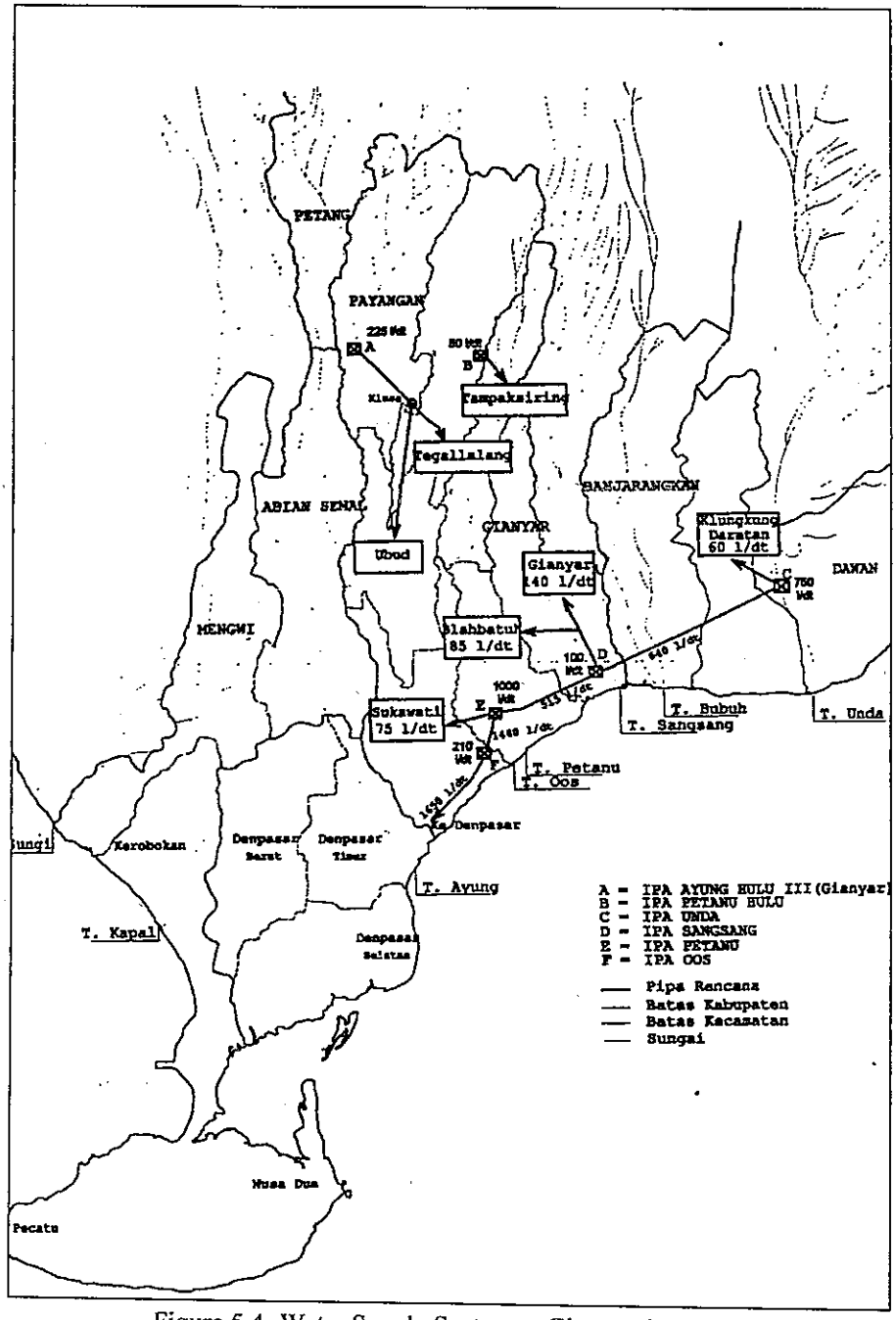

Figure 5.4 Water Supply System at Gianyar Regency.

The exploitation of the Ayung River as raw water sources is consistently implemented by Bali province Government throughout Bali Clean Water Master PLan. Planned dam in upstream Ayung River namely Buangga dam and Sidan Dam indicating government commitment to overcome sufficient raw water requirement for the people in Bali.

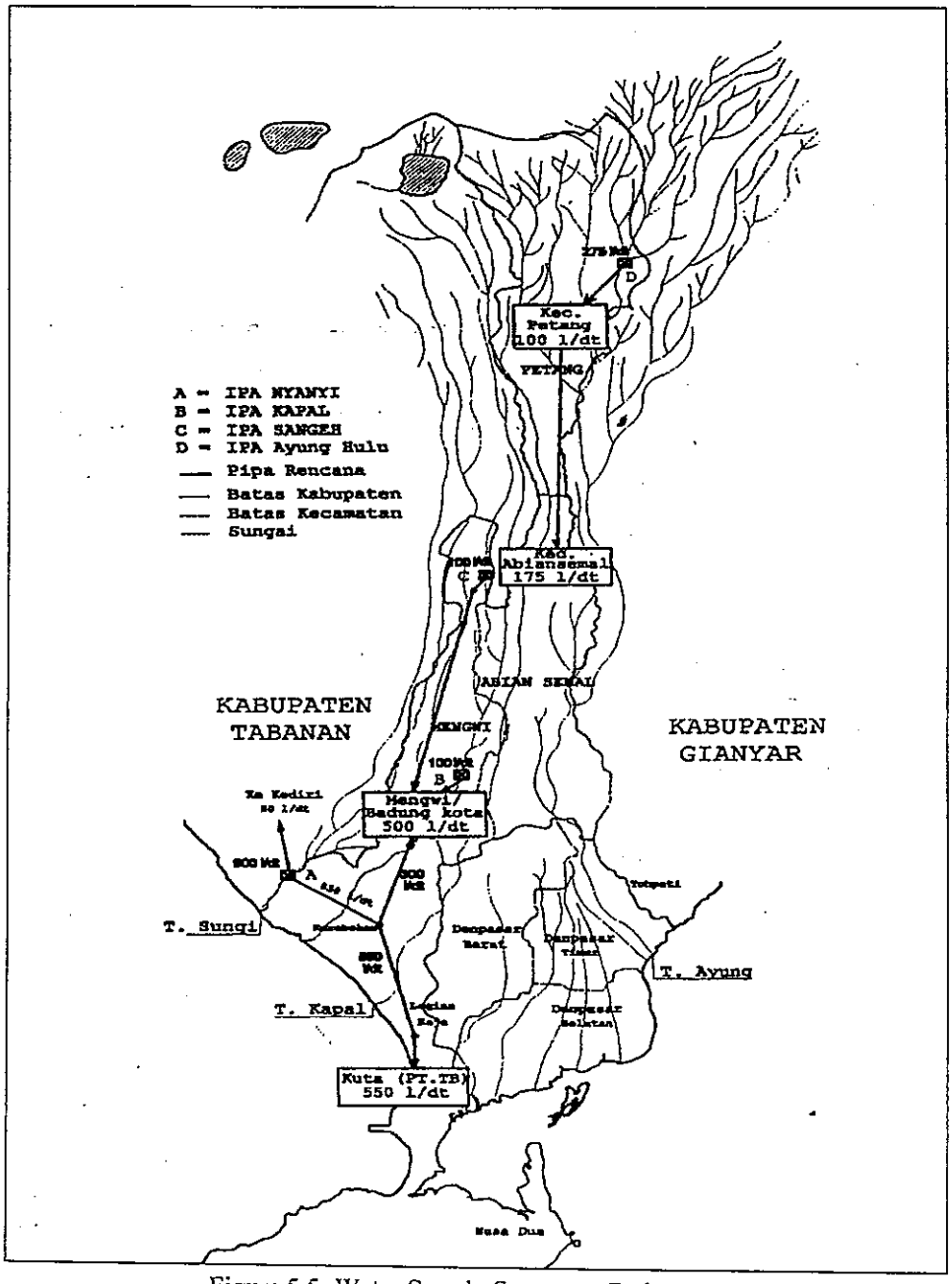

Figure 5.5 Water Supply System at Badung Regency

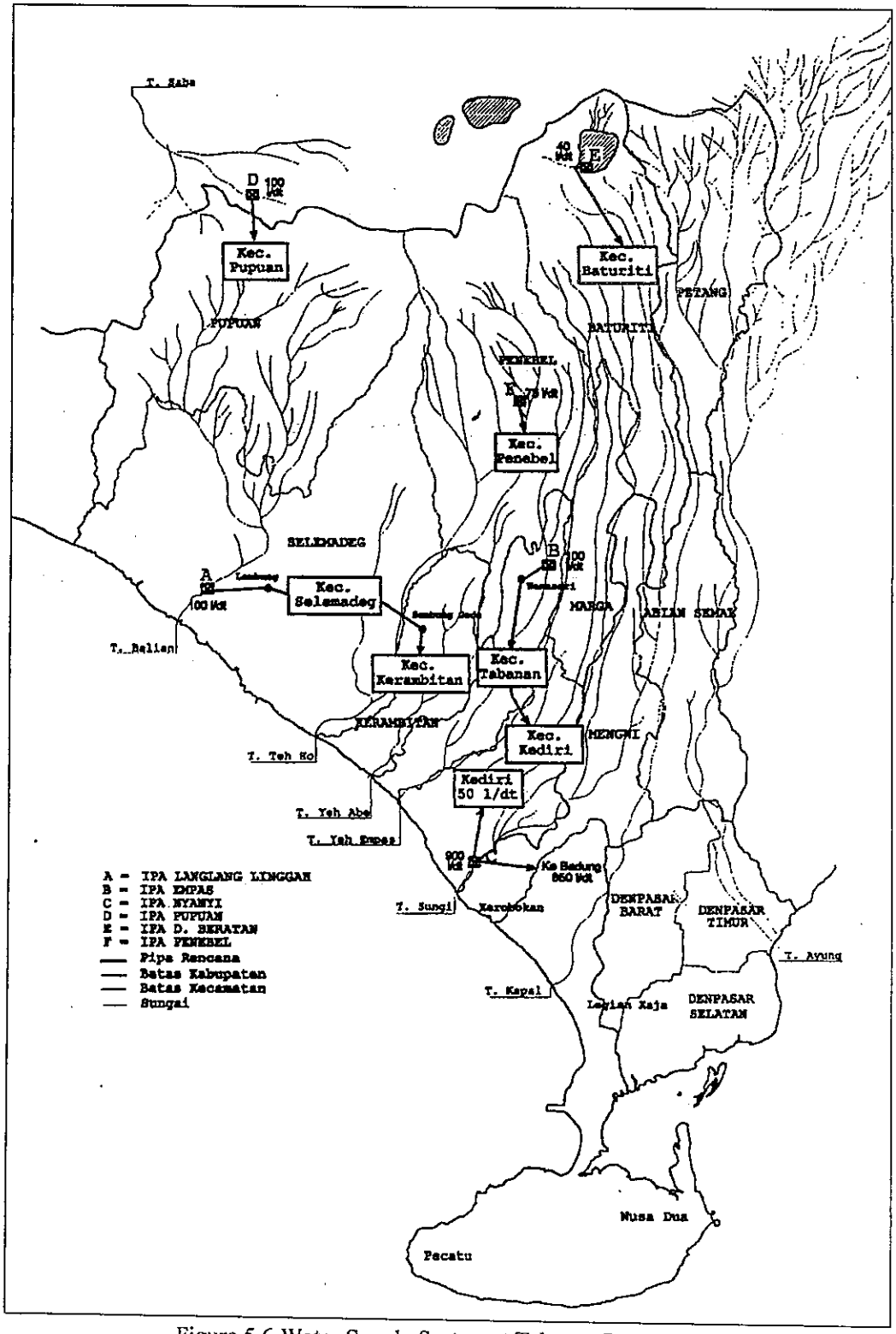

Figure 5.6 Water Supply System at Tabanan Regency

5.1.5 Space, Land and Soil

1. Land Use Inventory

From the result of aerial photo interpretation in scale 1 : 50.000 in 1981, land use in the entire Ayung river basin is very complex. Recalling the complexity of the land use, so that the land use classification nedds to be implemented by using land covering/land use classification system according to Malingrau and Christiani (1982) and was modificated by Wiradisastra (1985). Based on the land use classification, so there are some land uses found as followed: river, iirigation rice field, dry land, yard, primary forest, mixed plantation, coffee plantation, coconut plantation, clove plantation, bush, coast, city, village, industry area, and recreation spot. Land use data from aerial photo interpretation is shown on Table 5.20

Table 5.20 Type of land use on Ayung River basin

No	Type of land use	Wide (ha)	Percentage (%)
1	Ricefield	5697,7	18,20
2	Dry land	10433,8	33,30
3	Settlement	2150,9	6,80
4	Mixed Plantation	9299,6	29,60
5	Coffee Plantation	569,6	1,80
6	Thick forest	948,9	1,02
7	Forest	2277,6	7,30

From the field reconaisance, it is obtained that the rice fields are planted with rice and its planting pattern is rice – rice – palawija. The secondary crops which are commonly planted are corn and soya which are spread planted after harvest. Dry land is found at the upstream, commonly planted with crops as corn, nut, cassava or other yearly plants.

Mixed plantation is generally found at downstream area, consists of coconut, banana, cocoa, clove, vanilli, and other tubes plants. At the middle and downstream, commonly planted with coffee, dapdap, banana,sugar palm and others. Coffee is generally planted once with dapdap, because dapdap is functioned as protector. Apart from the usages above, rafting activities are also found in Ayung River, from Dusun Begawan, Payangan Village, Payangan Subdistrict to Dusun Kedewatan, Sayan Village, Ubud Sub district.
The distributions of land use at Petang Sub district Badung Regency are categorized as ricefield, dryland, yard, plantation, cemetery, and others.Those which are included to other category are roads, river, includes beach. Total of land at Petang Subdistrict Badung Regency is 115,00 km2. The land use at Petang in 2004 is shown on the table below.

Table 5.21 Land Use at Petang Subdistrict in 2004

Village/Kelurahan	Wide Km2	Land Use (Ha)					
		Ricefield	Dryland	Yard	Plantation	Cemetery	Others
Carangsari	8,85	411,00	107,00	36,00	589,00	3,00	1,00
Getasan	2,62	-	-	-	-	-	-
Pangsan	5,76	107,00	269,00	15,00	183,00	1,00	1,00
Petang	13,25	50,00	952,00	160,00	157,00	4,00	1,50
Sulangai	12,59	301,00	639,00	23,00	290,00	3,00	3,00
Pelaga	39,27	123,00	1906,00	1834,72	18,28	6,50	39,00
Belok	32,66	142,00	660,00	1545,64	899,00	4,00	15,36

Source : Petang Subdistrict in Numbers, 2004

While for Payangan Subdistrict, wide of tottal land is 75,88 Km2, and its land use as shown in Tabel 5.22.

Tabel 5.22 Land Use at Payangan Subdistrict in 2004

Village/Kelurahan	Wide Km2	Land Use (Ha)				
		Ricefield	Dryland	Yard	Cemetery	Others
Melinggih	4,67	222,00	128,85	58,56	5,21	72,38
Kelusa	6,50	203,00	209,40	62,01	3,77	171,82
Bukian	8,39	209,00	321,59	90,56	6,00	211,85
Puhu	13,91	313,00	589.82	67,03	5,00	416,15
Kerta	14,42	153,00	653,49	31,69	10,00	593,82
Buahan	9,50	150,00	370,23	53,03	4,50	372,24
Melinggih Klod	4,62	252,00	115,83	46,51	3,79	43,67
Buahan Kaja	10,75	231,00	130,64	32,05	4,50	676,81
Bresela	2,92	153,00	79,27	50,56	1,23	7,94

Source : Payangan Subdistrict in Numbers, 2004

2. Area Development

Progress in each rapid development leans to ask rapid space supply as well, appropriate with the development level of relatef sector. The fact shows that the effort of space supply is oftenly becoming problem, because:

- Space is a limited natural resources, therefore it needs efficient and optimal usage effort.
- Basically, a certain space can be used for various alternative activities, while on the other hand, a certain activity can take place at several alternative spaces.

Depend on the condition/fact above, a certain space oftenly causes conflict among different sectors.

Spatial plan is an important phase in the space organizing and controlling process because in this phase, it is very important to organize and control the space entirely to set the potential, community's activity, movement mobilization and incline of harmonious development and supporting each other in the existing spatial plan.

The spatial use pattern, commonly, done based on activity interrelation, environment suitability and region development pattern. Spatial structure is arranged to decide the area development problem which has dimension of service or service range as well as relation or service interaction, should concern on some principles:

1) First principle is space democration, which provides equality of access and services for the people.
2) Second principle, natural resources and environment conservation, the goal is to preserve and keep the ability of the area which also means to guarantee the sustainability of the activities.
3) Third principle is conformity of spatial use, development which has further potential to be developed must be concerned. Principle of spatial use is how to allocate the land for socio-economic activities so that several development targets can be reached.

There are several legal aspect related to city land in the form of Laws, government regulation, Minister Decrees. Those laws are set as references on the planing and implementation process so that the spatial plan has legal basement.

Base on Bali Province Local Regulation No 4 / 1996, the area being planned for Ayung Dam is set up as supporting area for Southern Bali development. Agriculture sector and tourism as strategic sectors are mainly serviced by available infrastructure and of course by planed Ayung Dam.

3. Aesthetic

The area of Ayung Dam has a very aesthetic environment. This beauty is in form of scenic nature, flowing river for whole year in meandering river course as well as clean water has an attractive value to be enjoyed. This beauty is added by the existence of steepy slope on the right and left of the river.

On the top of the slope, there are such very fertile agriculture land, by the rice fields or dry lands planted with various plants as whole year plants or yearly plants. Terrace rice fields which are neatly organized is also such a natural aesthetic which should be concerned of. This is because it could be developed as tourism object. On the dry land, it is planted with crops (corn and nuts) and other cultivation plants as coconut and others. Bush and other yearly plants at the right and left steepy slope riverbaks and others agriculture crops at the top of the slope is a very aesthetic environment combination.

5.2 Biology Component

5.2.1 Terrestrial Flora and Fauna

1. Terrestrial Flora

The investigation area is Ayung Dam Development Project, which is located between two regencies, Gianyar regency and Badung Regency. For terrestrial flora and fauna sampling is divided into two stations, those are West Ayung station includes Badung Regency and East Ayung (Siap River) includes Gianyar Regency, with sampling method of systematic quadrat method. Total of determined plots/quadrats for East and West Ayung stations are 20 plots with measure of 20m x 20m. For East Ayung station, vegetation samplings are conducted at two locations, those are upstream of inundation/south of bridge (Dusun Susut, Buahan Kelod Village, Gianyar Regency with position of 08° 24'55,7" South Latitude and 115° 14'16,3" East Longitude, and the second location is under Tangluk Temple (Dusun Susut, Buahan Kelod Village, Payangan Sub district, Gianyar Regency) is a local point between East and West Ayung's flow on position at 08° 25' 31,8" South Latitude dan 115° 13'52,2" East Longitude.

While the sampling for West Ayung Station is taken at four locations, those are; location 1) Dusun Petang, Petang Village, Petang Sub district, Badung, location 2) Dusun Kasihan, Pangsan Village, Petang Sub district, Badung, location 3) Dusun Buangga, Getasan Village, Petang Sub district, Badung and location 4) Dusun Anggungan, Carangsari Village, Petang Sub district, Badung.

These project plan locations have resemble ecosystems so that the terrestrial flora which grows around the project plan is similar. Types of terrestrial flora (vegetation) which is identified at East Ayung Station (area around Siap River) and West Ayung (Ayung Dam Development Project) are included on Table 5.23. and 5.24.

From 44 vegetation types which have been identified at Ayung Dam development plan site (East Zone) at Buahan Kelod Village, Payangan Subdistrict, Gianyar regency, apparently, there are 17 types categorized as endanger species, consist of 3 nationally endanger species: cempaka putih *(Michelia champaca),* boni *(Antidesma bunius)* and pangi (*Pangium edule*) and 14 types are rare in Bali (Table 5.5.1a). While the result of vegetation analysis shows that from 44 identified trees, there are only 2 types which have high important value (NP>20 %) those are: toop *(Arthocarpus elasticus*, NP = 36,0 %) and kaliandra (*Calliandra sp*, NP = 23,40 %), 8 types have moderate important value (10<NP<20) and 30 types categorized as low important value (NP < 10 %, Table 1).

Table 5.23 The result of vegetation analysis (terrestrial flora) for location of East Ayung Dam Development Project, Buahan Kelod Village, Payangan Sub district, Gianyar Regency

No	Local Name	Latin Name	Freq. Rel	Den. Rel	Dom. Rel	NP
1	Toop	*Arthocarpus elasticus**	10,00	9,45	16,55	36,00
2	Kaliandra	*Calliandra sp*	3,75	11,71	6,13	21,59
3	Duren	*Durio zibhetinus*	3,75	5,40	8,60	17,75
4	Gamal	*Glerecidia sepium*	2,50	9,00	4,74	16,24
5	Tulang katak	*Polianthia lateriflora*	5,00	4,50	6,20	15,70
6	Salak	*Salaca edulis*	2,50	6,75	5,69	14,94
7	Kelapa	*Cocos nucifera*	3,75	4,50	5,56	13,81
8	Kopi robusta	*Coffea robusta*	2,50	3,60	2,27	10,37
9	Nangka	*Arthocarpus integra*	3,75	3,15	3,44	10,34
10	Bambu	*Bambusa sp*	2,50	2,70	4,96	10,16
11	Suren	*Toona sureni*	2,50	4,50	2,40	9,40
12	Pisang	*Musa paradisiaca*	2,50	3,60	2,02	8,12
13	Sentul	*Sandoricum koetjape**	3,75	1,35	1,83	6,93
14	Gintungan	*Buschovia javanica**	2,50	1,35	1,87	5,72
15	Oo baas	*Ficus variegata**	2,50	1,35	1,83	5,68
16	Albesia	*Albesia sp*	2,50	1,35	1,48	5,33
17	Kakao	*Theobroma cacao*	1,25	3,60	0,41	5,26
18	Kayu adeng	*Dysoxylum sp*	2,50	1,35	1,20	5,05
19	Uduh	*Caryota mitis**	2,50	1,80	0,44	4,74
20	Kayu sugih	*Pleomele angustifolia*	2,50	1,80	0,37	4,67
21	Advokat	*Persea americana*	1,25	1,80	1,51	4,56
22	Sandat	*Cananga odorata**	2,50	0,90	1,07	4,47
23	Udu	*Lendera sp**	2,50	0,90	1,01	4,41
24	Angsana	*Pterocarpus indicus*	1,25	1,35	1,77	4,37
25	Bunut	*Ficus glabella**	1,25	0,90	1,58	3,73
26	Aren	*Arenga pinnata**	1,25	0,90	1,51	3,66
27	Canging	*Erythrina subumbrans*	1,25	0,90	1,32	3,47
28	Pangi	*Pangium edule***	1,25	0,90	1,20	3,35
29	Sente	*Hamalomena javanica*	2,50	0,45	0,28	3,23
30	Boni	*Antidesma bunius***	1,25	0,90	0,75	2,90
31	Dapdap	*Erythrina variegata*	1,25	0,90	0,75	2,90
32	Kutat	*Planchonia valida**	1,25	0,45	1,04	2,74
33	Leci	*Litchi glabella*	1,25	0,45	0,78	2,48
34	Temen	*Graptophyllum pictum*	1,25	0,90	0,31	2,46
35	Mangga	*Mangifera indica*	1,25	0,45	0,72	2,42
36	Kepundung	*Baccaurea sp**	1,25	0,45	0,69	2,39
37	Majegau	*Dyzoxylum densiflorum**	1,25	0,45	0,60	2,30
38	Trembesi	*Samanea samman*	1,25	0,45	0,56	2,26
39	Cempaka putih	*Michelia champaca***	1,25	0,45	0,53	2,23
40	Johar	*Cassia siamea*	1,25	0,45	0,53	2,23
41	Waru	*Hibiscus tiliaceus**	1,25	0,45	0,50	2,20
42	Mahoni	*Swietenia macropylla**	1,25	0,45	0,47	2,17
43	Jambu taluh	*Eugenia sp*	1,25	0,45	0,37	2,07
44	Soka alas	*Ixora paludosa*	1,25	0,45	0,18	1,88
Total			**98,75**	**99,91**	**96,97**	**295,63**

Notes:

**	: Nationally rare	high NP	: NP> 20 %
*	: rare in Bali	moderate NP	: 10<NP<20%
Freq Rel	: relatife frequency (%)	low NP	: NP< 10 %
Den Rel	: relatif density(%)		
Dom rel	: relatif domination(%)		
NP	: Important Value (%)		

From 46 types of vegetations/terrestrial flora which have been identified at the location of Ayung Dam Project development plan (West Zone) at four village locations (Petang, Pangsan, Getasan, Carangsari) Petang Subdistrict, Badung Regency, apparently there are 23 types which are categorized as endanger species, including 4 types of national endanger species; cempaka putih *(Michelia champaca)*, pangi *(Pangium edule)*, pule *(Alstonia scholaris)* and bayur *(Pterospermum indicum)*, 19 type are rare in Bali (Table 5.24).

While from the result vegetation analysis shows that from 46 types of trees which have been identified, there are only 2 types have high important value(NP>20 %), those are: kayu adeng *(Dysoxylum, sp*, NP = 26,759 %) and toop *(Arthocarpus indicus*, NP = 25,436 %), 4 typs have moderate important value (10<NP<20) and 38 types have low important value (NP<10 %,).

Table 5.24 The result of vegetation analysis (terrestrial flora) for location of West Ayung Dam Development Project, Petang Sub district, Badung Regency

No	Local name	Latin name	Freq Rel	Den Rel	Dom Rel	NP
1	Kayu adeng	*Dysoxylum sp*	5,600	10,804	10,355	26,759
2	Toop	*Arthocarpus elasticus**	7,200	7,537	10,699	25,436
3	Aren	*Arenga pinnata**	4,800	3,015	4,709	12,524
4	Peji	*Cystostachys sp*	3,200	5,025	2,754	10,979
5	Oo baas	*Ficus sp**	4,000	2,512	4,158	10,670
6	Duren	*Durio zibethinus*	2,400	3,517	4,544	10,461
7	Bayur	*Pterospermum indicum***	3,200	2,763	4,007	9,970
8	Uduh	*Caryota mitis**	3,200	2,512	3,263	8,975
9	Pisang	*Musa paradisiaca*	2,400	3,768	2,065	8,233
10	Bengkel	*Nauclea purpurescens**	2,400	2,753	2,891	8,044
11	Bambu	*Bambusa sp*	3,200	3,266	1,542	8,008
12	Pilang	*Acasia leucocephala*	2,400	2,010	3,442	7,852
13	Kaliandra	*Calliandra sp*	1,600	4,773	1,404	7,777
14	Cempaka	*Michelia champaca***	3,200	2,261	2,340	7,801
15	Pakusarang burung	*Asplenium nidus*	3,200	2,512	1,721	7,433
16	Kelapa	*Cocos nucifera*	1,600	2,512	3,194	7,306
17	Gamal	*Glerecidia sepium*	1,600	3,768	1,721	7,089
18	Kakao	*Theobroma cacao*	1,600	3,768	1,101	6,469

19	Bayur	*Pterospermum indicum**	2,400	1,507	2,519	6,426
20	Rotan	*Calamus rottan*	2,400	1,256	2,575	6,231
21	Gintungan	*Buschovia javanica**	2,400	1,256	2,451	6,107
22	Iseh	*Pometia tomentosa**	2,400	1,758	1,872	6,030
23	Tulang katak	*Polianthia laterifolia*	2,400	1,507	1,996	5,903
24	Kutat	*Planchonia valida**	1,600	1,758	2,409	5,767
25	Sente	*Hamalomena javanica*	1,600	2,512	1,542	5,654
26	Bunut	*Ficus glabela**	2,400	1,256	1,941	5,597
27	Lateng	*Laportea stimulans*	1,600	2,753	1,129	5,482
28	Lamtoro	*Leucaena glauca*	1,600	2,261	1,239	5,100
29	Kopi robusta	*Coffea robusta*	1,600	2,512	0,963	5,075
30	Wani	*Mangifera caesia**	2,400	1,256	1,239	4,895
31	Pule	*Alstonia scholaris***	1,600	0,753	1,542	3,895
32	Juwet	*Eugenia cumini**	1,600	1,005	1,239	3,844
33	Albesia	*Albezia procea*	1,600	0,753	0,963	3,316
34	Kepohpoh	*Buchanania arborescens**	1,600	0,753	0,826	3,179
35	Suren	*Toona sureni*	1,600	0,753	0,509	2,862
36	Sandat	*Cananga odorata**	1,600	0,502	0,716	2,818
37	Udu	*Lendera sp**	1,600	0,502	0,619	2,721
38	Mangga	*Mangifera indica*	0,800	0,502	1,266	2,568
39	Kayu sambuk	*Meliosma pinnata**	0,800	0,753	1,005	2,558
40	Majegau	*Dysoxylum densiflorum**	0,800	0,502	0,771	2,073
41	Sentul	*Sandoricum koetjape**	0,800	0,502	0,660	1,962
42	Nangka	*Arthocarpus integra*	0,800	0,502	0,578	1,880
43	Pangi	*Pangium edule***	0,800	0,502	0,578	1,880
44	Rambutan	*Nephelium lapaceum*	0,800	0,502	0,344	1,646
45	Jempinis	*Azadarachta indica**	0,800	0,251	0,302	1,353
46	Asam	*Tamarindus indicus*	0,800	0,251	0,275	1,326
Total			**99,999**	**99,954**	**99,972**	**299,926**

Explanation

** : Nationally rare
* : rare in Bali
Freq Rel : relatife frequency (%)
Den Rel : relatif density(%)
Dom rel : relatif domination(%)
NP : Important Value (%)

high NP : NP> 20 %
moderate NP : 10<NP<20%
low NP : NP< 10 %

Rice field plants at the study area are dominated with rice (*Oryza Sative*), while crops are corn (*Zea mays*), tubes plants (*Monihot utilisima*) and *kangkung* (*Ipomoea aquatica*). The terrestrial fauna found at the study area includes livestock animals, such as cow, pig, chicken and dog. The community also breed birds as their pets.

2. Terrestrial Fauna

The species richness of terrestrial fauna at the study area is rather high, those are 35 types of birds, 7 types of mammals and 8 types of insects/arthropodes. Most of the fauna found at thestudy area are the common types found in Jawa and Bali, and the distribution is very

wide, even to Asia and Australia, and topographically, they are cosmopolitant, they are able to live on lowland (coastal area) to plateau (2000 m) above the sea surface.

More detail description about terrestrial fauna which is successfully investigated during the research is shown on Table 5.25 and 5.26.

In accordance to characteristic analysis and status of the terrestrial fauna, with its reference of valid laws in Indonesia, there are 9 types of protected animals by the Indonesian Government are found at the study area. Those types consist of 7 types of birds: Kuntul Kerbau (*Bulbulcus/Egretta ibis* : Cattle Egret (Eng), Kuntul kecil (*Egretta garzetta* : Little Egret (Eng), Cekakak Jawa (*Halcyon cyanoventris* : Javan Kingfisher), Cekakak Sungai (*Halcyon chloris*: White-Collared Kingfiher), Alap-alap api (*Falco moluccensis*: Spotted Kestrel), Elang Hitam (*Ictinaetus malayensis* : Black-Eagle), and Elang Brontok (*Spizatus cirrhatus* : Changeable Hawk-Eagle), and two types of mammals, Landak (*Hystrix brachyura* : Southeast-Asian Porcupine), and Trenggiling (*Manis javanica* : Pangolin).

These types are protected by Indonesian Government based on the criterias below: (1) very small population, (2) Drastic degradation on the individuals at the environment, and (3) limited distribution (endemic), (4) Top carnivora and megaherbivora, (5) Those types are breeding in groups, (6) They are doing migration. The purposes are: avoid extinction, keep the genetic purity and species diversity, protect from wild hunting, illegal trade, as well as to keep the balance and preservation.

The laws which become related reference to the flora and fauna protection aspect are as below: (1) Law No. 5, 1990 considering natural resources and its ecosystem conservation, (2) Governmental Regulation of Republic of Indonesia No. 7, 1999 considering Preservation of flora and fauna, (3) Regulation of Wild Animal Protection, Year 1931; Decree of Minister of Agriculture No. 421/Kpts/Um/8/1970 and No. 247/KPTS/Um/4/1979, considering Decision of Protected Wil Animal Addition.

According to those above, most of them are common and global territorial), except *cekakak jawa (Halcyon cyanoventris* : Javan Kingfisher) categorized as endemic in java and Bali. tergolong endemik di Jawa dan Bali.

Some of the unprotected wild animals are giving restlessness to the farmers, due to they often damage farmers' rice plants. The existence of birds such as *perit*, *petingan*, and *bondol* are big disturbances for farmers at the study area. With some traditional methods, the farmers try to chase them. They produce loud sounds from cans stretched out with a rope among the rice. The usage of plastic cannot be avoided, only the appearance becomes not aesthetetic.

Table 5.25. Types of Terrestrial Fauna around Ayung River and Siap River for the Location of Ayung Dam Development Plan at Buangga-Payangan (December – January 2006)

No	Local Name	Scientific Name	General Name	Status	Explanation and Its Distribution
A. Bird (Aves)					
1	Tekukur biasa	*Streptopelia chinensis*	Spotted-Dove	TL	Widely and generally distributed in South East Asia until the Lesser Sundas. Many in Java and Bali, they are raised, and many are found at the study area (> 100)
2.	Delimukan zamrud	*Chalcophaps indica*	Emerald Dove	TL	Live wildly and general in Asia until Australia, for Java and Bali, they are rarely found. In study area, there are 3-5 birds, fast fly upon the river stream
3	Merbah Cerukcuk	*Pycnonotus goiavier*	Yellow-vented Bulbul	TL	Live wildly and general, the distribution covers South East Asia, Philipine, Cape of Malaysia, Big Sunda and Lombok. There are a lot in java and Bali, as well as at the study area.
4	Cucak Kutilang	*Pycnonotus aurigaster*	Sooty-headed Bulbul	TL	Live wildly and general, the distribution covers South China, South East Asia (except Cape of Malaysia) and Java. For Java and Bali, this species is the most widely distributed and there are a lot of it. It is traded and raised.
5	**Kuntul Kerbau**	***Bulbulcus/ Egretta ibis***	**Cattle Egret**	**L**	Widely distributed throughout the world, there are many of it in Bali, come to the location/study are only to get foods. Its nest is at Petulu Gianyar (± 6-8 km if a line is stretched out in the east). The base of the protection law: Regulation of Wild Animal Protection, year 1931 (types of Egretta) and Government of Republic of Indonesia Regulation no. 7/1999.
6	**Kuntul kecil**	***Egretta garzetta***	**Little Egret**	**L**	Live wildly, with the distribution areas at Africe, Europe, Asia and Australia. This type of birds is found a lot at the ricefields in the dawn: only to find foods. Its nest is at Petulu Gianyar (± 6-8 km if a line is stretched out in the east). The base of the protection law: Regulation of Wild Animal Protection, year 1931 (types of Egretta) and Government of Republic of Indonesia Regulation no. 7/1999.

7	Blekok sawah	*Ardeola speciosa*	Javan Pond - Heron	TL	It is wild and general, its distribution covers Cape of Malaysia, Indo-Chinese, Sulawesi (Celebes) and Big Sunda. It is general in Java and Bali and many are found at the rice fields, river and coastline/river's estuary; only to get some foods.
8	Kareo padi	*Amaurornis phoenicurus*	White-breasted Waterhen	TL	It is wild and general, its distribution covers India, South China, South East Asia, Philippine, Sulawesi, Big Sunda and the Lesser Sunda. In Bali and at the study area, it can be found a lot at the riverside and its nest is on the trees.
9	Berbik rawa	*Gallinago megala*	Swinhoe s Snipe	TL	It is breeded in East Asia, in the winter it immigrates to the south to Australia. Wild and can be found at the rice fields before the planting season or the rice has not become ripe yet.
10	Walet sapi	*Collocalia esculenta*	Glossy Swiftlet	TL	Wild and flying around
11	**Cekakak Jawa**	***Halcyon cyanoventris***	**Javan Kingfisher**	L	The base of the protection law: Regulation of Wild Animal Protection 1931 (written as Alcedinidae), and Government of Republic of Indonesia Regulation No.7/1999. It is endemic in Java and Bali. Wild and widely distributed until the elevation of 1.000 m in Java and Bali. The population is relatively small, and at some places they have been disappeared. The voice and colour are attractive.
12	**Cekakak sungai**	***Todirhamphus/Halcyon chloris***	**White-Collared Kingfisher**	L	The base of the protection law: Regulation of Wild Animal Protection 1931 (written as Alcedinidae), and Government of Republic of Indonesia Regulation No.7/1999 (written as all families of Alcedinidae). Wildly distributed from South Asia and South East Asia, Indonesia, Irian Islands and Australia. This king of prawn is the most general in Sumatera, Java and Bali. The populations have been decreasing/relatively small, quite difficult to be raised or breed.
13	Bentet kelabu	*Lanius schach*	Long-Tailed Shrike	Tl	General and distributed in Iran, China, South East Asia, Philippine, Malaysia, Big Sunda and Lesser Sunda. Abundant in Sumatera, Java and Bali. There are may of it is trapped to be traded and raised.

14	Bondol Jawa	*Louchura leucogastroides*	Javan Munia	TL	Generally distributed in Sumatera, Java, Bali and Lombok. The populations are a lot, as the pest.
15	Bondol Peking	*Lonchura punculata*	Scaly-breasted Munia	TL	Generally distributed in India, China, South East Asia, Philippine, Malaysia, Big Sunda and Lesser Sunda, at the study area, the population is abundance, often becomes pest for rice.
16	Kacamata biasa	*Zosterops palpebrosus*	Oriental White eye	TL	Generally distributed at North India – South China, South East Aisa, Malaysia, and Big Sunda, in Java and Bali is abundance, including at the study area
17	Bubut besar	*Centropus sinensis*	Greater Coucal	TL	Live wildly, with the distributions in India, China, Sout East Aisa, Philippine, Kalimantan, Sumatera, Nias, Mentawai, Java and Bali. It is rarely found. Attractive and characteristic voice. Rarely found at the study area.
18	Bubut alang-alang	*Centropus bengalensis*	Bulbul/Lesser Coucal	TL	Live wildly, with the distribution in India, China, South East Asia, Philippine, Kalimanta, Sumatera, Java and Bali, Sulawesi, maluku as well as Lesser Sunda. Generally is found at the lowland to 1000 m. At the study area is also rarely found (4-6)
19	Meninting besar	*Euicurus leschenaulti*	White-crowned Forktel	TL	The distribution covers North India, South China, South East Asia, Cape of Malaysia, and Big Sunda. At Java and Bali, as well as at the study area, these birds are found usually in couples; male and female. Generally they are found at the rocky rivers, covered by the trees.
20	Kucica kampung	*Copsychus saularis*	Magpie robin	TL	Distribution: India, South China, Philippine, South East Asia, Cape of Malaysia and Big Sunda. In Bali, this bird is general. However, the populations have been drastically decreasing due to hunting and over exploitation.
21	Kerak kerbau	*Acridotheres javanicus*	Javan Myna	TL	General species for Java and Bali. The general distribution covers East Asia, South East Asia, Java and Bali.
22	Kepudang Kuduk Hitam	*Oriolus chinensis*	Black-naped Oriole	TL	Distribution: India, China, South East Asia, Big Sunda and Lesser Sunda (Java and Bali). At the study area is also rarely found due to the exploitation and trading.

23	Sri Gunting batu	*Dicrurus paradiceus*	Greater Racket-tailed Drongo	TL	Distribution: India, China, South East Asia, and Big Sunda. It is widely and generally distributed at the lowland forest up to the altitude of 1400 m. At the study area, this is very rare
24	Empuloh Jenggot	*Alophoixus bres*	Grey-cheeked Bulbul	TL	Distribution: Cape of Malaysia, Palawan and Big Sunda. It is wide and generally distributed in Java and Bali. It can be found a lot at the study area. Most of them are being traded and raised.
25	Wiwik Kelabu	*Cacomantis merulinus*	Plaintive Cuckoo	TL	Distribution: East India, South China, Kalimantan, Sumatera, Java, Bali, Sulawesi and Philippine. It is rarely found at the study area.
26	**Alap-alap sapi**	***Falco moluccensis***	**Spotted Kestrel**	**L**	Base of Law: Decree of Minister of Agriculture No. 421/Kpts/Um/8/1970, and Government of Republic of Indonesia Regulation PP RI No 7 /1999 (written as all types from Accipitridae family). Distribution: Java, Sulawesi, Maluku and Lesser Sunda. In Bali, they are very rare.
27	**Elang Hitam**	***Ictinaetus malayensis***	**Black-eagle**	**L**	Base of Law: Decree of Minister of Agriculture No. 421/Kpts/Um/8/1970, and Government of Republic of Indonesia Regulation PP RI No 7 /1999 (written as all types from Accipitridae family). The distribution covers India, China, South East Asia, Philippine, Big Sunda and Lesser Sunda, particularly at the plateau of 2000 m. At the study area only 1 bird was found. Based on the information from local community, it is very rare.
28	**Elang Brontok**	***Spizatus cirrhatus***	**Changeable Hawk-eagle**	**L**	Base of Law: Decree of Minister of Agriculture No. 421/Kpts/Um/8/1970, and Government of Republic of Indonesia Regulation PP RI No 7 /1999 (written as all types from Accipitridae family). The distribution covers India, South East Asia, Sulawesi, maluku, and Big Sunda, At the study area there were only 2 birds which can be found around Siap River. Based on the information from the local community, this species is very rare.
29	Caladi Tilik	*Picoides mollucensis*	Sunda Woopecker	TL	Distribution covers India, South East Asia, Kalimantan, Sumatera, Java and Lesser Sunda. In Java and Bali is distributed at the lowland.
30	Pelatuk Tunggir-Emas	*Chrysocolaptes lucidus*	Greater Galdenback	TL	Distribution covers India, China, Philippine, Kalimantan, Sumatera, java and Bali, particularly at the lowland, open forest. At the study area, only 2-4 birds which can be found at Buangga-Petang. Based on the information from local community, this species is very rare

31	Cipoh Kacat	*Aegithina tiphia*	Common Iora	TL	Distribution covers India, China, South East Asia, Palawan, Cape of Malaysia and Big Sunda. It is general and widely distributed in Java -Bali at from lowland up to 1000 m, found in quite big numbers and flying in groups.
32	Anis merah	*Zoothera citrina*	Orange-headed Thrush	TL	One of the most favorite chirping bird and it is often involved in contest. Distribution: Pakistan-South China, South East Asia, Cape of Malaysia and Big Sunda. In Bali, it is found at plateaus or mountainous areas. The study area is its habitat and nesting are for the red species. Many people hunt their nest to get the young birds to be traded.
33	Gelatik Batu Kelabu	*Parus major*	Great Tit	TL	Paleartic Distribution. India, South East Asia, Cape of Malaysia and Big Sunda. In Java and Bali, it is found in quite big numbers.
34	Burung Madu pengantin	*Nectarinia sperata*	Purple-throated Sunbird	TL	Paleartic Distribution. India, South East Asia, Cape of Malaysia and Big Sunda. In Java and Bali, it is found in quite big numbers.
35	Burung Madu Sriganti	*Nectarinia jugularis*	Olive-backed Sunbird	TL	Distribution: China, South East Asia, Philippine, Malaysia and Indonesia, as well as Irian Island and Australia. In and around Java, it is general and widely distributed.
B. Reptile					
1	Biawak	*Varanus salvator*	Monitor Lizard	TL	Wild, found at the riverside and tree.
2	Kadal	*Mabouya multifascieta*	Lizard	TL	Wild, quite often be found
3	Tokek	*Gecko gecko*	House Lizard	TL	Wild, predicted from their voices
4	Ular hijau	*Tremeresurus alborabrus*	Green snake	TL	Wild, found in bamboos trees
5	Ular Cobra	*Naja sp*	Cobra	TL	Wild, interview (W)

C. Mamalia					
1.	**Landak**	*Hystrix brachyura*	**Southeast – Asian Porcupine**	**L**	Decree of Minister of Agriculture No. 247/KPTS/Um/4/1979, Considering the Decision of Addition to Kinds of Protected Wild Animals. Government of Republic of Indonesia regulation considering the Preservation of Kinds of Plants and Animals..
2	**Trenggiling/Peusing**	*Manis javanica*	**Pangolin**	**L**	Regulation of Wild Animal Protection, year 1931 Government of Republic of Indonesia Regulation No.7/1999. The distribution of this mammal covers Nias, Pagai Islands, Sumatera, Riau, Lingga, Bangka, Belitung, Natuna, Karimata, Kalimantan, Java and Bali.
3	Tupai/bajing	*Callosciurus sp*	Squirrel	TL	- Wild, quite a lot
4	Tikus	*Mus musculus*	Mouse/rat	TL	- Wild, around the rice fields
5	Lubak/Musang	*Paradoxurus hermaproditus*	Civet	TL	- Wild, its existence is from the feces and interview (W)
6	Kalong/ Kelelawar	*Pteropus sp*	Bat	TL	- Wild, it is gliding at the coconut's stems and from interview (W)
D. Arthopoda					
1	Kupu-kupu	*Danaus sp*	Butterfly	TL	This type of arthropod is wild, it was found in small numbers to the environs were rice fields, it is predicted that it can be more found if its environs were planted with crops.
2	Kupu-kupu	*Eurema lacteola*	Butterfly	TL	
3	Kupu-kupu	*Mycalesis mineus*	Butterfly	TL	
4	Kupu-kupu	*Neptis hylas*	Butterfly	TL	
5	Kupu-kupu	*Leptosia nina*	Butterfly	TL	
6	Kupu-kupu	*Parantica sp*	Butterfly	TL	
7	Capung	*Odonata spp*	Dragonfly	TL	
8	Tawon	*Vespula sp*	bee	TL	

Explanation :

TL : Unprotected

L : Protected (Regulation of Wild Animal Protection, year 1931; Decree of Minister of Agriculture No. 421/Kpts/Um/8/1970 and No. 247/KPTS/Um/4/1979, Considering the decision of Addition to Kinds of Protected Animals as well as Government of Republic of Indonesia regulation No 7 year 1999, considering Preservation of Kinds of Plants and Animals

W : The result of interview with the community at the study area..

Table 5.26 Result of Terrestrial Fauna Qualitative Analysis around Ayung River and Siap River, Location of Ayung Dam Development Plan at Buangga – Payangan (December – January 2006)

No	Local Name	Scientific Name	Common Name	Qualitative Weight	Explanation
A. Birds (Aves)					
1.	Tekukur biasa	*Streptopelia chinensis*	Spotted-Dove	5	> 50
2.	Delimukan zamrud	*Chalcophaps indica*	Emerald Dove	1	< 5
3	Merbah Cerukcuk	*Pycnonotus goiavier*	Yellow-vented Bulbul	5	> 50
4	Cucak Kutilang	*Pycnonotus aurigaster*	Sooty-headed Bulbul	3	15-30
5	Kuntul Kerbau	*Bulbulcus/Egretta ibis*	Cattle Egret	3	15-30
6	Kuntul kecil	*Egretta garzetta*	Little Egret	3	15-30
7	Blekok sawah	*Ardeola speciosa*	Javan Pond -Heron	2	6-14
8	Kareo padi	*Amaurornis phoenicurus*	White-breasted Waterhen	2	6-14
9	Berbik rawa	*Gallinago megala*	Swinhoe s Snipe	2	6-14
10	Walet sapi	*Collocalia esculenta*	Glossy Swiftlet	4	31-50
11	Cekakak Jawa	*Halcyon cyanoventris*	Javan Kingfisher	2	6-14
12	Cekakak sungai	*Todirhamphus/Halcyon chloris*	White- Collared Kingfisher	2	6-14
13	Bentet kelabu	*Lanius schach*	Long-Tailed Shrike	3	15-30
14	Bondol jawa	*Lonchura leucogastroides*	Javan Munia	5	> 50
15	Bondol Peking	*Lonchura punculata*	Scaly-breasted Munia	4	31-50
16	Kacamata biasa	*Zosterops palpebrosus*	Oriental White eye	4	31-50
17	Bubut besar	*Centropus sinensis*	Greater Coucal	2	6-14

18	Bubut alang-alang	*Centropus bengalensis*	Bulbul/Lesser Coucal	3	15-30
19	Meninting besar	*Euicurus leschenaulti*	White-crowned Forktel	2	6-14
20	Kucica kampung	*Copsychus saularis*	Magpie robin	1	< 5
21	Kerak kerbau	*Acridotheres javanicus*	Javan Myna	1	< 5
22	Kepudang Kuduk Hitam	*Oriolus chinensis*	Black-naped Oriole	1	< 5
23	Sri Gunting batu	*Dicrurus paradiceus*	Greater Racket-tailed Drongo	1	< 5
24	Empuloh Jenggot	*Alophoixus bres*	Grey-cheeked Bulbul	4	31-50
25	Wiwik Kelabu	*Cacomantis merulinus*	Plaintive Cuckoo	1	< 5
26	Alap-alap sapi	*Falco moluccensis*	Spotted Kestrel	1	< 5
27	Elang Hitam	*Ictinaetus malayensis*	Black-eagle	1	< 5
28	Elang Brontok	*Spizatus cirrhatus*	Changeable Hawk-eagle	1	< 5
29	Caladi Tilik	*Picoides mollucensis*	Sunda Woopecker	1	< 5
30	Pelatuk Tunggir-Emas	*Chrysocolaptes lucidus*	Greater Galdenback	1	< 5
31	Cipoh Kacat	*Aegithina tiphia*	Common Iora	3	15-30
32	Anis merah	*Zoothera citrina*	Orange-headed Thrush	2	6-14
33	Gelatik Batu Kelabu	*Parus major*	Great Tit	1	< 5
34	Burung Madu pengantin	*Nectarinia sperata*	Purple-throated Sunbird	3	15-30
35	Burung Madu Sriganti	*Nectarinia jugularis*	Olive-backed Sunbird	2	6-14
B. Reptile					
1	Biawak	*Varanus salvator*	Monitor Lizard	2	6-14
2	Kadal	*Mabouya multifascieta*	Lizard	4	
3	Tokek	*Gecko gecko*	House Lizard	2	6-14
4	Ular hijau	*Tremeresurus alborabrus*	Green snake	1	< 5
5	Ular Cobra	*Naja sp*	Cobra	-	-
C. Mamalia					
1	Landak	*Hystrix brachyura*	Southeast –Asian Porcupine	-	-
2	Trenggiling /Peusing	*Manis javanica*	Pangolin	-	-

3	Tupai/bajing	*Callosciurus sp*	Squirrel	3	15-30
4	Tikus	*Mus musculus*	Mouse/Rat	2	6-14
5	Lubak/Musang	*Paradoxurus hermaproditus*	Civet	-	-
6	Kalong/ Kelelawar	*Pteropus sp*	Bat	3	15-30
D. Arthopoda					
1	Kupu-kupu	*Danaus sp*	Butterfly	2	6-14
2	Kupu-kupu	*Eurema lacteola*	Butterfly	2	6-14
3	Kupu-kupu	*Mycalesis mineus*	Butterfly	2	6-14
4	Kupu-kupu	*Neptis hylas*	Butterfly	2	6-14
5	Kupu-kupu	*Leptosia nina*	Butterfly	2	6-14
6	Kupu-kupu	*Parantica sp*	Butterfly	3	6-14
7	Capung	*Odonata spp*	Dgragonfly	3	15-30
8	Tawon	*Vespula sp*	Bee	3	15-30

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Keterangan :

TL : Un-Protected

L : Protected (Regulation of Wild Animal Protection, Year 1931, Decree of Minister of Agriculture No. 421/KPTS/UM/8/1970 and No. 247/KPTS/UM/4/1979, Considering Addition of Protected Wild Animal and Governmental Regulation of Republic of Indonesia No. 7, 1999, considering Preservation of Plants and Animals.

W : Interview result to the community nearby

Range of weighing :

1 = population < 5 (very rare found during the research)
2 = population 6-14 (only a few found during the research)
3 = population 15-30 5 (a lot found during the research)
4 = population 31-50 (quite a lot found during the reseach)
5 = population > 50 (abundant found during the research)

5.5.2 Aquatic Flora and Fauna

1. Perifiton/ plankton Community

Perifiton (Aufwuch) is Suspended aquatic organism (similar with Plankton on lentic ecosystem), generally it is microscopic sized. Perifiton/plankton community is the terminology given to certain group of microscopic sized aquatic organisms, which is suspended organism in the water, or around the substrate with a very limited motion ability (*non-moving*); consists of plants or microscopic animals. The existence of perifiton/plankton as one of the important indicator to assest the beginning condition of a particular waters ecosystem, such as fertility level or pollution level in certain waters.

The investigation result of perifiton/plankton community at three Ayung River stations which are impacted areas of Ayung River Multifunction Dam is shown at Table 5.27 until Table 5.29.

Station I	:	Ayung River II Br Susut, Buahan Kelod Village Payangan Sub district, (S: 08°24'39,9" - 08°24'34,7" and E: 115°14'25,3" - 115°14'27,6")
Station II	:	Ayung River I Br. Petang, Petang Village Petang Sub district/ Bali Fantasi Rafting (S: 08°23'01,1" and E: 115°13'28,1")
Station III	:	Ayung River Br. Buangga, Getasan Village, Petang Sub district (S: 08°25'41,9" and E: 115°13'54,0")

The perifiton and plankton abundance at three monitoring stations are not equally distributed, it is between 972-1.602 cell/individu per liter. The highest plankton abundance can be obtained from Station I (Ayung River at Susut) of 1.602 individu per liter and the lowest is obtained from Station II (Ayung River Petang Village) of 972 cell/individu per liter. The perifiton/plankton abundance at those three stations are categorized as low abundance because the value is less than 2.000 individu per liter (Sigala ,1991). The prominent plankton composition at those three lakes: phytoplankton community: *Synedra acus, Fragilaria sp, Navicula sp, Pinnularia sp, Melosira sp, Tabellaria sp, Spirogyra protecta, Anabaena sp, Pediastrum* and *Straurastrum sp*, and zooplankton community consists of *: Cyclops, Branchionus, Keratella, Volvox, Monas sp, Arcella,* and *Tintinnidium sp.* Among tose species there are some that are sensitive to eutrification process: *Pediastrum sp*, and *Straurastrum sp*, and it is rather dangerous if there was blooming of plankton in it.

The diversity plankton which are shown by Shannon-Wiener's diversity index is between 4,4235 - 4,8416 units, it means that the plankton diversity at Ayung River I and II is categorized as the high one. The diversity index's value is bigger than 3 units which are high categorized (Kreb, 1978). This value indicates that the ecosystem is quite good for plankton/perifiton community's development.

The equitability index for all stations is between 0,9648 – 0,9898 unit, it means that the equitability in the community is very high/equal. This value indicates that the balance of primary energy in plankton comunity is very good, there is no ecologic pressure at the plankton community level.

The domination index value is very low, between 0,0365 – 0,0514 unit, it means that there is no domination or pressure from certain species or perifiton/plankton community.

Table 5.27 Composition and Abundance of Plankton/Perifiton Community at Station I Ayung River II

(Banjar Susut, Buahan Village, Payangan Sub district 3 January 2006 : 09.00 – 11.30 WITA, Weather : sunny)

No	Plankton Species	Repeatation of Monitoring View																									Total	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Ind.	Ind./ L
A.	**Phytoplankton**																											
1	*Genatozygon sauleatum*	-	-	-	1	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-	1	-	-	-	-	5	45
2	*Spirogyra protecta*	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	4	36
3	*Fragilaria sp*	-	-	-	2	-	-	1	-	1	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	8	72
4	*Asterionella sp*	2	-	-	1	-	1	-	-	1	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	7	63
5	*Synedra acus*	-	-	1	-	1	-	-	-	1	-	-	-	-	2	-	-	-	1	-	-	-	2	-	-	2	10	90
6	*Synedrra tabulata*	-	1	-	-	1	-	2	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	6	54
7	*Navicula sp*	1	-	-	-	-	2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	1	1	8	72
8	*Nitzschia acicularia*	-	-	-	2	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	1	6	54
9	*Sueirella elegana*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	4	36
10	*Anabaena sp*	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	4	36
11	*Closterium setaceum*	-	-	-	2	-	-	1	-	1	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	8	72
12	*Closterium rectimarginatum*	2	-	1	-	-	-	-	1	-	-	-	-	-	2	-	-	-	1	-	-	-	2	-	-	1	10	90
13	*Scenedesmus aematus*	-	1	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-	-	1	-	7	63
14	*Pachicladoz sp*	-	-	-	1	-	1	-	-	1	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	5	45
15	*Pediastrum simplex*	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	2	-	-	2	8	72
16	*Aphanizozenon flosaquae*	-	-	-	-	1	-	2	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	5	45
17	*Oscilatoria sp*	1	-	-	1	-	-	-	-	-	-	-	1	-	1	-	-	-	1	-	1	-	-	1	-	-	7	63
18	*Campilodiscus hiberpicus*	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	4	36
19	*Nitzschia acicularia*	-	-	-	1	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-	1	-	-	-	-	5	45
20	*Nitzschia myssanensis*	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	4	36
21	*Pinnularia nobilia*	-	-	-	2	-	-	1	-	1	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	8	72
22	*Tabellaria fanestrata*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	1	-	4	36
23	*Milosira granulata*	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	5	45
24	*Cyclotella sp*	-	-	-	-	-	1	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	5	45
25	*Chaetoceros sp*	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	2	5	45

B	***Zooplankton***																											
26	*Cyclops sp*	-	-	-	-	-	1	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	5	45
27	*Chlamydomonas*	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	1	-	4	36
28	*Branchionus sp*	-	2	-	-	1	-	1	-	-	2	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	8	72
29	*Monas ceronifera*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	1	-	4	36
30	*Tintinridium sp*	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	5	45
																											Total Individual of All Species (N) :	1.602
																											Total of Species (S) :	30 jenis
																											Diversity Index (H) :	4,8416
																											Equitability Index (E) :	0.9867
																											Domination Index (Id.) :	0,0365

Table 5.28 Composition and Abundance of Perifiton/Plankton Community at Station II Ayung River I

(Br. Petang Tengah, Petang Village, Petang Subdistrict, 4 January 2006 : 12.30 – 15.00 WITA. Weather : good and sunny)

No	Plankton Species	Repeatation of Monitoring View																								Total	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Ind.	Ind / L
A.	**Phytoplankton**																											
1	*Navicula sp*	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	27
2	*Nitzschia acicularia*	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	9
3	*Sueirella elegana*	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	5	45
4	*Anabaena sp*	-	2	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	3	2	-	-	2	1	-	-	12	108
5	*Pediastrum sp*	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	9
6	*Scenedesmus sp*	-	-	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	`1	5	45
7	*Spirogyra sp*	2	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	4	36
8	*Closterium sp*	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	3	27
9	*Straurastrum sp*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2	-	-	3	-	-	8	72
10	*Melosira granulata*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	3	27
11	*Cyclotella sp*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	3	27
12	*Rhizosolenia sp*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	3	27
13	*Fragilaria sp*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	-	3	27
14	*Asterionella sp*	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	36
15	*Synedra acus*	-	-	-	1	-	1	-	-	1	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	5	45
16	*Synedrra tabulata*	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	2	-	-	2	8	72
17	*Microspora sp*	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	36
18	*Ulothrix sp*	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	1	-	-	-	-	3	27
B.	**Zooplankton**																											
19	*Bosmina sp*	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	3	27
20	*Chlamydomonas*	1	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	5	45
21	*Monas ceronifera*	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	18
22	*Arcella sp*	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	1	-	-	-	5	45
23	*Tintinridium sp*	1	-	-	-	1	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-	1	-	6	54
24	*Cyclidium glaucopa*	-	2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	36
25	*Eucyclops sp*	1	-	-	1	-	1	-	-	1	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	5	45
																										Total Individual of All Species (N) :	972 sell
																										Total of Species (S) :	25 jenis
																										Diversity Index (H) :	4,4567
																										Equitability Index (E) :	0,9898
																										Domination Index (Id.) :	0,0514

Table 5.29. Composition and Abundance of Perifiton/Plankton Community at Station III

(Ayung River, Br. Buangga, getasan Village, Petang Sub district, 3 January 2006 : 13.30 – 16.00 WITA, Weather : heavy rain)

No	Plankton Species	Repeatation of Monitoring View																									Total	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Ind.	Ind./ L
A.	**Phytoplankton**																											
1	*Melosira granulata*	1	-	-	1	-	-	1	-	-	2	-	-	-	-	-	-	-	2	-	-	-	1	-	-	-	8	72
2	*Cyclotella sp*	-	-	2	-	-	2	-	-	-	-	-	1	-	1	-	-	-	-	1	-	1	-	-	-	2	10	90
3	*Rhizosolenia sp*	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-	4	36
4	*Fragilaria sp*	-	1	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	1	-	-	6	54
5	*Asterionella sp*	-	-	-	1	-	-	-	2	-	1	-	-	1	-	2	-	-	-	-	-	-	1	-	2	-	10	90
6	*Synedrra tabulata*	-	-	-	1	-	-	-	2	-	1	-	-	1	-	-	-	-	1	-	1	-	-	1	-	-	8	72
7	*Tabellaria fracculosa*	-	-	1	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	1	-	-	5	45
8	*Navicula sp*	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	1	-	-	-	-	1	-	5	45
9	*Nitzschia acicularia*	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	1	-	-	-	4	36
10	*Ntizschia sp*	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	2	4	36
11	*Sueirella elegana*	-	1	-	-	-	2	-	-	-	-	1	-	-	-	-	-	2	-	-	-	1	-	-	-	-	7	63
12	*Anabaena sp*	-	2	-	-	-	-	-	-	2	-	-	1	1	-	-	1	-	-	-	1	-	-	2	-	-	10	90
13	*Pediastrum sp*	-	1	-	-	-	-	-	-	-	1	-	-	1	-	-	-	1	-	-	1	-	-	-	-	-	5	45
14	*Scenedesmus sp*	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	1	-	-	1	5	45
15	*Straurastrum sp*	-	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	5	45
16	*Genatozygon sauleatum*	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	4	36
17	*Spirogyra protecta*	-	3	-	-	1	-	-	-	-	1	-	3	-	1	-	-	2	-	-	1	-	1	-	-	-	13	117
18	*Fragilaria sp*	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	4	36
19	*Asterionella sp*	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	1	-	-	-	-	2	5	45
B	***Zooplankton***																											
20	*Cephalodella auricalata*	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	1	-	5	45
21	*Stentor roszeli*	1	-	-	-	-	-	-	-	1	-	1	-	-	2	-	-	-	-	-	-	-	2	-	-	-	7	63
22	*Monas ceronifera*	-	2	-	-	-	-	-	-	2	-	-	1	1	-	-	1	-	-	-	1	-	-	2	-	-	10	90
23	*Keratella sp*	-		-	3	-	2	-	-	-	1	-	-	1	-	-	-	1	-	-	1	-	-	-	-	-	9	81
																											Total Individu of all species (N) :	1.377
																											Total Species (S) :	23 jenis
																											Diversity Index (H) :	4,4235
																											Equitability Index (E) :	0,9648
																											Species Domination Index (Id.) :	0,0499

2. Macrozoobenthos Community

Macrozoobenthos community is a terminology given to a group of organism which lives on the surface or for those which burry themselves in the waters bed, and the size is more 1.0 mm. Investigation in this component based on sampling instrument representation, and identification book availability and also impact requirement.

Qualitatively in this Amdal study of Ayung Dam, it is declared that benthic habitat conditions on the four sampling stations are not goodand supporting the life of benthos organism, especially macrozoobenthos, because the stream is very swift and river discharge in rainy season therefore it is significantly flushing sediment or bottom substrate tube which are benthos' habitat. In the deeper zone, it is predicted that benthos development is very difficult because the minimum of sun lihting and available food sources.

Species abundance and composition which are obtained from the investigation toward macrozoobenthos community, and diversity index, equitability or domination as shown on 5.30.

The abundance of macrozoobenthos at those four locations are low, it is between 123 – 179 individuals per area (1,6 m^2). The prominent species are insect group (dragonfly larve) and mollusca: *Thiara winteri, Thiara scabra, Pila ampullacea, Melanoides terulosa,* and crustacea : udang galah (*Macrobranchium rosenbergii*), and river crab (*Johora* sp). Among those species, the existence of Freshwater Giant Prawn are a lot.

The diversity value of macrozoobenthos community at the location is between 3;1536 – 3,6873 units. This is high diversity value. Equitability value is nearly equal in Ayung River. It is between 0,4542 – 0,9076, it means that the equitability level is from low until the high one. From four stations, there is only one station which categorized as the high one, it is in Petang, around Bali Fantasi Rafting (more than 0,75 unit). Domination index value is very low, it is between 0,0917- 0,1582, it means that there is no domination.

Refers to Governmental Regulation of Republic of Indonesia No 7, 199 considering Preservation of Animal and Plants, that among macrozoobenthosir components which are succesfully investigated (Table 4) there is no endanger species and or protected by the Government of Republic of Indonesia.

Table 5.30 Abundance and Composition of Macrozoobenthos Community at Ayung River (Amdal Study of Ayung Dam Development Plan) 3-4 January 2006 (8.30-16.30 Wita)

No	Group/Family	Scientific Name (Species)	Common Name	Local Name (Indonesian Name)	Macrozoobenthos Sampling Station			
					I	II	III	IV
A.	**Aquatic Insect**							
	1. Ephemeroptera							
	- Baetidae	*Baetis sp* (Leach)	Mayfly nymph	Insekta air	8	18	-	5
	- Ephemerellidae	*Ephemerella sp* (Walsh)	Stonefly nymph	Insekta air	3	5	16	-
	2. Odonata							
	- Zygoptera	*Hetairena sp* (Hagen)	Caddisfly	Larva capung	35	23	5	15
	- Anisoptera	*Hagenius sp* (Selys)	Caddisfly	Larva capung	11	4	14	3
	3. Plecoptera	*Isoperla sp* (Banks)	Caddisfly	Larva capung	8	13	8	5
		Acroneuria sp (Pictet)	Caddisfly	Larva capung	-	-	11	23
	4. Hemiptera	*Notonecta sp*	Caddisfly	Larva capung	13	30	20	16
	5.Coleoptera							
	- Dytiscidae	*Capelatus sp* (Erichson)	Water penny		6	2	7	2
	- Elmidae	*Ancyronix sp* (Erichson)	Water penny		-	-	4	11
B	**Moluscca**							
	1. Thiaridae	*Melanoides torulosa*	River snail	Siput air	20	8	2	28
		Tarebia granifera	River snail	Siput air	13	8	5	-

		Thiara winteri	River snail	Siput air	3	3	8	3
	2. Sphaeriidae	*Sphaerium simile*	River snail	Siput air	-	-	-	4
	3. Ampullaria	*Pila ampullacea*	River snail	Keong air	2	-	-	1
	4. Pleuroceridae	*Goniobasisi sp*	River snail	Siput air	13	8	5	-
C	**Crustacea**							
	1. Palaemonidae	*Macrobranchium rosenbergii*	*Freshwater prawn*	Udang galah	5	8	4	-
		Pontonides sp	*Freshwater shrimp*	Udang krosok	12	18	25	-
	2. Potamidae	*Stoliozia sp*	*Freshwater crab*	Kepiting	23	3	3	-
		Johora sp	*Freshwater crab*	Kepiting	4	11	13	8
				Total Individual of All Species (N) :	**179**	**162**	**150**	**123**
				Total of All Species (S) :	**16**	**15**	**16**	**13**
				Macrozoobenthos Diversity Index (H) :	**3,6290**	**3,5458**	**3,6873**	**3,1536**
				Macrozoobenthos Equitability Index (E) :	**0,4849**	**0,9076**	**0,5101**	**0,4542**
				Domination Index (ID) :	**0.096**	**0,1582**	**0.0917**	**0.1328**

Explanation :

Station I : Ayung River II Br Susut, Buahan Kelod Village Payangan Subdistrict, (S: 08°24'39,9" - 08°24'34,7" and E: 115°14'25,3" - 115°14'27,6")

Station II : Ayung River I Br. Petang, Petang Village Petang Subdistrict/ Bali Fantasi Rafting (S: 08°23'01,1" and E: 115°13'28,1")

Station III : Ayung River Br. Buangga, Getasan Village, Petang Subdistrict (S: 08°25'41,9" and E: 115°13'54,0")

Station IV : Ayung River Br Anggungan, Carangsari Village, Abiansemal Subditrict (S: 08°27'19,1" and E: 115°14'04,9")

3. Necton Community (Fish, crab and prawn)

Generally, the necton community is the closest aquatic biology component for human (society), because fish, crab and prawn have been the longest and oftenly consumed by human as animal protein source from aquatic ecosystem; therefore if this community is disturbed or degradated because of a certain project, the impact will be significant for the community whose earnings are by catching fish, crab and prawns at Ayung River.

The investigation result is obtained from the description of fish, crab and prawn community structure at Ayung River as shown on Table 5.5.2.5 and teh abundance fishes is shown on Figure 5.5.2.6.

At Ayunhg River, the fish species richness is relatively low, it is 15 species, with species abundance is between 173 – 737 individuals per sampling area. Species which are quite abundant are Nilem (*Osteochilus hasselti*), Masan-masan (*Rasbora* sp dan *Tor tambra*), kepala timah (*Xiphophorus helleri*), sidat (*Anguilla marmorata*), and beboso (*Butis sp*).

Beside that, there are giant prawn and crab (river) found, those are: udang galah (*Macrobranchium rosenbergii*), udang kresek (*Palaemonetes sp*), and trestes (Bali) (*Pontonides sp*), and also giant crab (*Johara* sp and *Stolizia* sp). The existence of this resources is quite abundant.

The diversity index value is between 2,5170-3,8236, it means that the fish diversity is categorized as the moderate to high diversity. The equitability index is categorized as high equitability. The domination index is between 0,1663-0,2326, it means that the domnation is categorized as low equitability.

Refers to the Governmental Regulation of republic of Indonesia No.7, 1999 considering Preservation of Plants and Animals, that in the aquatic biology components (Table 5) which are successfully investigated, endanger species of necton (fish, prawn and crab in Ayung River) are not found and or protected by Government of Republic of Indonesia.

Figure 5.7 The investigation result of necton community at Ayung River and Siap River, Ayung Dam Plan, Buangga

Table 5.31 Abundance, Composition, Diversity, Equitability, Domination of Necton (Fish, crab, and prawn) at Ayung River (Studi Amdal of Ayung Dam, 3-4 January 2006).

No	Family	*Scientific name*	Common Name	Local Name	Sampling Location			
					Station I	Station II	Station III	Station IV
A.	Fish Community							
1	Cyprinidae	*Tor tambra / Labeobarbus tambra*	Carps	Tembera (Ind.), Nyalian Bangkal (Bali)	12	9	2	6
2		*Rasbora sp*	Carps	Wader (ind.), Nyalian (Bali)	41	28	26	61
3		*Osteochilus hasselti*	Carps	Nilem	4	-	-	2
4	Aplocheilidae	*Aplocheilus panchax*	Tinheads	Kepala timah	24	2	10	-
5	Poeciliidae	*Xiphophorus helleri*	Livebearers	Ikan seribu (Ind), Ikan Pedang (Bali)	34	11	6	9
6	Anguillidae	*Anguilla marmorata*	Freshwater Eels	Sidat/Moa kembang (Ind.), Julit (Bali)	2	2	4 (Anakan)	3
		Anguilla bicolor/ A. spengeli	Freshwater Eels	Moa (Ind), Kulen (Bali)	1	-	-	-
		Anguilla cellebesensis	Freshwater Eels	Menguling (Ind), Kulen Kuning (Bali)	-	-	-	2
	Claridae	*Clarias batrachus*	Walking Catfish	Lele	-	-	-	1
7.	Ophiocephalidae	*Ophiocephalus striatus/Channa striata*	Snakeheads	Gabus/kehung (Ind), Jeleg (Bali)	1	-	-	-
8	Balitoriidae	*Glaniopsis sp*	Hillstream Loaches	Selusur (Ind.), Jajung (Kepe-kepe)	2	3	2	14

9.	Eleotrididae	*Butis sp*	*Sleepers/Gudgeons*	Belosoh (ind.), Boboso (Bali)	2	1	1	4
B	Crustacea (Decapoda)							
10	Palaemonidae	*Macrobranchium rosenbergii*	Freshwater prawn	Udang galah	4	5	8	32
		Palaemonetes sp	Shrimps	Udang kresek	3	-	2	19
		Pontonides sp	Shrimps	Udang terestes (Bali)	14	34	38	9
11		*Stoliozia stoliockana*	Crabs	Kepiting	5	2	4	2
		Johora sp	Crabs	kepiting	3	-	3	5
				Total of trapped fishes (S) :	152	97	106	169
				Total Individual of All Species (N) :	15	10	12	14
				Fish Diversity Index(H) :	3,0236	2,5170	2,7552	2,9115
				Fish Equitability Index (E) :	0,7739	0,7577	0,7685	0,7647
				Fish Domination Index (ID) :	0,1663	0,2326	0,2113	0,1945

Explanation :

Station I : Ayung River II Br Susut, Buahan Kelod Village Payangan Sub district, (S: 08°24'39,9" - 08°24'34,7" and E: 115°14'25,3" - 115°14'27,6")

Station II : Ayung River I Br. Petang, Petang Village Petang Subdistrict/ Bali Fantasi Rafting (S: 08°23'01,1" and E: 115°13'28,1")

Station III : Ayung River Br. Buangga, Getasan Village, Petang Subdistrict (S: 08°25'41,9" and E: 115°13'54,0")

Station IV : Ayung River Br Anggungan, Carangsari Village, Abiansemal Sub district(S: 08°27'19,1" and E: 115°14'04,9")

Component of aquatic flora and fauna in Ayung River is a very strategic and important environment component to have considerations in the relation of Ayung River Development Plan. Ayung dam development is an activity with significant and important impact to the existence of aquatic flora and fauna, it is predicted that there will be a basic change on aquatic ecosystem tipology (from the lotic system into inundation/stagnant/lentic system) and change of river landscape. The condition has very big influence to the aquatic flora and fauna component, especially to adaptation and attitude pattern even it is predicted that there will be an alteration to the community structure, especially dam water scape.

5.3 SOCIO-ECONOMIC ENVIRONMENT

The analyzed socio-economic environment covers the demographic, socio-economic and cultural condition on 5 villages: Melinggih, Buahan, Pangsan, Getasan and Carangsari on two Subdistricts, Petang Sub district Badung Regency and Payangan Sub district Gianyar Regency. Directly, these villages touch the project locations, where the community's interaction, project's workers and activity's impacts are in high intensity.

5.3.1 Demography Aspect

According to the collected secondary data, it is known that the communities on five villages reach 17001 persons (4,572 families) consist of male = 8345 persons, and female = 8566 persons. The sex ratio reaches 98,47 %, it means, every 100 females there are 98,47 males or in the other words, female is more than male. The highest numbers of people belong to Carangsari Village of 4,718 persons (50,63 %), while the most dense is on Getasan Village, in average of 791 persons./Km^2. The average density of those five villages reaches 587 jiwa per km^2.

Table 5.32. Wide of Area, Household and Average of Household members on the study villages in 2004

Village	Area (Km2)	People			House hold	density Per Km2	Average per household
		Male	Female	Total			
Buahan	9.50	1.570	1.641	3.211	.662	338	5
Melinggih	4.87	2.225	2.247	4.472	1.275	918	4
Pangsan	5.76	1.215	1.289	2.504	712	432	4
Getasan	4.01	1.061	1.035	2.096	582	791	4
Canangsari	7.46	2.364	2.354	4.718	1341	537	4

Source: Data is processed form Petang Sub district 2004 and Statistic of Payangan Subdistrict 2004.

Natality and mortality rates in both sub-district are decrease from 2003 to 2004. Natality rate decrease 43,03 % and mortality rate decrease 55,95 %. Its caesed by Family Plan Program (Keluarga Berencana) and health conditions of the people is now getting better. Numbers of resident mobilization in Petang sub-District is commonly higher than Payangan, even coming or leaving people. It shows that Poetang sub-District is more open sphere.

Table 5.33. Resident Turn Over base on Gender at the end of 2004. (1/2)

Village	Born		Total	Died		Total
	Men	Women		Men	Women	
Buahan	-	-	-	-	-	-
Melinggih	2	1	3	2	3	5
Pangsan	8	19	27	13	13	26
Getasan	21	23	44	7	10	17
Canangsari	7	1	8	7	1	8

Table 5.33. Resident Turn Over base on Gender at the end of 2004. (2/2)

Village	Leave			Come		
	Men	Women	Total	Men	Women	Total
Buahan	-	-	-	-	-	-
Melinggih	2	1	3	-	-	-
Pangsan	6	9	15	13	15	28
Getasan	9	20	19	13	19	32
Canangsari	11	15	11	2	13	15

Source: data is processed form Petang Sub district 2004 and Statistic of Payangan Subdistrict 2004.

Most of resident in the study area is in productive ages. Numbers of resident in the range of 15-64 years of ages is 68,66 %, while non-productive resident over 64 years of ages is 5,51 % and under 15 of ages is 25,12 %.

Table 5.34. Resident Structure base on Ages Group

Sub-District	Ages			Total
	<15	15-64	>64	
Petang	6799	18443	1644	26886
Payangan	8625	23710	2179	34514
Total 2004	15424	42153	3823	61400
2003	19013	38131	4206	61350

Source: Data is processed form Petang Sub District in Figure 2004 and Payangan Subdistrict in Figure 2004.

5.3.2 Economy

Resident livelihood in the study area is mostly peasent, those are: wetland and dry land farmer, livestock, and plantations. But others earning sources are look vary such as trade, handy craft industry, mining (stone excavation) and others. Numbers of people who working in handy-craft industry are mostly found in Payangan sub-District.

Tabel 5.35. Sectors of Main Sources Income of Resident in Study Area 2004

Income Sources	Villages				
	Buahan	Melinggih	Pangsan	Getasan	Canangsari
Agriculture	3065	1464	1511	1250	1570
Livestock	44	225	270	160	226
Plantations	33	243	17	18	17
Trades	46	319	126	90	110
Industry	-	140	19	17	11
Mining	-	-	-	-	-
Electricity, Gaz and Water Supply	-	-	3	-	1
Transportations/ Communications	11	245	18	11	58
Financials	-	-	23	6	38
Government/ Services	236	759	92	67	180
Others	139	777	57	15	46

Source: Data is processed form Petang Sub District in Figure 2004 and Payangan Subdistrict in Figure 2004

Even most of the resident working in agriculture sector, specially foods production, but type of irrigations infrastructure in both sub-district is not completely technized. The table bellow shows type of available irrigation facilities in study area.

Table 5.36. Irrigation Facilities and Services Area in 2004.

Villages	Agriculture Area (Ha)			Type of Irrigation facilities (Ha)		
	Wet land	Dry land	Total	Semi-technized	Simple Facilities	Non-Govet Facilities
Buahan	150	800	950	130	-	-
Melinggih	222	265	487	190	32	-
Pangsan	136	440	576	136	136	-
Getasan	134	267	401	134	-	-
Canangsari	221	525	746	221	-	-

Source: Data is processed form Petang Sub District in Figure 2004 and Payangan Subdistrict in Figure 2004

5.3.3 Socio-Cultural

1. Culture (traditions, cultural valu and norm)

Bali is known to be such area with culture diversity and uniqueness, as the result of a long culture-historical process from the past. As the community of a village located at the riverside with main earning of farming, it has been producing a form and cultural value which are reflected from their social attitude and behaviour. Nilai budaya juga tercermin dari aturan adat (awig-awig) yang mereka buat dan sepakati bersama untuk menata dan melestarikan kehidupan sosial, budaya dan lingkungan yang dipandang baik dan bermanfaat.

Generally, the cultural system consists of some concepts which live in the ideologies of most of the community, about the valuable things that they should concern in their lifes, and functioned as the highest guideline for them to behave in the society patterned life (Koentjaraningrat:1980). Among the existing cultural values and traditions in the society are as followed:

a. Tri Hita Karana

Cultural value of *Tri Hita Karana* (*palemahan, pawongan and parhyangan*), basically is a desire to create a harmonious horizontal relation among the community (humanism), balance and harmony in a vertical relation between human and environment (ecologism) and harmony between human and spirit (God/Bhatara) as God's manifestation (Theologism) to reach the mental and physical prosperity.

b. Holyness Value

Holyness value is an honorable cultural system, and it is maintained through ceremony/*yadnya* or social behaviour because it is good and positive for human's life. Holyness value is able to be found in cultural things (artifact, architecture, and so on), on people, or on natural element (mountain, lake, *campuhan*, spring, certain animal, and so on).

In Balinese culture, holyness value is closely related with cosmology phylosophy, especially spatial concept of *dwi mandala*, *tri mandala*, *sange mandala* and others. *Dwi Mandala* concept, it is a space divison based on the holyness level, into two parts, those are *utama mandala* (sacred space) and *nista mandala* (profane space). An example of *kaja* space/mountain (utama mandala) – *kelod*/ocean (nista mandala) – or *kangin* (east as a direction for sunrise/*utama mandala*) – and *kauh*/west (*nista mandala*). Tri Mandala concept is a space

mandala) – and *kauh*/west (*nista mandala*). Tri Mandala concept is a space division into 3 zones, those are *nista mandala* (profane), *madya mandala* (profane-sacred) and *utama mandala* (sacred/holy). While Sange Mandala is a division into 9 zones based on directions, and the central space is the most important/most sacred. This division can be mcrocosmic and/or microcosmic.

In Bali traditional cultural value system, direction/main place (holy) is concerned to be a place for God/dewa/holy spirit or source of positive energy which is able to bless saviour, fertility, welfare, prosperity, lucky and other blessings, while place of evil/bhuta (source of negative energy) which is able to sprad disease, suffer, miserable, or even disaster or death. Even they are negative, in the local culture, both values must be concerned, well and harmoniously treated. The negative values can be transformed into positive through *yadnya* ceremony (sacrifice) such as: *mecaru/tawur* (*bhuta yadnya*), *ruwatan* and other kinds of *yadnya*. By appropriate yadnya and followed by life which is based on Tri Kaya Parisudha phylosophy, those are,well and wisely (holy) think, speak, and physical behaviour (social) and proportional, the negative elements can be exorcised and transformed into positive power which provides lucky/ saviour or blessings.

c. Tirtha Religion and Environmental Wisdom

Hinduism in Bali is also known as *tirtha* religion, because in every rituals always begin and end by splashing holy water (*tirtha*). Within this concept, the role of holy water has important position in the culture, so does in community's daily life, therefore holy water is always preserved. Related to the holy water, in Hinduism is known tirtha amerta concept, that is a holy water as a source of everlasting life.

River as one of the natural environment element which its upstreams are at the mountain and lake, is also concerned to be a source of *amerta* (everlasting life) for the community and the farmer as spring (holy water) for rituals, such as *melasti*, *nganyut*, *kebejian* ceremony and others. Archeological evidences show that the river concept as a holy area is the background of the building of temples along the riversieds in Bali.

Apart from that, based on Balinese community, river is also as a place for spirits, the positive or negative ones, to stay. Indirectly, it influences the behaviours of the local community, that for those who break the rules or disturb the habitats will get suffer or miserables. This kind of cultural value is still practiced and growing in the community, particularly in interacting eith the surroundings. It gives positive impact related to contex of environment conservation, due to it supports the environment (river) to become relatively stable and preserved.

However, the rapid development which is followed by rapid growth of people and basic needs, as well as the intervension of progressive economic culture from stranges culture make the culture values become shaky.

2. Social Process (assosiative process/cooperation, disossiative process/social conflict, aculturation, assimilation and integration, social cohession);

Cooperation among village community in such organization such as desa adat institution, banjar, Sekehe Teruna-Teruni (youngsters' organization) or other social societies (Melinggih Village, Susut Buahan Village, Pangsan Village, Getasan and Carangsari Village) are running well. The cooperation is oftenly in form of community work to clean up the environment, road construction or *ngayah* (help) for *pitra yadnya* ceremony (immortal ceremony or *ngaben*), *manusa yadnya* (marriage ceremony, *mesangih*), *upacara piodalan pura* (ceremony in the temple) *dewa yadnya*, art-cultural activities, preparation to celebrate Hindu's days (Galungan, Nyepi, and soon) or national day such as Independence Day of Republic of Indonesia tgl.i 17th August, or to organize security in the environment.

Especially for subak which are using river water for irigation are often involved in cooperation (community work), clean and repair the channel especially in the preparation of planting season, conducting meeting (paruman) among members, and also for other agricultural ceremonies such as nangluk merana, Ngusaba, Nini mendak toya (ceremony to ask for God of Water) piodalan pura subak (ceremony in Subak Temple), and so on.

Social tolerance and religious life in the community around project site is quite good. It is proved by, for example, in Melinggih Village, particularly in Desa Adat Payangan Desa, there have been Chinese culture developed and have been living there harmoniously with local community which are generally Hindu. Until today, the existence of Chinese Cemetery (Pekkung Cemetery) and holy place to worship the Ancestors of Chinese descendants (Hooping); Toa Pekkong (God of the Earth) and Tien Kung (God/Hyang Widhi) and a place to celebrate Cingbing ceremony, every April 5th in Payangan Desa are running well and harmoniously.

Nevertheless, it does not mean that there have never been any problem or conflict in the study area. Conflict is frequently occurs caused by the increase of requirement toward the same natural resources usages which its availability is relatively constant or even become limited. In example, conflict among subak in distribute irrigation water. Another conflict is between rafting company with hotel or restaurant which are predicted throwing out their wastes to Ayung River around Kedewatan or section. Or conflict between hotels and society, because the society do not get any benefits while the hotel and tourists enjoy the views across the river.

3. Social institutional in economy, education, religion

a. Village Institution

Institution of Desa Dinas is led by Head of Village. In his daily duties, Head of Village is assisted by Village Secretary and some of his staffs. Some institutions which are participation of the village community, such as LPM (Lembaga Pemberdayaan Masyarakat/Community Empowering Institution) which assist Head of Village in the planning and implementation of physic and mental development in the village. Beside that, Hed of Village must be in coordination with BPD (Village Representatives) in the planning, implementation or in evaluating the development result. BPD has analog function with the village legislatives, who has the rights to control, give advise and ask for responsibility to Head of Village in meeting or responsibility meeting.

Social institution in traditional government is Desa Adat. Desa Adat is an institution which its members are tied by same residence area, and also the existence of *Kahyangan Desa* (temple/*Kahyangan Tiga*) as well as same *awig-awig* (traditional regulations). In order to reach the goal, community's prosperity (kasukertan desa) which is implicitly included in Tri Hita Karana, Desa Adat is focusing its activities on traditin and religion development, such as make concept and conducting traditional and religious ceremonies, village's physical facilities (balai banjar [hall] or temple), organizing and keep the village's orderliness through awig-awig which must be obeyed and honored.

b. Subak Institution

Subak is a tradition agricultural organization which has religious characteristic, and the members, consists of farmers who own rice fields and get irrigation water from the same source. The existence of subak is predicted since the Ancient Bali period (XI century) and commonly characterized by self-supporting and community work. Generally, subak is led by *pekaseh/kelian subak* (organization leader). Pekaseh is assisted by Juru Tulis (Secretary and also as *juru arah/saya/kesinoman*), *petengen* (treasurer), and assisted by several *kelian tempek/subak munduk (kelian subsubak* – leader of sub-subak*)*. The lowest structure is farmer as krama/subak member.

Subak has autonomous right to organize its household through the formed organization, such as organize the kinds of plants or its plnating pattern related with *kertamasa* and *tulak-sumur* to increase the productivity, make or maintain the physical structures, including drains and Subak Temple, fund from members (pajak sarin tahun), held ceremonies, controlling toward the existing cannal, law and punishment implementation according to the agreement.

c. Institution on Economy Sector

Village social institutional in economy sector such as koperasi desa (village's cooperative entreprise) and LPD (Village's Credit Institution). Generally, LPD is the sub-business oned by desa adat for credit matters for local community;

Related to the tousim economy on investigated area, there are several rafting companies (Bali Disocvery, Bali Fantasi, and Bali Holiday located at the upstream of the dam) and accomodations (villa/Ubud Hanging Garden Hotel and Nandini Villa located on Susut-Buahan). The existences of ratings or villa/hotel are also contributing fund. Regularly, to Desa Adat or surrounding community. It is used as addition fund to conduct traditional/religious ceremonies.

d. **Education Institution**

Education has an important role in increasing human resources quality. The education process is not only at school (formal education), but also in family and society. On the villages around the dam site, formal education is handled by school institutions, from kindergarten (TK), Elementary School (SD), Junior High School (SLTP), and Senior High School (SLTA).

The condition of community's education at the study area can be described as below :

1). Pangsan, Getasan and Carangsari Village(West of Ayung River)

Table 5.37. Education Level of Pangsan, Getasan and Carangsari Resident

No	Village / Education	Pangsan	Getasan	Carangsari	Total	
					person	%
1	Non educated/ not yet educated	226	157	164	547	6,05
2	Not yet graduated from Elementary School	718	913	1490	3121	34,52
3	Graduated from Elementary School	740	917	1490	3147	34,80
4	Graduated from Junior High School	312	317	419	1048	11,59
5	Graduated from Senior High School	321	212	329	862	9,53
6	Diploma	17	11	6	34	0,38
7	Bachelor Degree	104	77	102	283	3,13
Total		2438	2604	4000	9042	100

Source : Processed from Petang Subdistrict in Figures 2003

According to data in the table, generally, the education level of the community from the three villages are low, because the numbers of the community which are elementary school graduated, not yet graduated and not yet educated reaching the mubers of 6815 people (75,37 %). It means that the human resources quality should be increased through education.

2). Buahan and Melinggih Village (East of the River)

Table 5.38. Numbers of Resident based on Education Level in 2004

No	Village / Education	Buahan	Melinggih	Total	
				person	%
1	2	3	4	5	6
1	Non educated/ not yet educated	222	196	418	5.,37
2	Not yet graduated from Elementary School	258	491	749	9.62
3	Graduated from Elementary School	1,606	1,738	3,344	42.97
4	Graduated from Junior High School	527	1,556	2,083	26.77
5	Graduated from Senior High School	521	495	1,016	13.06
6	Diploma	23	43	66	0.85
7	Bachelor Degree	34	72	106	1.36
Total		**3,191**	**4,591**	**7,782**	**100**

Source : Processed from Payangan Subdistrict in Figures 2004

According to the data on the table above, it shows that the education level on Buahan or Melinggih Village is still low. It is shown by 4,511 people (57.96%) whose education is under Junior High School, those are non/not yet educaetd of 418 people (5.37 %), not yet graduated from elementary school of 749 (9.62 %) and elementary school graduated of 3,344 people (42.92 %). If the 9 years compuilsory education is implemented effectively, it means that the community's education level which is categorized as basic education of 6,594 (84,73 %).
Generally, the education condition of the village society around the project (west and east of the river) is still low, dominated by Elementary educated level of 57.96 % - 75.37%.

e. Religious Institution

Social institution in religion aspect is assigned to increase the piritual knowledge of the community and their faith to God, as well as maintaining a harmonious relation among community (tolerance) followed by affection. Majority, the community at the study area is Hindu. In Hindu, there is such institutional as PHDI (Parisadha Hindu Dharma Indonesia).

There are also holy places (temple) as a place to organize socio-religious activities can be included as religious institutional. In each temple, a socio-religious organization known as *pemaksan* or *pengemong* (worshippers) who have the responsibility to maintain the and conduct the ceremony and maintain the unity in socio-religious life. The highest position in a religious ceremony, commonly led by *pemangku* (priest).

Especially in Chinese community in Payangan Desa, they have their own religious institutional (suka-duka) of 72 households named Ciladharma, it is an organization for the Chinese as the means of communication and coordination to maintain a harmonious relation among them and prepare the celebration of CingBing in Pekkung Cemetery;

f. Security Institution

Security factor has an important role in community's daily life. Security includes physic and phsycological security from all disturbances. One of the security institutional owned by Desa Adat is *pecalang. Pecalang* has a duty or social loyality to secure the traditional activities, such as on *odalan* (pujawali), *ngaben*, *ogoh-ogoh* festival in celebrating Icaka New Year (Nyepi) and other traditional ceremonies.

In handling particular bigger cases, Desa Adat's security personnels, usually, are in coordination with Hansip (security personnel from Desa Dinas) and also police.

4. Cultural Heritage (aercheological sites, cultural sites):

Cultural heritages around the project are:

a. Tangluk Temple, Desa Adat Susut

Tangluk Temple is also known as Gunung Lebah temple, located on the upstream of the dam plan (campuhan upstream between two Ayung's estuaries, west Ayung estuary and left Ayung) which belong to Desa Adat Susut-Buahan, Payangan Sub district, Gianyar. Tangluk Temple is one of *susungan* in Desa Adat Susut-Buahan worshipped (*diempon*) by 200 households. Piodalan ceremony in Tangluk temple is persisted for three days (nyejer) on the Tenth Purnama. This temple is also related to Pucak Penulisan Tmple (Sukawana-Kintamani), Pura Manik Liu (Manik-Liu Village, Kintamani), and Paosan Temple (Pucak Paosan on Buahan kaja). Other ceremony which is oftenly held at Tangluk Temple is Upacara Nagluk Merana, which is held every Tilem Sasih VI (around December). According to the tradition, in Nagluk Merana, it is also completed by offer some offerings and ask for holy water (tirtha) at pesisi (Lebih Beach, Gianyar regency).

b. **Petirtaan and Meditation Site**

Tangluk Temple is also related to two other holy places, those are a petirtaan which is located at the side of eastern estuary (200 m below the Tangluk Temple) and a holy place made of natural rock (there is a relief of footprint) and a seat of horizontal rock which extends high up from the side of steeply slope (p= 2 m, l = 50 CM). Petirtaan of Tangluk Temple generally is sacred and functioned as a place to ask holy water (*tirtha*) for ceremonies (mesangih, ngeresi gana,nagluk merana, and other yadnya ceremonies) as a place/source to ask salvation and welfare (lucky); based on the information from pemangku (priest) of Tangluk Temple, the meditation site (approximately 100 m below Tangluk Temple) is oftenly functioned to be the place to *nunas kesidian* (ask for divine power) of medicinal treatment for shaman (balian) and *nunas kepradnyanan* (ask for intelligent) for *pedanda* (highest priest of Hindu), or aske for salvation and success. Many of community including community figures and sulinggih who go praying *(tangkil)* to this temple as well as doing exorcism ritual at the existing campuan in the southern (± 200 m). The sulinggih who once coming *(tangkil)* to this meditation site are from Payangan (Gianyar), Griya Bangli, Denpasar and Nusa Penida, as well as Government apparatures of Bali Povince, and other general community. Usually they come *(tangkil)* on certain days like fullmoon or other holy days.

c. Taman Beji Pucak Meru Temple at Banjar Kesianan Pangsan Village

Taman beji Pura Pucak Meru at East Kasianan (at the side of Ayung River with the altitude of 70 m above the river water surface). This temple is worshipped by 60 Households as the place for "beji" of Kahyangan Tiga Temple, and a place to get holy water (tirtha) for ceremonies at the village

d. Chinese Cemetery

Right on the dam plan which is located at the eastern of Ayung River (location is at Payangan Desa) there is Chinese cemetery site. This cemetery is owned by 72 Head of Households of community of Chinese blood, whom mostly live at Payangan, Denpasar, Tabanan and Gianyar (informant : Suwiadnyana/ Pemangku and Kelian Suka-Duka Chinese descent society (Ciladharma) Payangan , and Kt. Sudiana, 28/12/2005). According to them, the status of the cemetery land is an inheritage from their ancestors as a gift from the King of Payangan for their loyality to the palace. In this cemetery there are several holy places. Those are Prajapati temple, Toa Pekkong (God of the Earth), and the cemetery. The big ceremony related to the Chinese culture is Cingbing, every April 5th. It is a ceremony to worship the ancestors (Hyang Pitara), similar to Pagerwesi celebration for Chinese-Buddhists on Buleleng.

e. Tunnel (Aungan) and Other Holy Springs

At the dam's upstream, there are several tunnels (aungan) as culture's production which perhaps, it was purposed as a tunnel for subak water irrigation. Nowadays, these tunnels are not used anymore, due to the locations which are far from the river water surface (10-12 m); inspite of it, along the river side on Banjar Badung Melinggih Village, there are some sacred springs for the society.

5. Community's Response and Perception towards the Project

a. Respondent's Understanding towards the Project's Plan and Benefit

According to the questionnaires distribution to 130 respondents spread around the dam plan and downstream of dam shows the result as the table below:

Table 5.39 Respondents' Knowledge towards the Project Plan

No	Respondents' knowledge towards the project plan	Total	
		person	%
1	Understand	56	43,08
2	Do not understand	74	56,92
	Total	130	100

Source : Data is processed from the result of field survey 2005

Above data told that more respondents (56,92 %) have not understood about the project plan. Generally, they know the information from project socialization by Public Works Service Team or information from their friends/relatives.

However, when they answer the question about the project's benefit, 57,76 % of respondents have already understood, while the rest of 42,24 % declared that they have not understood.

b. Respondents' Response towards the Dam Plan

Table 5.40. Respondents' Response toward Ayung Dam Development

No	Response	Total	
		person	%
1	No worry	66	50,76
2	Objected/still worry	64	49,23
	Total	130	100

Source : Data is processed from the result of field survey 2005

Data above seems that more respondents worried or objected to the dam project. Those who were objected, generally are subak/farmer at the dam's downstream and rafting entrepreneurs. However, the latest socialization result by a team from Public Works Service of Bali Province with initiator and consultant in Pangsan Village and Melinggih Village which attended by the land owners, subak, head of villages, head of sub district, LPM, BPD and desa adat's personnels, eventually it seems that most of them are supporting the project plan with some notes and requirements given. This is might be caused by the socialization have been for several times (5 times) and the community have already undertood about the project.

The reasons for their worries:

(1) land that should be released
(2) Un-fair compensation value;
(3) Job losses after the project operation;
(4) Pollution during the construction phase; and
(5) For the rafting companies and subak at the downstream, they are really worries for there will be decrease of water discharge for their canoes or not adequate water for irrigation.

If the problems can be solved or there are definitive guarantee towards the water stability for those which flow to the downstream, 90.77 % of 130 respondents declared that they agree to the project, and only 9.23 % of respondents disagree or refuse the project still.

Among those reasons, the worry in losing their land becomes the main reason for them to objrected the project. Another reasons are: benefit of the project will taken by rich people only; downstream ricefield still kept limited of water.

c. The Respondents' Perception to the Compensation

Related to the respondents' perception to the compensation of impavted land, they declared their perception on the table below:

Table 5.41. Repondents' Perception to the Compensation

No	Compensation	Total	
		Person	%
1	Money	3	8,82
2	Resemble repalcing land	22	64,71
3	Free replacing land	1	2,94
4	Land owners' agreement	6	17,64
5	Disagree for any compensation	2	5,88
	Total	34	100

Source: Data is processed from the field survey 2005

Basec on the data in the table above, it seems that the indication of losing the land is still becoming the main reason. It is shown by the total of respondents (land owners and subak) which is the majority (64,77 %) chose that their impacted land will be replaced by the resemble land, and 17,64 % desired to get compensation appropriate to the agreement between the owners with the government/investor.

d. Respondents' Suggestion or Idea

Various idea or sugestion by the respondent is grouped as table bellow.

Table 5.42. Idea/Suggestion of the Respondent to the Project

	Suggestion/Idea
1	Waduk is not only purposed for water supply, but also to irrigate agriculture planting. Priority should be put on agriculture.
2	Sharing water uses with PDAM, please don't rising up the portion for PDAM
3	Project is required for potable water
4	The existence of petirtan/spring must always be in clean condition, and it needs an access road to holy spring to be constructed
5	There should be replacing land for the farmer whose land is impacted
6	Project should create job opportunities for local community
7	It needs to implement intensive socialization to the community
8	It will not eliminate the earning sources of farmer
9	Built a bridge for peoples crossing the river
10	Appropriate compensation to the impacted land/trees
11	It is exerted for there will not be any slides
12	Release tax for the impacted land
13	Free electricity for local community

Source : Data is processed from the field survey 2005

e. Community's Expectation

The latest socialization result Team of Bali Province on Melinggih and Pangsan Village (22nd, 28th December 2005) shows that basically, the community is not objected towards the dam project for potable water supply and hydraulic electricty power on Buangga and Pangsan, on condition that the local community will not get loss; Their expectations are:

- It is expected that there will not be any house or holy places condemnation for road widen into 7 m or more;

- The road construction (widen or asphalting) will not only for those passed by the project, but also the road's infrastructure which connect to other banjar. This is also purposed to avoid the traffic jam during the project.
- The impacted/inundated land or land for environmet and gardening affair must get appropriate compensation (agreement with the land owners), or replaced by land on the other place, and new certificates are made for them (so that the impacted land is purposed for dam environment will not be paid again by the farmer;
- If the project is working, the dam quality and its power must be concerned, in order to save it from broken down and disater;
- It needs more intensive socialization, especially with Br Buangga Getasan Village to make sure the project,and avoid the community's confusion;
- Environment's security on the construction or operational phase of the dam must be guaranteed. It needs to involve adat/pecalang;
- Niskala holy places should be concerned (Taman Beji Pucak Meru Temple- such as maintenance or renovation cost) and also contribution to desa adat or Kahyangan Tiga Temple;
- Befor the project activities are running, firstly, *pinunas* ceremony at the environment and its surrounding Temples and also *ngaturan pekelem* (mulang dasar) ceremony according to theSulinggih/Pedanda (Hindu's priests);
- Local workers recruitment (60 % in minimum) should be given priority according to the educational background and skills.;
- Scholarships to increase local Human resources;
- If it is dammed, the inundated area is inclined to get slides. It is also happening if the steepy slope riverbanks are inundated, obviously the monkeys (black and grey) in large number (hundreds) will go upper and disturb the agriculture. It needs conservation by planting fruit trees and suitable local/productive trees such as: mahoni, majegau, kepelan, suar, so that the monkeys will not disturb;
- It needs environment arrangement and green belt along the path on the inundation area so that it adds the aesthetic and ecologic value;
- A particular place for *nganyut sekah* ceremony (sequence of *ngaben* ceremony) is made for the traditional community around the dam.
- A bridge and connecting road between Petang (Pangsan, Buangga/Getasan) at the west of the river with Payangan (east of the river). It is really expected by the community to:
  *) Increase the economy of Getasan and Pangsan community, especially for agriculture producation marketing (coconut, durian, rambutan and others) to Payangan Market (the distance will become closer, 1 km in maximum, while to Petang Market becomes 4-5 km) 4-5 km);
  *) Inspite of it, it is for cultural requirements. Based on the community's faith of Buangga (west of the river), that they were coming from the Payangan Desa (east of the river). This relation is proved when piodalan ceremony at

Agung Temple on Payangan Desa is held, *petapakan* of Ida Bhatara (God) of Pura Dalem Buangga goes (*lunga*) to Payangan Desa. The usual route is quite far, that they have to pass Buangga to the south through Bongkasa, Sayan, and Payangan. (informant : Head of Village of Getasan , 22-12-2005).

5.4 Community's Health

One of the specific condition of studied area is forming of habitat, which is indirectly related to the river flowing condition differences. This condition is shown not only from the physic-chemical point of view or ground water as explained on the previous sub chapters, but also related to the socio-economic condition (especially earnings) and community's health.

Table 5.43 Numbers of Medical workers Based on Its Category in 2004

Subdistrict	General Practitioner	specialist/ Dentist	Midwife	Medical Worker	Traditional Midwife	Traditional Massage
Petang	5	1	12	16	-	7
Payangan	3	2	19	11	16	20
Total 2004	8	3	31	27	16	27
Total 2003	17	3	24	26	25	27

Source: Data is processed from Petang Subdistrict in Figure 2004 and Payangan Subdistrict 2004

Data from Petang Local Government Clinic shows that ISPA disease is a main disease for years. It shows that ISPA is on the top position, followed by skin disease and diarrhea. The density of traffic at the area may lead to high rate of accidents which is more than diarrhea position.

Based on the community's nutrition status of Health Service of Bali province, 2000, most of the community (80 %) is in good nutrition condition, while those who lack of nutrition is only of 1,6 %, and over nutrition of 7 %. The expected age is quite good, 70 years old.

Reminding the various communities on the cities in the study area, so that to get a whole description of community which can be divided into middle upper and middle lower society. While the middle lower society more often go to the Local Government Clinic, and in this monetary crisis, perhaps most of them will go to the healer which is legal in Bali.

The health facilities available on Petang Subdistrict including the study area are serving 27,328 persons (Year 2004) consist of 2 Local Government Clinics located on Petang and Pelaga Village. 5 assistant Local Government Clinic situated in Petang, Carangsari, Sulangai, Pelaga and Belok. There are two BKIA located on Petang Village and Pelaga Village. There are 5 practitioners at Petang Subdistrict, with Family Planning posts of 7 posts.

Table 5.44 The Numbers of Health Facilities Based on Its Category in 2004

Sub district	Health facility					
	Policlinic	Local Gvt Clinic	Assistant Local Gvt Clinic	BKIA	Practitioner	Family Planning Post
Petang	-	2	7	1	4	6
Payangan	-	1	7	2	11	-
Total 2004	-	3	14	3	15	6
Total 2003	-	3	12	3	16	7

Source: Data is processed from Petang Subdistrict in Figures 2004 and Payangan Subdistrict Statistic 2004

The number of household in Petang that have good WC for environment sanitation are 2,910 families but 1,253 others still use open area for defecate (for example river or back yard).

Health facility at Payangan Subdistrict is only one Local Government Clinic at Melinggih Village. While there are 7 assistant Local Government Clinic at Kelusa Village, Bukian, Puhu, Kerta, Buahan, Melinggih Kelod, and Buahan Kaja. There are 5 doctors at Payangan Subdistrict and two maternity hospitals.

CHAPTER VI

PREDICTION OF SIGNIFICANT AND IMPORTANT IMPACT

General

The plan of Ayung Dam Development on Buangga, Petang Sub district, badung regency includes dam development, quarry, Hydraulic Electricity Power and other facilities which are predicted to cause impact, both positive or negative impacts.

An approach implemented to predict the impact is Impact Identification Matrix. In this matrix, it is predicted that there is no impact on environment component due to the activities without make the impact category in detail. Impact Identification matrix is shown on Table 6.1. Then the activity impact prediction determined by predicting the magnitude of environment quality change on the beginning existing environment condition with the environment quality predicted to be occured due to Ayung Dam development project. The impact prediction is implemented in each activities, those are pre-construction, construction, and post-construction.

6.1. The Activity's Impact Prediction on Pre-Construction Phase

The activities which are conducted on the pre-construction phase include: socialization, survey and interview with the local society at the study area, governmental officers by the province, regency, subdistrict and village level and other stakeholders. Several prediction of significant and important impact are as followed:

1. Various community's attitude and perception

The location bordering activities through direct survey by the team, completed with erecting some poles rise such restlessness among the community, farmers and temple's worhippers (*penyungsung*) in particular. The sources are the possibility of either their land and some holy springs would be inundated by project. It is predicted that 36.92 % of local community are worried, so that this impact is categorized as important negative (-P).

The restlessness also occurs on the land procurement for dam and its facilities devleopment. It is because the community are worried about condemnation of community's residents and some holy places, and also Chinese cemetery due to the road widen as an access to reach the dam.

Table 6.1 Impact Identification Matrix of Ayung River Dam Development Plan, Buangga, Pangsan Village, Petang Subdistrict, Badung Rgency, Bali

No	Environment Component	Pre-Construction				Construction												Operational					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A.	**Geophysic-Chemical**																						
1	Climate																						
	- Micro climate							x		x								x	x		x		
	- Air quality					x	x			x		x	x	x	x	x	x						
	- Noise and vibration					x	x			x		x	x	x	x	x	x						
2	Physiography																						
	- Topography					x			x	x				x				x					
	- Geology stability									x				x				x					
	- Land physic-chemical					x	x			x	x		x	x				x			x		
3.	Space and aesthetic																						
	- Land use					x		x	x	x				x				x		x			
	- Aesthetic					x		x	x	x				x				x		x			
4.	Hydrology																						
	- Water potential											x		x				x	x		x		
	- Water quality					x		x		x		x		x				x	x	x	x		
	- Erosion & Sedimentation					x				x				x				x	x	x	x		
B	**Biology**																						
1	Terrestrial Flora					x			x	x			x	x	x			x	x				
2	Terrestrial Fauna					x			x	x			x	x	x			x	x	x	x		
3	Aquatic Flora and fauna									x								x	x	x	x		
C	**Socio-economic-cultural and Community's helath**																						
1	Community						x										x		x			x	x
2	Earning		x			x		x											x		x	x	x

3	Vacancies and Business Opportunity					x	x	x					x				x		x	x	x	x	x
4	Community's Income		x			x	x	x					x				x		x	x	x	x	x
5	Community's attitude and perception	x	x	x	x	x	x	x									x	x	x		x	x	x
6	Security and Orderliness	x	x	x	x	x	x	x									x		x			x	x
7	K_3					x	x	x	x	x		x	x	x	x	x	x	x	x		x		
8	Holy place/site/local value		x			x		x		x													
9	Community's health					x				x									x				
10	Transportation					x	x							x			x		x			x	

Explanation of Ayung River Dam Development Activity Plan

No Explanation

I. Pre-construction Phase

1) Determination of borders of activity plan location
2) Land for dam development and its facilities
3) Socialization of dam development plan
4) Erect the information board and announcement on printed media

II. Construction Phase

5) Access road construction
6) Mobilization of equipment and workers
7) Construction and operational of base camp
8) Land acquistition and land clearing
9) Cut and fill for cofferdam, main dam and spillway
10) Grouting
11) Stone and concrete construction for the dam
12) Material transportation in and out of the project
13) Quarry
14) Mechanical and electrical for the dam
15) Development of Hydraulic Electricity Power scheme
16) Demobilization of equipment and workers

III. Operational Phase

17) plugging and impounding
18) Dam operational for irrigation, water supply and electricity
19) Maintenance of dam functions and it facilities
20) Conservation of the protection forest's functions and dam surroundings for ecologic, drainage, ergonomy and aesthetic functions.
21) Tourism/recreation facility development
22) Dam and visitor security and safety

The worshippers (*penyungsung*) of Tangluk Temple whose agriculture land/*laba pura* (rice field and dry field) located on Banjar badung, Payangan Desa, Susut-Buahan, and Buangga – Getasan Village are also worried. Generally they are worried about losing their agriculture land, and plan of land releasing will not be transparant and adverse the farmers. This impact towards the community's attitude and perception is actegorized as important negative (-P).

The project socialization is done through erecting information board at the project area, and announcement on some local newspaper as well as direct information by the Team (iniator, provincial Public Works Service, and Consultant) to the society around the project. This socialization rises important negative impact (- P) on most of the community's(> 50 %) attitudes and perception aspect, especially to the rafting company both those which are located at the upstream of dam (Rafting Bali Discovery, Bali Fantasi and Bali Holiday) or the downstream (Sobek Rafting,and so on), hotel or villa owners (Ubud Hanging Garden, and Villa Nandini located on Susut) and farmers/ subak downstream (Kedewatan, Sengempel, Praupan, and Ongan).

Table 6.2 The Impact of Community's Attitude and Perception on Pre-Construction Phase

No	Determining factor of important impact	Kegiatan		
		Project Plan Location Bordering	**Land Procurement**	**Project Socialization**
1	The impacted community	> 50 % people in the area impacted	> 50 % people in the area impacted	> 50 % people in the area impacted
2	The impact spread area	Melinggih, Buahan villages, Payangan Sub-district, and Pangsan Village, and Banjar Buanga Getasan Village Petang Subdistrict.	Melinggih, Buahan villages, Payangan Sub-district, and Pangsan Village, and Banjar Buanga Getasan Village Petang Subdistrict	Melinggih, Buahan villages, Payangan Sub-district, and Pangsan Village, and Banjar Buanga Getasan Village Petang Subdistrict
3	Impact's intensity and term of impact	The impact is temporarry and low intensity	The impact is temporarry and moderate intensity	The impact is temporarry and moderate intensity
4	Other environment component	Community's security and orderliness	Community's security and orderliness	Community's security and orderliness
5	Impact's cummulative characteristic	Not cummulative	cummulative	Not cummulative
6	Reversible or irreversible	reversible	reversible	reversible
	Impact's weight	Important negative (-P)	Important negative (-P)	Important negative (-P)

2. Holy Area and Places

The land procurement activities for dam and its facilities development affect some holy areas and places. It is due to that on dam's upstream (300 m to the north) there are land owned (*druwen*) by the village or land (*laba*) of Tangluk Temple (14 ha as dry field and forest) and some holy springs which are oftenly used for rituals related to ceremonies (*piodalan*) at

Tangluk Temple and other traditional rituals on Susut and Payangan Desa Village. It is predicted that > 50 % of the worshippers (*pemangksan/penyungsung*) of the temple are having restlessness and objections, therefore the impact is categorized as important negative (- P). The explanation of impact on holy area and places is shown on table 6.3.

Table 6.3. The Impact of Land Procurement towards the Holy Areas and Places

No	Determining factor of important impact	Activity
		Land procurement for dam
1	The impacted community	> 50 % of the worshippers (*penyungsung and pengemong*) are impacted
2	Impact Spread Area	Melinggih Village, and Susut-Buahan, Payangan Subdistrict
3	Intensity and term of impact	Impact occurs in long term and high intensity
4	Other impacted environment component	Community's security and orderliness
5	Impact's cummulative characteristic	cummulative
6	Reversible or irreversible	The condition will get back to normal after having problem solving efforts and information from PHDI (religious institution for Hindu) and the priests (*sulinggih/pemangku/pedanda*)
	Impact weight	Important negative (- P)

3. Community's Security and Orderliness

Community's security and orderliness disturbances such as demonstration, violence or expulsion acts to the team members might appear on the location bordering activities, land procurement for dam and its facilities, and socialization.

Those negative impacts above are categorized as unimportant negative(-TP), due to it has been understood by the society and socializations have been done for some times (5 times) and get the positive responses from the local community.

The impact of community's security and orderliness on land procurement activities are categorized as important negative (-P) due to > 50 % of the community are impacted. The impact of community's security and orderliness is also due to the unsatisfaction of the community towards the land releasing and price or compensation process on community's land.