Table 6.4 The Impact of Activity on Pre-Construction Phase toward Community's Security and Orderliness

No	Determining factor of important impact	Activity		
		Project Location Borderings	**Land procurement for dam**	**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. Carangsari Village, and farmers at dam's downstream
3	Intensity and term of impact	Light and temporarry	Moderate and temporarry	Low and temporarry
4	The impacted environment component	Community's security and orderliness	Community's security and orderliness	Community's security and orderliness
5	Impact's cummulative characteristic	Not cumulative	Cumulative	Not cumulative
6	Reversible or irreversible	The condition gets back to normal	The condition will turn to normal after having information and proper compensation for land release	The condition will turn to normal after having information and guarantee from the initiator
Impact weight		Important negative (-P)	Important negative (-P)	Important negative (-P)

6.2. The Prediction of Activiti's Impact on Construction Phase

1. Micro climate disturbance

The impact on micro climate condition is predicted coming from the land clearing and stripping activities. The impact flow pattern is:

The aqcuisition, clearing and stripping activities include tree's canopy, bushes cutting and clearing on the location of main street and building, and cut and fill activities. When the activities are persisted, there will be change on solar radiation receiving on earth surface, wind movement, earth surface heating, atmosphere and vapouring. Increase of land and air temperature as well as the wind flow at the project site will cause increase of vapouring (dry season). By the plan of organizing the protection site and dam surroundings, it is predicted that the impact will not be any longer persisted, small intensity and non significant, it is also

categorized as the impact which can be easily recovered, therefore this impact is unimportant negative (-TP).

Table 6.5 Determining the important impact's weight of micro climate disturbance on construction phase

No	Determining factor of important impact	Land stripping, clearing and acquisition activities
1.	The numbers of impacted community	It is predicted that the micro climate disturbance will not give much impact to the community (non significant)
2.	Impact spread area	The impacts are spread locally, only at the land clearing site, due to the area is not big (small ratio)
3.	Term of the impact	Only on constructio phase, it is easy to restore, simply through reforestation
4.	Impact intensity	Small and not principal (very large supporting area)
5.	Other impacted environment component	None
6.	Impact's cummulative	Non cummulative
7.	Reversible or irreversible impact	Returned, through forest, environment and landscape structuring, this impact is able to be restored immediately
Impact Criteria		**Unimportant negative (-TP)**

2. Degradation of Air Quality

On the construction phase, the activities which are able to causes impact to the air quality are: access road construction, equipment and material mobilization, land clearing and acquisition, cut and pile on cofferdam, main dam and spillway; material transportation in and out of the project, quarry construction, equipment and workers demobilization.
The resultants of above activities, especially mobilization and demobilization of material and heavy equipments, lead to increase dust emission (NO_2, SO_2, HC and CO) to the atmosphere. This impact will occurs along the routes to and from the project site. It is predicted that the impacted society are those who live close to the road of before Banjar Buangga and Melinggih Village. (Table 6.6).

On this activities, the occured impacts will give effect to the community around the project as well as the construction workers, for the impact spread area around the road with dust concentration of between 150 up to 200 $\mu g/m^3$ and persisted during land clearing and acquisition activities. Other impacted environment components are flora and fauna around the location. The impact is not cummulative and able to reversiblenaturally, or returned as the activities have been finished, so that the impact is unimportant negative (-TP).

3. Increase of Noise and Vibration

The activit impact to the noise on construction phase begins since the material, equipment and workers activities; land clearing, stripping and acquisition; cofferdam, weir and spillway cut and fillt; material transportation to and out from the project; quarry construction, dam and hydraulic electricity power and material, equipment and workers demobilization.

Activities of equipment and material mobility, transportation of the material to and from the project, and demobilization are predicted to produce noise and vibration in the same format, which come from the increase of transportation flow or machine source, moreover usage of

heavy and big vehicle/equipment. The prediction of community which will be impacted is the community along the road to and from the project and the workers at the project area. The significant spread areas are the society along the entrance (Buangga and Payangan) and the location with noise intensity between 60 dB up to 90 dB and persisted during the activities. Other impacted environment component is the fauna around the location. This impact is not cummulative and can be reversible naturally, or it will reversible since the activities have been finished, therefore the impact is unimportant negative (-TP).

On land clearing and acquisition, cut and fill, also civil construction for the dam, and hydo-electric power can cause noise. The noise is coming from the sound of heavy equipments, senzo and contrsuction works which are fluctuated between 55 dB up to 90 dB(A). Noise level is depend on the equipment type such as: Buldozer (82 dBA), Timber cutter machine (90 dBA), hardening tool (85 dBA), *mesin molen* (55 dBA) and Truck (78 dBA).

This impact happens on the sub activity of construction phase and it is predicted that the impacted workers are ± 250 workers. This impact is not cummulative and local spread area at 55 dB up to 92 dB intensity and persisted during the activities. Other impacted environment component is the fauna around the location and this impact is cummulative and will be returned as the activities have been finished. There fore the noise impact due to the increase of noise intensity can be categorized as unimportant negative impact (-TP).

It is predicted that the material, equipment and workers demobilization's noise intensity is the same with mobilization activity, between 60 dBA up to 90 dBA and it is predicted that the impacted workers have become lesser and term of contact to this impact is only on the day, therefore it is categorized as unimportant negative impact (-TP).

The resultants of significant and important impact of the noise and vibration component in construction phase is shown on Table 6.7.

4. Change of topography

Change of topography on the construction phase caused by several activities such as access road construction, cut and piles on cofferdam, weir and spillway, and quarry development.

The activity of access road construction for 7.600 m and width of 5-7 m, located at the west of the dam for 3.400 m and east of dam for 4,200 m by using heavy equipment will cause change of topography due to cut and fill activities. Inspite of causing change of topography (landscape), it is also able to cause change of type of soil and change on physic and chemical characteristic of soil. The impact spread area is predicted only 3,8 ha (entire road access). This impact will be only on construction phase, with the intensity of area condition is wavy to flat. Other environment components which will be impacted are vegetation, land use, aesthethic and water quality. These are cummulative and cannot naturally be reversible. Due to 80 % of the access road has been existing, it needs to be improved only, so that this activity has unimportant negative impact (-TP).

Cut and fill activity on cofferdam, main dam and spillway are using heavy machines. A tunnel is constructed for cofferdam, and the excavated materials are piled on the main dam.

Table 6.6. Determining of important impact's weight from the plan of access road construction; equipment and workers mobilization; land clearing and harden; cut and cofferdam, dam and spillway fillt; material transportation to and from the project location; quarry, dam and hydraulic electricity power construction; material and workers demobilization toward the air quality.

No	Determining factor of important impact	Construction Phase						
		Access road construction	**Equipment and workers mobilization**	**Land clearing, stripping, and acquistion**	**Cut and pile**	**Material transportation to and from the project**	**Quarry, dam, and hydraulic electricty power development**	**Material, equipment and workers demobilization**
1.	The impacted community	Few, only at the edge of the road (<10%)	Few, only at the edge of the road (<20%)	Quite a lot, but < 30 %	Quite a lot, especially the workers, but < 30 %	Quite a lot and pekerja, the workers, but < 30 %	Quite a lot and pekerja, the workers, but < 30 %	Quite a lot, but < 30 %
2.	Impact spread area	Around the road and project (narrow)	Around the road and project (narrow)	Area > 6 ha, especially on the opened area	Area > 6 ha, especially on the opened area	At and around the project location	At and around the project location	At and the road around the project location, community on Buangga and Melinggih Village
3.	Impact intensity and term of impact	Small, no basic change and in short term	Small, no basic change and in short term	Small because there will be delussion by the environment and in short term	Small because there will be delussion by the environment and in short term	Small because there will be delussion and in short term	Quite high because there will be delussion and in short term	Small and in short term
4.	Other impacted environment component	Flora and fauna, comfort and aesthetic	Flora and fauna, comfort and aesthetic	Flora and fauna, micro climate especially the air temperature	Terrestrial flora and fauna	Terrestrial flora and fauna	Terrestrial flora and fauna	Terrestrial flora and fauna
5.	Impact's cummulative characteristic	Non cummulative	Non cummulative	Non cummulative	Non cummulative	Non cummulative	Non cummulative	Non cummulative
6.	The reversible or irreversible of an impact	Able to be reversible	Able to be reversible	Able to be reversible	Able to be reversible	Able to be reversible	Able to be reversible	Able to be reversible
Impact criteria		Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)

Table 6.7 Determining of important impact's weight of equipment and material mobility activity, land clearing and acquisition, mechanic civil construction and material, equipment and workers demobilization on construction phase towards the noise and vibration

No	Determinig factor of important impact	Construction Phase					
		Equipment and material mobilization	**Land clearing and acquisition**	**cofferdam, bendung and spillway Cut and fillt**	**Dam, quarry, hydraulic electricity power construction**	**Mechanical and electrical**	**Equipment and material demobilization**
1.	The impacted community	Community along the entrance road to the project and construction workers (< 20 %)	Community around the project and construction workers (10 %)	Community around the project location and dominantly construction workers	Community around and construction workers	Community around the project and mechanic and electric workers	Community along the entrance road to the project location and construction workers (< 20 %)
2.	Impact spread area	Along the road especially entrance to the project	Project site and surrounds it	Project site and surrounds it	Project site and surrounds it	Project site and surrounds it	Exit road of the project (project's nearest route)
3.	Impact intensity and term of impact	The produced noise level of between 60-90 dB(A) and during the activities of equipment and material mobility	The produced noise level of between 55-85 dB(A) and during the land clearing and acquisition activities	The produced noise level of between 60-85 dB(A) and during the civil construction activity	The produced intensity of between 55-90 dB(A) and during the activities	The produced noise level of between 60 dB and activities' period	The produced noise level 60-90 dB(A) and during the mobilization of equipemnts and materials
4.	Other impacted environment component	The fauna around and toursim component around the location	The fauna around and toursim component around the location	The fauna around and toursim component around the location	The fauna around and toursim component around the location	The fauna around and toursim component around the location	The fauna around and toursim component around the location
5.	Impact's cummulative characteristic	Non cummulative	Non cummulative	Non cummulative	Non cummulative	Non cummulative	Non cummulative
6.	The reversible or irreversibleof an impact	Reversible after the activities have finished	Reversible after the activities have finished	Reversible after the activities have finished	Reversible after the activities have finished	Reversibleafter the activities have finished	Reversible after the activities have finished
Impact criteria and weight		Important negative (-TP)	Important negative (-TP)	Important negative (-TP)	Important negative (-TP)	Important negative (-TP)	Important negative (-TP)

The dam with the height of 100,10 m, length of 221,25 m and wide of peak of 6 m will change the existing landscape at the project site. So that the cofferdam will changes the topographic and land stability at the project site. The spread impact is predicted only at the cut area, tunnel construction, dam site and excavated materials piles. These impacts will only occurs on the construction phase, with quite significant of topography and land stability changes, from stable to rather unstable. Others impacted environment components are geology, vegetation, land use, aesthetic and water quality. These are cummulative and irreversible. Hence, this activity has important negative impact (-P).

The quarry development includes material cut at and out of river body will cause topographical changes. The predicted spread area is 73,17 ha (whole dam inundation). This impact will occur on the construction phase only, with the intensity from wavy topography to flat. The other impacted environment components are land stability, geology, vegetation, land use, aesthetic, and water quality. These are cummulative and immediately turn to normal after the grouting for dam storage is over. Hence, this activity has unimportant negative impact (-TP).

5. Decreasing of geology stability

The decreasing of geology stability is predicted due to the cut and fill activities, and quarry development. Cut and fill activities are done on cofferdam, main dam and spillway, while quarry development is done at the excavation at and outside of river body.

Table 6.8 Activity's Impact toward Change of Topography on Construction Phase

No	Determining factor of important impact	Activity		
		Access road construction	**Cut and pile**	**Quarry development**
1	Total of impacted community	-	-	-
2	Impact spread area	3,8 ha (all of acces road)	At the tunnel cut area, dam site, and fillt area	73,17 ha (entire dam inundation).
3	Term of impact	During construction	During construction	During construction
4	Impact's intensity	From wavy topography to the flat one	Significant topographic changes from stable to rather unstable	From wavy topography to the flat one
5	Other impacted environment component	vegetation, land use, aesthetic and water quality.	vegetation, land use, aesthetic and water quality.	vegetation, land use, aesthetic and water quality.
6	Impact's cummulative characteristic	Non cummulative	Non cummulative	Non cummulative
7	Reversible or ireversible of impact	irreversible	irreversible	irreversible
Impact criteria		Unimportant negative (- TP)	Important negative (-P)	Unimportant negative (-TP)

Cut and fill activities on cofferdam, main dam and spillway are using heavy equipments. Cofferdam is made by construct a tunnel, and the excavated materials are piled on the main dam. Spillway is constructed through cut, so that these activities are predicted to cause decrease of geology stability. The impact spread area is at the cut location, tunnel construction, dam site and excavated material pile.

This will only occur on the construction phase, with the intensity of the decrease of geology stability from the stable to the rather unstable. The other impacted environment components are land stability, vegetation, land use, aesthetic and water quality. This impact is not cummulative and will be reversible on the dam's operational. Hence, this impact is categorized as unimportant negative impact (-TP).

The quarry development with the cut on and outside the riverbody is also predicted will cause decrease of geology stability. It will lead to the possibilityof slide. The impact-spread area is predicted of 73,17 ha (entire dam inundtaions). This impact will only on construction phase, with the intensity of the stable geology to rather unstable one. The other impacted environment components are land stability, vegetation, land use, aesthetica, and water quality. This impact is cummulative and able to reversibleimmediately once the dam's operational over. Hence this activity has unimportant negative impact (-TP).

Table 6.9. Activity's impact toward decrease of geology stability on the construction phase

No	Determining factor of important impact	Activity	
		Cut and pile	Quarry development
1	Total of impacted community	-	-
2	Impact spread area	Only at the cut site, tunnel construction and location of dam development and excavated material filled location	73,17 ha (entire dam inundation).
3	Term of impact	During cut and fillt	During quarry development
4	Impact's intensity	From stable geology to rather unstable	From stable geology to rather unstable
5	Other impacted environment component	Land stability, vegetation, land use, aesthetic, and water quality	Land stability, vegetation, land use, aesthetic and water quality
6	Impact's cummulative characteristic	Non cummulative	Non cummulative
7	Reversibleor irreversible of an impact	reversible	reversible
	Impact criteria	Unimportant negative (-TP)	Unimportant negative (-TP)

6. Deteorioration of Land's Physical and Chemical Characteristics

The impact on construction phase is change of soil's phyical and chemical characteristic at the project location. This impact is caused by several activities such as access road construction, mobilization of equipments and workers, land clearing and stripping, grouting at the quarry, material transportation to and from the project, and quarry development.

The access road construction activity for 7.600 m and width of 5 m, located at the west of the dam for 3.400 and east of the dam for 4.200 m is using heavy equipment. It is predicted that it will cause land structure damage, land's consistency, land's pore space, soil airasion, land's bulk density and land's permeality. This damage of land's characteristic caused by road's hardening process using wales, which is able to give pressure to the land's surface. As the result, it is able to decrease the rain's infiltration and increase of surface flow, so that the erossion is increasing. The impact spread area is predicted of 3,8 ha (entire access road

locations). This impact will occur on the construction phase only, with the intensity from a good land's physical characteristics to the bad one. The other impacted environment components are reserve ground water, vegetation, land use, aesthetic and water quality. This impact is cummulative and cannot reversible naturally. Therefore this activity is important negative (-P).

The mobilization activity of equipment and workers can cause change of land's physical characteristics. The equipments which will be mobilized are the land stripping and acquisition's equipments and dam development's equipments. Those equipments are 8 units of buldozers, 8 units escavator, 10 units motor grader, 4 units loader, 4 units double roller (tandem roller), 4 units vibro roller, 4 units driving machine, 35 dump trucks, 10 units compressors, 4 units tire rollers and 35 water tanks. The transportation of these heavy equipments will give pressure to the land's surface, which is able to cause damage to the land's physical characteristics such as land structure, land's consistency, land's pore space, soil airasion, land's bulk density and land's permeality. The damage on land's physical characteristic will cause the land's infiltration, so that the reserved ground water will decrease and increase of *run off*. It will have negative impact to the increase of land's erossion which is able to lead to river water pollution. The impact spreas area at thoroughout the access road construction location is predicted of 3,8 ha. This impact will only occur on construction phase, with the intensity from a good land physical condition to the bad one. The other impacted environment components are reserved ground water, river water quality and air quality. This impact is not cummulative and reversible in such long term. Hence, it has important negative impact (- P).

The land clearing and stripping activities include trees/vegetation cutting, as well as cut and fill. The land clearing and stripping is using buldozer, excavator and louder. Land stripping and clearing makes the lands open, so that the land will get erosion easily. This impact will lead to the loss of the top layer of land which has good physical and chemical characteristics (fertile) due to erossion and vaporing of nutrition especially nitrogen. The impact spread area is predicted of 73,17 ha (entire dam inundations). It will occur only on construction phase, with the intensity from a good physic and chemical characteristic of land into the bad one, in other words from the moderate land's fertility level into the low one. The other impacted environment components are vegetation, land use, aesthetic, and river water quality. This impact is cummulative and able to reversible naturally. Hence, this actvity causes unimportant negative impact (-TP).

Grouting at the quarry is a rehabilitation of dam's base activity. Principally, this activity is done to plug the land's pores so that the inundation water will not easily lost or absorped. The used materials are limestone as the hardening base, and then above it is concrete (sand and cement). This activity leads to change of land's physical and chemical characteristics. The adding of limestones inspite of able to plug the land's pores, it is also able to change the land's reaction. The impact spread area is predicted of 73,17 ha (entir dam's inundations). This impact will be on a unit of activity with the intensity of rather netral land reaction to alkaline. The impacted environment components are vegetation, land use, aesthetics and river water quality. Therefore this activity can cause important negative (-P) impact to the change of land physical and chemical characteristics.

The material transportation to and from the project can cause the alteration of land's physical characteristics. The materials which are transported are required for dam development

activities (project) such as cements, irons, limestones, sand, etc. The materials which are transported from the project are those which are useless for the project such as cement, steel, limes stone, sand ect. This material transportation will give pressure to the land's physical characteristics such as land structure, land consistency, land's pores space, soil airasion, land's Bulk Density and land permeality. The damage to the land's physical characteristic leads to decrease of land infiltration power, so that reserved ground water will also decrease and the increase of run off. It will have adverse impact to the possibility of slide and land's erosion which might lead to river water pollution. It is predicted that the impact spread area is at the whole locations of the vehicle traffic. This impact will only be on construction phase, with the intensity from good physical land characteristics to the bad one. The other impacted environment components are reserved ground water, community's health, transportation, and air quality. This impact is not cummulative and able to naturally reversible in a rather long term. Hence this impact has important negative (- P).

The quarry development includes material cut at and outside the river body. The activity of quarry development will cause damage to the land physical characteristic, such as land stability, damage on land structure, land consistency, land's pores space and land permeality. The damage of of this land physical characteristic causes the increase of surface water loss because it runs to the bottom. The impact spread area is of 73,17 ha (entire dam's inundation). This impact will only be on the construction phase, from the good to the bad one (high phorocity). The other impacted environment components are land stability, geology stability, vegetation, land use, aesthetic and water quality. This impact is not cummulative and able to be reversible immediately once the grouting on the quarry is over. Hence this activity has the unimportant negative impact (- TP).

Table 6.10 The activity's impact to the change of physical and chemical land characteristic on construction phase

No	Determining factor of important impact	Access road construction	Equipment and workers mobilization	Land clearing and stripping	grouting	Material transportation	quarry Development
1	The impacted community	-	-	-	-	-	-
2	Impact spread area	3,8 ha, entire access road locations	The access road track of 3,8 ha.	73,17 ha (entire dam inundation locations).	73,17 ha (entire dam inundation locations)	Location of vehicle traffic	73,17 ha, entire dam inundations
3	Term of impact	During construction	During construction	During construction	On construction phase	During construction	During construction
	Impact intensity	From good land physical characteristic to bad land physical characteristic	From good land physical characteristic to bad land physical characteristic	Good land physical and chemical characteristic to the bad one and from the moderate fertility level to the low one	Good land physical and chemical characteristic to the bad one or from netral reaction level to alkaline	From good land physical characteristic to bad land physical characteristic	From good land physical characteristic to bad land physical characteristic (high phorocity).
4	The other impacted environment components	Reserved ground water, vegetation, land use, aesthetics and water quality	Reserved ground water, river water quality and air quality	Vegetation, land use, aesthetics and river water quality	Vegetation, land use, aesthetics and river water quality	Reserved ground water, health, transpotation, and air quality	Land stability, geology, vegetation, land use, aesthetic and water quality
5	Impact's cummulative characteristics	Not cummulative	Not cummulative	Not cummulative	Not cummulative	Not cummulative	Not cummulative
6	Reversible or irreversible of an impact	Irreversible	Reversible	Naturally reversible	Irreversible	Reversible	Reversible
Impact's criteria		Important negative (- P)	Important negative (-P)	Unimportant negative (-TP)	Important negative (- P)	Important negative (- P)	Unimportant negative (-TP)

7. Water Quality Deterioration

On the construction phase, especially on the land clearing, stripping and land acquisition, cut and fillt up, dam construction, quarry development and hydarulic electricity power development are predicted causing impact as Ayung River water quality deterioration. This due to the work of all activities there will be erosion, flushing, scatters and runoff, particularly on the rainy season. On the rainy season, the activity plan area and its upstream are categorized as a very wet area, it means that the extremely high rainfall will give impact such as very huge surface flow and river flow dan aliran sungai, hence the deteriration of Ayung River water qaulity will be very significant. The pollution materials which are predicted to be dominant are mud hole, and a bit of construction materials scatter both organic or unorganic or even metal which if it is mixed with the water will also surface water quality deteorioration.

According to the magnitude of erosion level at the area, so that the deteorioration of Ayung River water quality will also be categorized as the significant one due to the erosion which will be on the river's estuary. Apart from that, its impact has a cummulative characteristic, each of the activity is able to accumulate the impacts therefore the impact magnitude on the main river becomes higher, the period of impact is during the construction project, it is relatively a long time (75 % from construction phase). The impact of Ayung River water quality deteorioration is continuous and causing multiflier effect on the other environment component. The detemining of impact's weight and criteria is shown on the Table 6.11.

The secondary and tertiary impact of Ayung River water quality deteorioration are as followed:

- The life of aquatic biota on the river: deterioration of water quality will disturb the diurnal behaviour such as ruaya, spawning, respiration disturbance, sight disturbance, as well as benthic habitat damage
- Decrease of environment aesthetics value which enjoyed by the rafting tourists, becasue of the water turbidity so that it is able to minimize the tourism interests, eventually minimize the income.
- Deterioration of Ayung River water quality also affects some WTPs below, such as WTP peraupan and WTP Waribang.
- The high level of mud hole will give impact to the environment quality at Ayung River's estuary on Padang Galak so that it is able to deteriorate the water quality on that very beach.

Table 6.11 Determining of impact weight of Ayung River Water Quality deterioration from the construction activities of Ayung River Dam Development Plan

No	Determining factor of important Impact	Activity				
		Land clearing, stripping and hardening	**Cut and fill up**	**Construction of dam and spillway and other facilities**	**Quarry development**	**Hydraulic electricity power installation development**
1.	The impacted community	The impacted local community < 20 %	The impacted community > 50 %	The impacted community < 10 %	The impacted community > 50 %	The impacted community< 10 %
2.	The impact spread area	The impact spread area is very large, up to the estuary	The impact spread area is very large, up to the estuary	The impact spread area is local only	The impact spread area is very large, reach several km to the downstream	The impact spread area is local only
3.	Impact's intensity and term of impact	Its intensity is very relative, it will be high if the land clearing is done on the rainy season and it will not take such long time	Its intensity is very relative, it will be high if the land clearing is done on the rainy season and it will not take such long time	The impact's intensity is smal due to the construction's security is good and only on a unit of activity	The impact intensity is significant due to the quarry development and constructionand wide and persist on several months.	The impact intensity is small because the hydraulic electricity power construction is relatively not touching thewater and persist only on one activity
4.	The other impacted environment components	Aquatic biota, rafting business, tourists and WTP	Aquatic biota, rafting business, tourists and WTP	The aquatic biota next to construction actvity's downstream (max. 500 m)	Aquatic biota, rafting business, tourists and WTP	The aquatic biota next to construction actvity's downstream (max. 300 m)
5.	Impact's cummulative character	Cummulative	Cummulative	Not cummulative	Cummulative	Not cummulative
6.	Reversible or irreversible of an impact	Able to be reversible but it is continuous	Able to be reversible but it is continuous	Able to be reversible	Able to be reversible but it is continuous	Able to be reversible
Impact's weight and criteria		-P (important negative)	-P (important negative)	- TP (unimportant)	-P (important negative)	- TP (unimportant)

8. Changes of Land use and Aesthetics

Changes of land use and aesthetics due to the access road construction, land clearing and stripping, cut and fillt up activities and quarry development.

The access road construction for 7.600 m with width of 5 m, which is located at the west of the dam for 3.400 m and the east of the dam for 4.200 m by using heavy equipments, will be done by trees cutting. This activity will convert the existing land use and environment aesthetic. The impact spread area is predicted of 3,8 ha (entire access road locations). This impact will only on construction phase, with the intensity of plantation land use into access road. The other impacted environment components are reserved ground water and water quality. This impact is not cummulative and naturally reversible or with human's interference such as reforestation of fertilization. Therefore this activity has unimportant negative impact (-TP).

The land clearing and stripping include vegetation/trees cutting, and cut and fill. Clearing and stripping activities are using buldozer, excavator and louder. It leads to lands open, so that the existing land use and aesthetics will be basically changed. The impact spread area is predicted of 73,17 ha (entire dam's inundation locations) and will be continuously persisted during the construction phase, with the intensity from a natural land use to an open land. The other impacted environment components are land physical characteristic, topography, biology (terrestrial and aquatic) and river water quality. This impact is not cumulative and naturally reversible, or immediately reversible if it is restored through revegetation. Hence this activity is predicted to cause important negative impact (-P) to the land use.

The cut and fill activities on cofferdam, main dam and spillway are implemented by using heavy equipements. Cofferdam is made by constructing such tunnel, the excavated materials are accumulated on the main dam. Spillway is made through cut, so that all of these activities are predicted to cause change of land use and aesthetic. The impact spread area is predicted only on the cut site, tunnel construction, dam development location and excavated materials filling location. This impact will be only on construction phase only, with the intensity of change of natural land use and aesthetics into unnatural ones. The other impacted environment components are land stability and water quality. This impact is cummulative and naturally reversible. Therefore this activity has an important negative impact (-P).

The quarry development includes material cut on and outside of the river body. This quarry development activity will cause an impact to the change of land use and natural aesthetic. The impact spread area is predicted of 73,17 ha (entire dam's inundation locations). This impact will only be on construction phase, with the intensity of change of land use and natural aesthetics into a damaged land use and aesthetics. The other impacted environment components are land stability, geology stability, and river water quality. This activity is cummulative and immediately returns once the quarry development is over. Therefore the activity has important negative impact (- P).

Table 6.12 The activity's impact towards the land physical and chemical characteristic on the construction phase

No	Determining factor of important impact	Construction activity			
		Access road construction	Land clearing an stripping	Cut and fillt up	Quarry development
1	The impacted community	-	-	-	-
2	The impact spread area	It is predicted of 3,8 ha (entire access road locations	It is predicted of 73,17 ha (entire dam's inundation)	At the cut site, tunnel construction, dam development and excavated matrial fillt up	It is predicted of 73,17 ha (entire dam inundation)
3	Term of impact	During construction	During construction	During construction	During construction
	Impact intensity	Change of natural land use and aesthetics into damaged land use and aesthetics	Change of natural land use and aesthetics into damaged land use and aesthetics	Change of natural land use and aesthetics into damaged land use and aesthetics	Change of natural land use and aesthetics into damaged land use and aesthetics
4	The other impacted environment components	Reserved ground water, and water quality.	Reserved ground water, and water quality	Land stability, geology stability, river water quality	Land stability, geology stability, river water quality
5	Impact's cummulative characteristics	Not cummulative	Not cummulative	Not cummulative	Not cummulative
6	Reversible or irreversible	reversible	Naturally reversible	reversible	reversible
	Impact's criteria	- TP	- P	-P	- P

9. Erosion and Sedimentation

Sort of activities which cause erosion and sedimentation on construction phase are: access road construction, land clearing and stripping, cut and fill, and quarry development.

Access road construction for 7.600 m with the width of 5 m, located at the west of dam for 3.400 m and at the east for 4.200 m by using heavy equipments can changes land's characteristics such as land's structure, land's consistency, land's pores space, soil airasion, land Bulk Density and land permeality. The damage of land's characteristics due to the road hardening using wales, which is able to give pressure to the land surface. As the consequences are decrease of land's pores space and land airasi, as well as increase of land Bulk Density. It can lead to the decrease of rain infiltration and run off, so that the erosion and sedimentation will increase. Despite it, on the erosion area (3,8 ha), there will be loss of good land layer and nutrition for plant's growth. Outside of it, it will lead to such mud hole and silting up of the river as it is on Ayung River and rice field's irrigation channel. The impact spread is of 3,8 ha (entire locations of access road) and among the river on the dam's

downstream. This impact will be only on construction phase, with the intensity of from medium level to serious one and from small into significant sedimentation. The other impacted environment components are reserved ground water, vegetation, land use, aesthetics and water quality. This impact is cummu-lative and reversible naturally. Hence, this impact is unimportant negative (-TP).

The land clearing and stripping include vegetation cutting and cut and fill. The activities of clearing and stripping are using buldozer, excavator and louder. This activity leads to an open area, so that the land at the activity location is easily got erosion, and will be sedimentated at its lower land on the downstream. This erosion impact can cause the loss of top layer which has very good physics and chemical characteristics (fertile) and the vapour of nutrition, especially nitrogen. The impact spread area is predicted of 73,17 ha (all of the dam's inundations) and along Ayung River at the downstream of Dam in form of incerase of mud hole and sedimentation. This is predicted to persist during the construction phase, with the intensity from the medium intensity into the serious one. The other impacted environment components are vegetation, land use, aesthetics and river water quality. This impact is not cummulative and reversible. It is categorized as important negative (-P) toward the increase of erosion and sedimentation.

The activities of cut and fill on cofferdam, main dam and spillway are implemented by using heavy equipments. Cofferdam is made by constructing tunnel, and the excavated materials are piled on the main dam. The cut of dam's fondation is 3,9 m deep, length of 221,25 m and width of dam's peak is of 6 m. This activity is potential to cause erosion on the project location and sedimentation outside the location. The impact spread area is predicted only during the construction phase, with the intensity of light erosion into medium one. The other impacted environment components are geology, vegetation, land use, aethetics and water quality. This impact is cummulative and reversible after the operational activities. Hence, this activity is unimportant negative (-TP).

The quarry development includes material cut on and outside of the river body. The quarry development can cause such impact towards the land's physical characteristics, such as land stability, land structure damage, land consistency, land pores space, and land permeability. The damage of the land's physical characteristics due to the cut on and outside of the riverbody, The consequences are increase of erosion and sedimentation. The impact spread area is 73,17 ha at the location project (dam inundation area), along Ayung river basin at dam's downstream. This impact is only on construction phase, with the intensity from light erosion and sedimentation level into serious erosion and sedimentation level. The other impacted environment components are land stability, geology stability, vegetation, land use, aesthetics and water quality. This impact is cummulative and able to be natureally reversible. Therefore, it has important negative impact (-P).

Table 6.13 The activity's impact towards erosion and sedimentation on Construction phase

No	Determining factor of important impact	Activity			
		Access road construction	Land clearing and stripping	Cut and fill	quarry development
1	The impacted community	-	-	-	-
2	The impact spread area	3,8 ha (entire the access road locations) and along the river at dam's downstream	At dam sites is predicted of 73,17 ha (entire inundation area) and along Ayung dam's downstream	At tunnel, dam site, at material filled area, and outside project area as sedi-ment.	73,17 ha at the project site (inundated area) along Ayung River at dam's downstream
3	Term of impact	During construction	During construction	During construction	During construction
4	Impact intensity	From medium erosion level into the serious one and from small sedimentation to huge sedimentation	From medium into serious	Change of natural land use and aesthetics into damaged land use and aesthetics	Easy erosion and sedimentation into serious erosion and sedimentation
5	The impacted environment component	Reserved groumd water, vegetation, land use, aesthetics and water quality	Vegetation, land use, aesthetics and river water quality	Vegetation, land use, aesthetics and river water quality	Land and geology stability, vegetation, land use, aesthetics and water quality
6	Impact's cumula-tive characteristic	Not cummulative	Not cummulative	Not cummulative	Not cummulative
7	Reversible and irreversible	reversible	Naturally reversible	reversible	reversible
Impact criteria		Unimportant negative (-TP)	Important negative (- P)	Unimportant negative(-TP)	Unimportant negative(-TP)

10. Impacts towards Terrestrial Flora

Activities on the construction phase which is predicted to cause impacts to the environment component of terrestrial flora as followed:

a. Access Road Construction Activities,

The access road construction to the project location for 700 m and width of 7 m and planned to be developed on Dusun Buangga, Getasan Villege, Petang Sub district, Badung Regency is an activity on construction phase. On this phase it is predicted that there will be cutting of several flora species , 21 trees species and bushes. From 21 species of flora which might be cut, among those, some are rare categorized both national (Indonesia) or regional (Bali) such as: pangi *(Pangium edule)*, gintungan *(Buschovia javanica)*, toop *(Arthocarpus elasticus)*, buni *(Antidesma bunius)*, pule

(Alstonia scholaris), sentul *(Sandoricum koetjape)* and so on. The next activities are filling with limestones and road hardening. The sustainable impact to the terrestrial flora during the road construction is permanent loss of several species of plants which are exist growing on the habitat.

Inspite of it, the lost of several flora will affect the existence of fauna which take benefits from those trees and bushes for various needs such as: a place or nest for some birds or other insects, as feeding area, breeding area, and other functions.

The access road construction is also predicted will cause noise from the vehicles which transport the materials or other heavy equipments (excavator, cylinder and others). The next impact is it is able to cause disturbance for some birds due to the noise. The impacts are temporrary during the road construction and the cut trees are relatively in very small quantities and the reservation has been done through reforestation, based on the suitability to the previous exist plants. According to the indicator above, the impact on the terrestrial flora is unimportant negative (-TP).

b. Mobilization of Equipment and Workers

Mobilization of equipments and workers on the construction pahse includes the heavy equipments transporation such as buldozer, excavator, motor grader, loader, double roller (tandem), vibro roller, dump truck, compressor, tire roller, water tank or even huge numbers of workers 150 – 300 persons to and from the project, which cause incerase of transportation traffics, noise or even dust volume on the earth surface or in the air. The impacts from noise and dust volume depend on the types, age of vehicles and total load of the vehicles. These impacts (noise or dust) due to mobilization of equipments and materials will occur along the transportation track and surround it. These will provide direct and indirect impacts to the terrestrial flora at the project site. The direct impact occurs due to some plants must be cut because it will disturb the transportation to and from the project. While the dust which sticks on the leaves will block the photosynthesis process in which if it is on abundant quantities will lead to plant's death. However, this activity is only on such narrow area. There are still alot of flora have not been cut, so that a lot of plants still able to survive at the area. Then, the impact is unimportant negative (-TP).

c. Construction and Operational of the Base Camp

The construction and operational of the base camp, as well as the warehouse, which will be completed with construction of bathing, washing, and toilet facilities with land clearing area, approximately, of 500 m^2. On this phase, there will be total cut of trees on an area of basecamp and warehouse construction. Cut of some vegetations (trees, bush, and herbs) will affect the deterioration of ecosystem quality such as disturbance on plants components as the producers. And in this phase there is also loss of fauna habitat (birds, insects, and mammlas) which live on the area. And due to the operational of the base camp, there will be increase of dust because of construction of base camp. This condition will give negative impact as the disturbance on photosynthesis process of plant

as the consequence of the leaf's mouth will be blocked by the dust so that it will block the oxygen and absorption of carbon dioxyde (CO2), which will give impact to the death of the plant, especially for those which live around the basecamp and warehouse constructions. However, the base camp and warehouse constructions took a place which is not too large, so that the impact is unimportant negative (-TP).

d. Land clearing and Stripping

On the construction phase, there will be land clearing and stripping on 6 Ha. The land stripping begins with cutting of all species of plants (trees, bushes, and herbs) which exist on the project location area. While for the land aqcuisition/hardening begins by forcing the top layer to be broken-down and then hardened with limestones for building fondation or yards. On this phase, there will be disturbance on ecosystem components, by the plants (producers), types of animals (aves, insects, reptiles or mammals) as consumers and also some species or decomposser, so that there will be ecosystem primary disturbance on the locationor secondary disturbance for the surroundings ecosystems. The other impacts of land clearing and stripping are loss of some rare plants both for national and regional (Bali) such as: pangi *(Pangium edule)*, gintungan *(Buschovia javanica)*, toop *(Arthocarpus elasticus)*, buni *(Antidesma bunius)*, pule *(Alstonia scholaris)*, sentul *(Sandoricum koetjape)* and so on. The loss of those species will also give impacts to some birds, insects, terrestrial mammals which take the benefits for their activities. However, those activities will not produce large impact spread area and not cummulative towards the surrounding environment so that the impact is unimportant negative (-TP).

e. Material transportation to and from the project

The material transportation to and from teh project location on the construction phase includes the materials transportation for dam development. The transported materials such as sand, stones, limestones, iron, cements, and so on. While the materials which are transported from the project suvh as the useless excavated materials. The volum of the transported materials to and from the project is rather huge, so that it will increase of noise or dust in the air. The impact of noise and dust volum depend on the type, vehicle's age and load of vehicle.

It will provide direct and indirect impacts to the terrestrial flora around the project site. While dust which sticks on the leaves will block the photosynthesis process and lead to disturbance on the plant itself. Due to this activity only occurs on a narrow area and the potential of vegetations on the study area are still in big numbers or the disturbance ratio is very small so that it is not degradating the existence of terrestrial flora at the area. Therefore this impact is unimportant negative (-TP).

Based on the explanation above, the summarized impact's flow and weight of the sub-activities on the construction phase such as: access road construction, mobilization of equipments and workers, construction and operational of base camp, land clearing and

stripping, material transportation to and from the project toward the terrestrial flora components is shown on Table 6.14.

11. The Impact towards Terrestrial Fauna

Ayung River dam development on its construction phase predicted will cause negative impacts to the terrestrial fauna. The activities which are predicted having negative impacts are: access road construction, mobilization of equipments and workers, land clearing, stripping and acquisition; cut and fillt up, general construction (dam, spillway and others, quarry development, transportation, mechanic and electricity; hydraulic electricity power installation development.

- As entering the phase of access road construction and mobilization of equipments and materials (on the construction phase), there is such impact to the terrestrial fauna. The impact spread areas are along the road construction and mobilization of equipment and material. The term of the impact is only on one unit of activity. From the intensity point of view, the impact is classified as the light one, it is only in for of disturbance due to movement of impacted population to the other locations around. The impact is not cummulative and able to return, because once it is over then it will get back to the normal condition. From the explanation above, the impact is small and unimportant negative (-TP).
- Land clearing, stripping and acquisition will lead to negative impact to the terrestrial fauna related to the decrease of habitat of the fauna. The existence of trees cutting activity will lead to decrease of habitat for fauna community. The decrease of habitat with a very small ratio compared with the existing natural habitat around. The impact of this activity is it does not cause migration or movement of fauna to a far location but only hundreds meters around. The impact is in more than one phase of activity. The occured impact is not cummulative and the beginning condition can be returned. Thus it can be concluded that land clearing and acqusition lead to unimportant negative impact (-TP) to terrestrial fauna.
- Main civil construction (cut and fillt up on dam, cofferdam and spillway, stone and concrete construction, material transportation, quarry development) mechanical and electricity, and hydraulic electricity power development cause negative impact to the terrestrial fauna. These activities, resultantly, can cause impacts such as: damage/decrease of habitat and noise disturbance on terrestrial fauna component, which is able to reach 80 dB and this will lead to disturbance (negative impact) to the fauna. The disturbance can occur especially related to the communication of the fauna which involving "*calling*". For example, if there is a young bird which is always with its mother, it is always hatchling and yearling, in particular to communicate and beg for some foods. The impact intensity is smalldue to the location is on the valley so that the noise distribution/flow is not covering large area (damping), the impacted population can move to the surrounding environments. Therefore, it is classified as unimportant negative (-TP). The flow pattern and impact criteria is shown on Table 6.15.

Table 6.14 Determining of important impact's weight of access road construction, equipments and workers mobilization, base camp construction and operational, land clearing and stripping activities, material transportation to and from the project toward the terresrial flora on construction phase

No	Determining factor of important impact	Activities on Construction Phase				
		Access road construction	**Mobilization of equipments and workers**	**Base camp construction and operational**	**Land clearing and stripping**	**Material transportation to and from the project**
1	The impacted community	50 – 100 workers	Workers (150 – 300 persons)	50 – 100 workers	50 – 100 workers	None
2	The impact spread area	Around the activity area	Around the project site (6Ha)	Around the project site (6 Ha)	On the project site up to its environs (> 6 Ha)	On the project site up to its environs (> 6 Ha)
3	Impact's intensity and term of impact	small, during the road construction for 700 m to the project location (for approx. 3 months)	small, during the activities persisted	The intensity is only around the project, during the activities persisted	The intensity is small and during the activites persisted	Small, during the road construction for 500 m to the project location (for approx. 3 months)
4	The other impacted components	Decrease of terrestrial flora habitats, air quality	Air quality, increase of dust, noise and aesthetic	Air quality, increase of dust, noise and aesthetic	Air quality, increase of dust, noise and aesthetic	Air quality, increase of dust, noise and aesthetic
5	Impact's cummulative characteristic	Not cummulative	Not cummulative	Not cummulative	Not cummulative	Not cummulative
6	Reversible or irreversible	Reversible, during the operational activities	Reversible after the activities are persisted	Reversibleafter the activities are persisted	Reversibleafter the port-operational	Reversibleafter the activities are persisted
Impact's criteria and weight		Unimportant negative (- TP)	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)

12. Disturbance towards Aquatic Flora and Fauna Component

Impacts on Ayung River aquatic flora and fauna component is predicted only in form of disturbance on diurnal behaviour, decrease of abundance and diversity of aquatic flora and fauna species; which are dominantly as the indirect impacts and the secondary impacts of increase of erosion and decrease of land clearing, stripping, acquisition activities, cut and fillt up activities, stone and concrete construction for the dam, spillway and so on, quarry development and hydraulic electricity power development. The impact flow pattern is below:

- Land clearing, stripping and acquisition include: tree's canopies and bushes cutting and clearing; cut and fill and land leveling. If these zacvtivities are implemented on the rainy season, it is predicted that it will cause surface run off and eventually river run off loaded by sediments/mud and organic substances. The muding impact can rapidly spread to part of water column and accumulative in the water base. Increase of turbidity and sedimentation on Ayung River will cause disturbance to the ecology system on that river, such as: disturbance on sun light penetration so that it can minimize the primary productivity, minimize the fused oxygen, deterioration of water quality, disturbance on the respiration process of aquatic biota due to the fish gill's filament covered by the mud, and disturbance or even death to the base community (*phyto & zoobenthos*) because it is closed by the mud and sediment. The impact of this mud hole is also impacted the other environment component such as: decrease of tourism interest to Ayung River. The mud hole impact can return, however it is continuous, even it will be sustainable if the management and rehabilitation activities at the upstream area as the catchments are not running well. According to impact's characteristic of the land clearing and acquisition, it is important negative (-P).

- The resemble and related impact flow pattern is predicted to be ocured due to the activities of cut and fillt up, stone and concrete construction for the dam, spillway and so on, quarry development, and hydraulic electricity power. Based on those characteristics, this impact is categorized as the important negative impact (- P).

The flow pattern and impact criteria on aquatic flora and fauna component is shown on Table 6.16.

Table 6.15 Determining of important impact's weight of access road construction, equipment and workers mobilization, land clearing , stripping and acqusition, cut and fillt up, stone and concrete construction, material transportation to and from the project, quarry development, mechanical and electric, hydraulic electricity power development toward the terrestrial fauna

No	Detremining factor of important impact	Activity on Construction Phase								
		Access road construction	**Mobilization of equipment and workers**	**Land clearing, stripping, and acquistion**	**Cut and fillt up activities**	**Stone and concrete construction**	**Material transportation to and from the project**	**Quarry development**	**Mechanical and electrical**	**PLTA development**
1	The impacted community	-	-	Less than 10 %	Less than 10 %	Less than 10 %	Less than 5 %	Less than 50 %	Less than 10 %	Less than 20 %
2	The impact spread area	Narrow, at the track around the road	Narrow, at the track around the road	Ratio, with small area	Ratio, with small area	Ratio, with small area	Ratio, with small area	Ratio, with small area	Ratio, with small area	Ratio, with small area
3	Term of impact and impact intensity	Temporarry, with small intensity	Temporarry, with small intensity	Temporarry , with small intensity	2-3 months and medium intensity	3-4 months and medium intensity	Several months and medium intensity	> 6 months and medium intensity	2-3 months and medium intensity	> 5 months and medium intensity
4	Other environment component	-	-	-	-	-	-	-	-	-
5	Impact's cummulative characteristics	Not cummulative	Not cummulative	Not cummulativ e	Not cummulative	Not cummulative	Not cummulative	Not cummulative	Not cummulative	Not cummulative
6	Reversible or irreversible	Reversible once after the road has finished	Reversible once after the road has finished	Reversible once after the road has finished	Reversible once after the road has finished	Reversible once after the road has finished	Reversible once after the road has finished	Reversible once after the road has finished	Reversible once after the road has finished	Reversible once after the road has finished
	Impact criteria and weight	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportan t negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)

Table 6.16 Determining of important impact's weight of land clearing, stripping and acquisition, cut and fillt up, stone and concrete construction, quarry development, and hydraulic electricity toward aquatic flora and fauna on construction phase

No	Determining factor of important impact	Activity on Construction Phase				
		Land clearing, stripping and acquisition	**Cut and fillt up activities**	**Stone and concrete construction**	**Quarry development**	**Hydraulic electricity power development**
1	The impacted community	Less than 30 %	Less than10 %	Less than 40 %	Less than 40 %	Less than 20 %
2	The impact spread area	Synergically widen with the Ayung River's flow, especially on rainy season (mud)	Synergically widen with the Ayung River's flow, especially on rainy season (mud)	Limited only around the project location and can be localized	Synergically widen with the Ayung River's flow, especially on rainy season (mud)	Limited only around the project location and can be localized
3	Term of impact and impact's intensity	On several seasons (1 year), high intensity and quite high slide potential	On several seasons (1 year), high intensity and quite high slide potential	Occur within rather long time, less intensity due to no basic change	On several seasons (1 year), high intensity and quite high slide potential	Occur within rather long time, less intensity due to no basic change
4	The other impacted environment component	aquatic biota to Ayung River's downstream, tourism society, WTP below and general community	aquatic biota to Ayung River's downstream, tourism society, WTP below and general community	aquatic biota to Ayung River's downstream, tourism society, WTP below and general community	aquatic biota to Ayung River's downstream, tourism society, WTP below and general community	aquatic biota to Ayung River's downstream, tourism society, WTP below and general community
5	Impact's cummulative characteristic	Accumulated and continuous	Accumulated and continuous	Not cummulative	Accumulated and continuous	Not cummulative
6	Reversible or irreversible of an impact	Reversible by particular management	Reversible by particular management	Reversible by particular management	Hardly reversible	Reversible by particular management
Impact's criteria and weight		Important negative (-P)	Important negative (-P)	Unimportant negative (-TP)	Important negative (-P)	Unimportant negative (-TP)

13. Impact on Social Component

a. Impact on Community Component

The project requirement of workers from various stratifications, briefly, cannot be fulfilled by the local resources. Simultantly, according to the work phases, the workers will come to the location so that there will be temporary increase of numbers of people. The increase of people must be completed with temporary camp, bathing, washing, and toilet facilities and primary needs supply. The sources of those facility supplies can be separated from the local community's facilities, still it is not impossible they use the same facilities, such as: small shops, market, access road and so on, that it will take the space of the local community who has enjoyed the facilities.

The outsiders often bring such dynamic phsyco-social conditions, they do not want to be tightly related to the local condition or different tradition and customs with the local community. The interaction of the outside workers leans to rise conflicts. The security of local community is easily annoyed by the workers mobilization whose their origins and their existence are not exactly known.

The impacts due to the workers mobilization is the negative sensitivity of the community to the project. This impact is categorized as theDampak yangunimportant negative impact (-TP). The explanation is shown on Table 6.17.

Table 6.17. Impact on Community Component on Construction phase

No	Determining factor of important impact	Activity
		Project workers mobilization
1	The impacted community	Most of the community are worried about the existence of the outside workers
2	The impact spread area	Local
3	Term of impact and impact intensity	Moderate and within quite long term
4	Other impacted environment component	Community's security and orderliness
5	Impact's cumulative characteristic	Not cummulative
6	Reversible or irreversible of an impact	reversible
Impact's weight		Unimportant negative (-TP)

b. Impact on Job Opportunities Component

Due to the huge activity volume which will be conducted, there will be opportunities for the local community to be involved in the project for the various stratifications they owned, from the preparati Dengan besarnya volume kegiatan stage to the operational stage. Even it is not a must to employee all the lcal workers and there are skill requirements which are limited, however the priority and opportunity for the local workers who have simple skill will have chance to be recruited.

Apart from that, the existence of human's activities in huge quantity and in such long term, directly, will create chances for the local people to supply services, such as residents, primary needs supply, transportation and so on. This condition, indirectly, provides job and business vacancies to the local people. This impact is categorized as important positive impact (+P). The impact explanation is shown on Table 6.18.

Table 6.18. Construction Activity's Impact on Increasing Job Opportunities

No	Determining factor of important impact	Kegiatan		
		Access road construction	Land clearing and stripping	Civil construction
1	The impacted community	small, less than 50 persons	small, less than 50 persons	Rather a lot, more than 200 persons
2	The impact pread area	local	local	Very large, among the regencies
3	Impact intensity and term of impact	Small and temporarry	Small and temporarry	Big intensity and persist for more than a year
4	Other impacted environment component	Community's income, community's security and orderliness	Community's income, community's security and orderliness	Community's income, community's security and orderliness and regional economy
5	Impact's cumulative characteristic	not cummulative	not cummulative	not cummulative
6	Reversible or irreversible of an impact	reversible	reversible	reversible
Impact's weight		Unimportant positive (+TP)	Unimportant positive (+TP)	Important positive (+P)

c. Impact on Income

The job and business vacancies which are due to the activities, directly will give impact of increase of local people's income simultantly, and can increase the people's prosperity. So will for the lowest government as Village Government which has chance to take the benefit of higher fee, because the workers should register their demography administration. In this case, the impacted people are reaching more than 50 persons, with quite long time intensity. The impact can be said as important positive impact (+P)

Table 6.19 Construction Activity's Impact on Community's Income Component

No	Determining factor of important impact	Activity		
		Access Road Construction	Land clearing and stripping	Civil construction
1	The impacted community	small, less than 50 persons	small, less than 50 persons	Rather a lot, more than 200 persons
2	The impact spread area	local	local	Very large, among regencies
3	Impact's intensity and term of impact	Small and temporarry	Small and temporarry	Big intensity and persist for more than a year
4	Other impacted environment component	Community's income, community's security and orderliness	Community's income, community's security and orderliness	Community's income, community's security and orderliness and regional economy
5	Impact's cumulative characteristic	not cummulative	not cummulative	not cummulative
6	Reversible or irreversible of an impact	reversible	reversible	reversible
Impact's weight		Unimportant positive (+TP)	Unimportant positive (+TP)	Important positive (+P)

14. Impact on Socio-cultural Component

a. Community's Attitude and Perception

The access road construction causes unimportant negative (-TP) attitudes and perceptions due to noise and dust as well as comfort disturbance on religious/ritual activities held by the community around the project (Payangan Desa, Susut-Buahan, Buangga-Getasan, and Pangsan Village). It is predicted that < 50 % of village community are impacted.

The negative perception also occurs on equipment and workers mobilization activity. The heavy equipment transportation raises negative perceptions since it causes security and comfort disturbances of village community around as well as it can disturb the ritual activities around the Chinese cemetery (72 household) on Melinggih Village. Inspite of it, the outsiders existence around the project as workers has risen social jealousy, because there are still a lot of the local community members who are jobless, therefore the impact is categorized as unimportant negative (-TP).

The other activities which also give impact to community's negative perception and attitudes are cut and fill on cofferdam, main dam and spillway. It is due to the secondary impact caused by these activities on river water turbidity at the downstream area that disturb rafting tourism activities, washing, bathing and toilet activities, and cultural activities such as pure water and holy water along Ayung River's downstream. It is

predicted that > 50 % of the community are impacted and the impact is categorized as important negative (-P).

The negative perception also occurs on Ayung dam's hydraulic electricity power installation development. It is due to the noise during the construction. However this impact is unimportant negative (-TP) because the community are used to those noises, and the settlement location is far from the site, in addition it is temporarry.

Table 6.20 The Impact of Activity toward Community's Attitudes and Perceptions on Construction Phase

No	Determining factor of important impact	Activity		
		Access road construction	Equipment and workers mobility	Cut and fill
1	The impacted community	> 50% of community are impacted	> 50% of community are impacted	> 50% of community are impacted
2	The impact spread area	Payangan Desa, Susut-Buahan, Payangan Subdistrict, and Pangsan Village, and Banjar Buanga Getasan Village Petang Subdistrict, and Carangsari Village	Payangan Desa, Susut-Buahan, Payangan Subdistrict, and Pangsan Village, and Banjar Buanga Getasan Village Petang Subdistrict, and Carangsari Village	The community who consume the water from Ayung River located on downstream (Subak, PDAM, Rafting and other community)
3	Intensity and term of impact	Moderate impact intensity and persist for approximately 1 month	Moderate impact intensity and persist during construction	Moderate impact intensity and temporarry
4	The other impacted environment component	Community's security and orderliness	Community's security and orderliness	Community's security and orderliness
5	Impact's cummulative characteristic	Not cummulative	Not cummulative	Not cummulative
6	Reversible or irreversible	The condition will get better once the road construction has over	The condition will get better once the road construction has over	The condition will get better after having socialization and guarantees from the initiator
	Impact weight	Important negative (-TP)	Important negative (-TP)	Important negative (-P)

b. Holy Area/Place and *Nganyut* Ritual (*Ngaben*/ Cremation)

The land clearing and stripping activities around the dam, particularly around holy area and holy springs around Tangluk Temple, Susut-Buahan (Payangan) and other temples, can rise holiness disturbances which is able to rise other unexpected secondary impacts. Based on the faith of local community (the worshippers of Tangluk temple = 200 households, in particular) the forest around tabluk Temple is sacred, that makes this impact is important negative (-P), due to the worhippers (*penyungsung*) are impacted.

Meanwhile, cut and fillt activities on cofferdam, main dam, and spillway will give impact to *nganyut* (*ngaben*) and *ngepugin* ceremony which are oftenly held by traditional community of Melinggih Village exactly right on the main dam plan. It is predicted that > 50 % of the traditional society are impacted and it is categorized as important negative impact (-P). The explanation of the impact of holy area, places and local values existences is shown on Table 6.21.

Table 6.21 The impact of construction activities on cultural component; holy area and place and local value

No	Determining factor of important impact	Activity	
		Land clearing and stripping	**Cut and fill**
1	The impacted community	> 50 % of the worshippers (*penyungsung*)	> 50 % of the worshippers (*penyungsung*)
2	The impact spread area	Desa Adat Susut-Buahan, and Payangan Desa-Melinggih	Desa Adat Susut-Buahan, and Payangan Desa-Melinggih
3	Intensity and term of impact	Moderate impact intensity and persist on one activity unit	High impact intensity and persist in a long term
4	Other impacted environment component	Worhippers' phsycology and community's security and orderliness	community's security and orderliness
5	Impact's cummulative characteristic	Not cummulative	Not cummulative
6	Reversible or irreversible	The condition will get back to normal after *atur piuning* or *guru piduka* ceremony	The condition will be normal with an effort of alternative location of *nganyut (ngaben)* to the south of dam
Impact's weight		Important negative (-P)	Important negative (-P)

c. Community's Security and Orderliness

The community's security and orderliness disturbance can appear on access road construction to the project. Based on the prediction, this activity will not produce any significant community's security and orderliness disturbance such as violence to the workers, due to this activity will not damage the community's buildings (residents or holy

places [temple or *sanggah*]) which are located on sides of the road. It is predicted that < 50 % of the community are impacted that it is unimportant negative impact (-TP).

The community's security and orderliness disturbance is also predicted to appear on the activities of equipment and workers mobilization. The heavy equipments transportation can cause accidents to the community and will strike down the bordering walls of the house (*penyengker*) or buildings owned by the community. It has small possibility due to the normalization of access road has been done. It is predicted that <50 % of the community are impacted, and the impact is unimportant negative (-TP). The explanation of community's security and disturbance impact is shown on Table 6.22.

Table 6.22 The Impact of Access Road and Equipment and Workers Mobilization toward the Community's Security and Orderliness

No	Determining factor of important impact	Activity	
		Access road construction to the project	**Equipment and workers mobilization**
1	The impacted community	< 50 % of the community	< 50 % of the community
2	The spread impact area	Village around the project Payangan Desa, Susut Buahan, Pangsan Village, Banjar Buanga Getasan Village, and Carangsari Village	Village around the project Payangan Desa, Susut Buahan, Pangsan Village, Banjar Buanga Getasan Village, and Carangsari Village
3	Intensity and term of impact	Big impact intensity and persist during access road construction	Moderate impact intensity and persist during equipment mobilization activities
4	The other impacted environment component	Community's health	Environmental aesthetics
5	Impact's cummulative characteristic	Not cummulative	Not cummulative
6	Reversible or irreversible	The condition will be normal once the access road construction has over	The condition will be normal after organizing effort and community demobilization
Impact's weight		Unimportant negative (-TP)	Important negative (-P)

15. Impact on Community's health component

The activities of access road construction and material, equipment, and workers mobilization can impact the community's health. This negative impact is due to that workers mobilization will be completed with basecamp construction and washing, bathing, and toilet facilities. If the waste of basecamp is not well managed, it will give impact to the community's health. In the dry season, this negative impact will only occur at the basecamp and washing, bathing and toilet facilities environment, however if it is on rainy season, the basecamp's wastes will spread according to the runoff direction. Considering the wastes produced by workers mobilization is well managed that the impact towards the community's health becomes unimportant negative (-TP).

Land clearing and acquisition; cut and fill activities will increase the dust content in the air around the activities. The land clearing and acquisition and cut and fillt which are conducted on the dry season lead to the significant increase of dust concentration, which is reaching 110 $\mu g/m^3$, meanwhile if the land clearing and acquisition done on the rainy season, the impact will be in return, the dust content will decrease. The quality standard for dust as decided in Governmental regulation of Republic of Indonesia No 41,1999 is 230 $\mu g/m^3$ for 24 hours. The impact spread area will only be within the radius of land clearing and acquisition. Due to the activity area is densely vegetated therefore the dust spread will be blocked by the flora around, so that the impact intensity will be small. The dust concentration in the air is not cummulative. It will not be accumulated from one phase of activity to the other activities. This is because the dust is heavier than other air component that the dust will be easily found or sticks on the existing flora. The impact is temporarry, during the phase of land acquisitioning, hence the impact is *unimportant negative* (-TP)
The next activities are dam civil construction, and quarry, mechanic and electric as well as hydraulic electricity power development. The construction activities, certainly, will give negative impacts to the community, both locals or project workers. The increase of dust, noise, vibration and deterioration of water quality, directly and indirectly, disturb the community's health. The impact to the community's health, the workers' health in particular, is categorized as unimportant negative (-TP). The impact's criteria is shown on Table 6.23.

Table 6.23 The Impact of Activities on Construction Phase toward the Community's Health

No	Determining factor of important impact	Activity		
		Access road construction and equipment and workers mobilization .	**Land clearing, stripping and acquisition, and cut and fill**	**Civil construction (dam, quarry, hydraulic electricity power, and other facilities), mechanical and electrical**
1	The impacted community	<50% of the community are impacted	<50% of the community are impacted	<50% of the community are impacted
2	The impact spread area	Project location and its environs	Project location and its environs	Project location and its environs and also able to spread to the ouside of impact spread area
3	Intensity and term of impact	Small and persist for approx. 1 month	Moderate intensity and persist for approx. 4 months	Small intensity and persist for more than 1 year
4	The other impacted environment component	Working ability and income	Working ability and income	Working ability and income
5	Impact's cummulative characteristic	Not cummulative	Not cummulative	Not cummulative
6	Reversible or irreversible	reversible	reversible	reversible
Impact's weight		Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)

16. Works Accident

Entirely, the construction activites of Ayung River Dam development plan is predicted to give impact to the job safety and health. The heavy equipments transportation with more than 50 tons weight has extremely high accident risk with such incidentally accident considering the area is very steep and tortuous. The numbers of impacted people are very small but the personnels who are assigned in material and equipment transportation. The impact spread area is along the road which is passed because all of the materials and equipements brought from Denpasar. The impact intensity is small because it is incidental and persist during the construction phase. This activity will give impact to the other environment component, traffic disturbance. Due to the accidents above are incidental, that the impact is categorized as *unimportant negative* (-TP).

Land clearing and acquisition, and cut and fill activities are the activities using many machineries and heavy equipments. The land acquisition activites suchas trees cutting using sensor equipment can cause accident. While land acquisition activites and cut and fill are predicted to give impact to the job safety. The impacted persons are the workers and only occur around the activity location. The impact persists during the construction phase with small impact intensity. The other impacted environment component is the air quality which are reversible. Thus the impact is *unimportant negative (-TP).*

The main civil construction (dam, spillway, quarry, hydraulic electricity power) and others on construction phase are predicted to give significant and important impact because during this phase, it needs long time to realize the expected construction. For this main activities, there are often accidents, even can cause death to the workers. The impact spread area is only around the construction location with the workers as the impacted community. The term of iumpact is as long as the period needed by the civil construction with big intensity due to the possibility of death for the workers. The other impacted environment component is air quality, particularly the noise level. The reversibility of impacts on accidents depend on the accident's level. Therefore it is categorized as *important negative impact* (-P).

Table 6.24. The Impact of Activities on Construction Phase toward the Job Safety and Accident (*K3*)

No	Determining factor of important impact	Activity		
		Access road construction and equipment and workers mobilization	**Land clearing, stripping and cut and fill**	**Civil construction (dam, quarry, hydraulic electricity power, other facilities), mechanical and electrical**
1	The impacted community	Less than 50 workers	Less than 50 workers	The workers for construction are quite a lot (50 %)
2	The Impact Spread Area	The project location and around the access road	The project location and around	The construction project location and around
3	Intensity and term of impact	Small and persist for approx. 1 month	Moderate intensity and persist for such long time (4 months)	Big intensity and persists for more than 1 year
4	The other impacted environment component	Health and income	Health and income	Health and income
5	Impact's cumulative characteristic	Cummulative	Cummulative	Cummulative
6	Reversible or irreversible	reversible	reversible	reversible
Impact's weight		Unimportant negative(-TP)	Unimportant negative (-TP)	Important negative (-P)

17. Transportation Disturbance

Generally, the construction activities are related to the transportation aspect due to the mobilization of construction workers, materials and project equipments as well as other facilities which are involving transportation component. Based on such condition, obviously, the transportation aspect gets quite significant negative impact by the existence of construction activities of Ayung dam development. Nevertheless, the transportation impact is categorized as important negative impact which whould be well managed. The explanation of transportation impact is shown on Table 6.25.

Table 6.25 The Determining of important impact's weight towards the transportation component on construction phase

No	Determining factor of important impact	General Construction Activities
1	The impacted community	Very significant if there is transportation disturbance (>50 %)
2	The impact spread area	Very wide,reaching the outside area of project (material or man powers [if available] transportation track) : Gianyar-Badung-Karangasem
3	Term of Impact	Nearly the whole construction time
	Impact intensity	Significant impact intensity
4	The impacted environment component	Community's restlessness Traffic accident
5	Impact's cummulative characteristic	Not cummulative
6	Reversible or irreversible	Reversible
Impact's weight		Important negative (-P)

6.3 The Prediction of Activity's Impact on Operational Phase

1. Micro Climate Rehabilitation

The impacts on micro climate condition on the operational phase are predicted coming from the dam operational activities, dam and its facilities maintenance as well as organizing the conservation area and dam surroundings. The impact flow pattern is as below:

On the dam operational activity, there is significant landscape change, from land scape into aquatic zone with surface of ± 73,17 ha. The aquatic zone is predicted to be able to increase the vapour that the temperature and relative humidity on that area will get better. Changes on several micro climate determining factors, such as temperature, humidity and pressure, also affect the rainfall. More significant positive impact occurs as the protecting activities and reforestation at conservation area as well as organizing the dam surroundings landscape are conducted. Those activities are related to each other in order to for a better micro climate. The conservation area organizing and dam surroundings's maintenance on dam's operational persist for long time and continuous, therefore the impact is predicted to be long lasting (30 years), with quite significant impact intensity and also significant and basic change. This impact is cummulative, which means that the more significant and longer the aquatic zone, the better maintenance and impact organizing it has, also the impact is able to be restored. Therefore, this impact is categorized as the important positive impact (+P).

Table 6.26 The determining of important impact weight of micro climate on operational phase

No	Determining factor of important impact	Operational Activity		
		Dam operational	**Dam and its facilities maintenace**	**Conservation on protected area and dam surroundings**
1.	The impacted community	Community around the dam, >50 %	Community around the dam, >50 %	Community around the dam, >50 %
2.	The impact spread area	Waduk environment and its surrounding, especially the upstream area	Waduk environment and its surrounding,	Waduk environment and its surrounding, especially the upstream area
3.	Term of impact	Very long, > 30 years	Very long, > 30 years	Very long, > 30 years
4.	Impact intensity	Cause basic change	Not basics, but quite significant	Cause basic change
5.	The other impacted environment component	Other environment components (physiography, hydrology, biology and socio-economy, culture and community's health)	Other environment components (physiography, hydrology, biology and socio-economy, culture and community's health)	Other environment components (physiography, hydrology, biology and socio-economy, culture and community's health)
6.	Impact's cummulative characteristic	Cummulative	Cummulative	Cummulative
7.	Reversible or irreversible	reversible	reversible	reversible
Impact's criteria		Important positive (+P)	Important positive (+P)	Important positive (+P)

2. Change of Topography

Change of topography on the operational phase is due to the blocking cofferdam channel and impounding. The impact spread areas are predicted only on the area or location of cofferdam. The impact persists on operational phase, with the intensity of change of topography condition nearly becomes natural condition. The other impacted environment components are increase of land and geology stability. This impact is cummulative and irreversible. Therefore this impact is important positive. (+P).

Table 6.27 The impact of plugging and impounding on operational phase toward the land topography

No	Determining factor of important impact	Plugging
1	The impacted community	-
2	The impact spread area	Ocurs only at the area or location of cofferdam
3	Term of impact	During operational
	Impact's intensity	Change of topography condition nearly into natural condition
4	The other impacted environment components	Increaseof land and geology stability
5	Impact's cummulative characteristic	cummulative
6	Reversible or irreversible	irreversible
Impact's criteria		Important positive (+TP)

3. Change of geology stability

Change of geology stability on operational phase due to the plugging and impounding activities. In addition, these activities are able to increase geology stability. The spread area is predicted only at the cofferdam location and around the dam. This impact persists on the oprational phase, with the intensity of increase of geology stability, from the rather unstable t the stable one. The other impacted environment components are land stability and the better topography. This impact is cummulative and irreversible. Therefore, this activity is important positive (+P).

Table 6.28 The impact of plugging and impounding on the operational phase toward geology stability

No	Determining factor of important impact	Plugging and dam inundation
1	The impacted community	
2	The impact spread area	Only on the area or location of cofferdam
3	Term of impact	During operational
	Impact's intensity	Change of geology stability from rather unstable into stable
4	The other impacted environment component	Increase of land and topography stability
5	Impact's cummulative characteristic	cummulative
6	Reversible or irreversible	irreversible
Impact's criteria		Important positive (+P)

4. Change of land's physical and chemical characteristics

The change of land's physical and chemical characteristics is due to the plugging and impounding activities. These activities lead to the change of land types and stability. This is because the land structure has not been formed yet, and always inundated so that becomes Typic Hydraquents. The impact spread area is predicted of 73,17 ha (entire dam inundations). This impact persists during the dam oprational, with the intensity of change of land types, from Inceptisols into Entisols. The other impacted environment component is the geology stability. This impact is cummulative and naturally reversible within long time. Hence this activity is categorized as important negative impact (- P).

The conservation on protected area and dam surroundings activities can cause important positive impact toward the environment such as improvement of ecologic, drainage, agronomy and aesthetics functions. There will be such improvements on land physical and chemical characteristics, as land structure, land consistency, land pores space, soil airasion, soil Bulk Density and land permeality. The impact spread areas are at the entire project location and also its surroundings. This impact persists continuously and naturally, and becomes more positive and more natural as the longer time it takes, with the intensity from bad land condition into the good one. The other impacted environment componnets are land use, aesthetics, erosion and sedimentation, and water quality and quantity. This impact is cummulative and irreversible. Therefore this impactis important positive (+P).

Table 6.29 The impact of plugging and impounding activities toward the land physical and chemical characteristics on operational phase

No	Determining factor of important impact	Plugging and impounding	Conservation on protected area and dam surroundings
1	The impacted community	-	-
2	The impact spread area	73,17 ha (entire dam inundation locations).	All of the project locations and its surroundings
3	Term of impact	During dam operational	During dam operational
	Impact intensity	Change of land types, from Inceptisols into Entisols.	From bad land condition into the good one
4	The other impacted environment component	Geology stability	Land use, aesthetics, erosion and sedimentation, and water quality and quantity
5	The impact's cummulative characteristics	Not cummulative	cummulative
6	Reversible or irreversible	reversible	irreversible
Impact's criteria		Important negative (-P)	Unimportant positive (+TP)

5. Land use and aesthetics

Change of land use and aesthetics on operational phase is due to the plugging and impounding activities, and conservation on protected area and dam surroundings. These activities are able to convert the land use and aesthetics significantly.

The activities of plugging and impounding are able to change the land use and aesthetics permanently. The impact spread area is 73,17 ha (entire dam's inundations). This impact persists continuously during the dam operational, with the intensity from natural land use (bushes and river flow) into aquatic zone (Ayung River Dam). The other impacted environment components are geology stability, land stability, land physical characteristics, hydrology, terrestrial flora and fauna. This impact is cummulative and reversible. Therefore it is important negative impact (-P).

The conservation on protected area and dam surroundings are predicted to raise important positive impact to the environment such as improvements of ecologic, drainage, ergonomy and aesthetics functions. There will be changes of land use and aesthetics which are becoming better. The impact spread areas are the project location and its environs. This impact naturally persists and becomes more positive as as the longer time it takes, from such irregular land use into the regular one, as well as good and convenient land scape's aesthetics. This impact is cummulative and reversible. Therefore this impact is important positive (+P).

Table 6.30 The impact of conservation area and dam surroundings activities toward the land use and aesthetics

No	Determining factor of important impact	Plugging and impounding	Conservation on protected area and dam surroundings
1	The impacted community	-	-
2	The impact spread area	73,17 ha (entire dam's inundation)	All of project locations and its surroundings
3	Term of impact	During dam operational	During dam operational
	Impact's intensity	Changhe of natural land use (bushes and river flow) into dam's inundation	From irregular land use into regular land use with good and convenient aesthetics
4	The other impacted environment component	Geology stability, land stability, land physical characteristic, hydrology, terrestrial flora and fauna	erosion and sedimentation, and water quality and quantity
5	Impact's cummulative characteristic	Not cummulative	Cummulative
6	Reversible or irreversible	reversible	reversible
Impact's criteria		Important positive (+P)	Important positive (+P)

6. Impact on Water Resources Potential

On Ayung River Dam operational phase, particularly the plugging and impounding activities, operational of dam and its facilities and activities of conservation area and dam surroundings will cause significant impact (negative and positive) on the surface water resources conditions.

- The plugging and impounding activities are predicted causing negative impact to the potential flow of Ayung River, which runs to downstream. Impounding activities, certainly, will block the flow that runs to downstream for certain term until it reaches the expected water height, the required time is 4 – 5 months on the rainy season. Therefore, this activity causes very significant impacts to the environment components, such as: disturbance on irrigation system of downstream community, still it can be solved due to the water supply from the rain on rainy season is evenly distrubuted on downstream area. The rafting activities on Ayung River and raw material supply for WTP located on its lower land will be a bit disturbed. The occurred impact is not basic, has cummulative characteristic and reversible. Hence it is categorized as unimportant negative (-TP).
- On the operational phase of the dam and its facilities, it is extremely different with the explanation above. The water resources potential in the dam have been abundant. This potential is predicted increasing the water usage for irrigation of 9.542 ha, water supply raw material of 3,6 M_3 per second and for electricity generating power of 12,3 Megawatt. The impact caused by by this activity is giving impact to quite big numbers of people (>50 %), rather large impact spread area (out of the project location [covering 2 regencies and a city), the impact persists for long term, cummulative and reversible. This impact is categorized as the important positive (+P).
- The activities of conservation on protected area and dam surroundings are expected to be able to increase the potential of catchment area to trap and store the rain in such long term that the releasing can be done through steps. The final goal is increasing the reserved water on the catchment area. These activities are impacted quite big numbers of people (>50 %), quite large impact spread area (out of the project location [covering 2 regencies and a city]), the impact persists in a very long time, it is cummulative and reversible. This impact is categorized as important positive (+P).

Table 6.31 The impact of activities on operational phase to the water resources potential

No	Determining factor of important impact	Plugging and impounding	Dam operational	Conservation on protected area and dam surroundings
1	The impacted community	Large community, > 50 %	Large community, > 50 %	Large community, > 50 %
2	The impact spread area	Very large area, covering 2 regencies and 1 city	Very large area, covering 2 regencies and 1 city	Very large area, covering 2 regencies and 1 city
3	Term of impact	Very long time (more than 30 years)	Very long time (more than 30 years)	Very long time (more than 30 years)
	Impact intensity	Intensive and very principal	Intensive and very principal	Intensive and very principal
4	The other impacted environment component	Subak irrigation system, rafting activity, WTP, large community and hydrobiota	Subak irrigation system, rafting activity, WTP, large community	Subak irrigation system, rafting activity, WTP, large community
5	Impact's cummulative characteristic	cummulative	cummulative	cummulative
6	Reversible or irreversible	reversible	reversible	reversible
Impact's criteria		Important negative (-P)	Important positive (+P)	Important positive (+P)

7. Impact on Water Quality

On Ayung River Dam's operational phase, especially on plugging and impounding, dam and its facilities operational, mainetance of dam and its facilities' functions, conservation on protected area and dam surroundings activities are predicted causing significant impact on surface water resources condition.

- Plugging and impounding activities are predicted causing negative impact to the Ayung River water quality, which flows to downstream. Impounding activities, certainly, will block the flow that runs to downstream for certain term until it reaches the expected water height, the required time is 4 – 5 months. Hence, this activity will affect Ayung River's water quality. The deterioration of water quality also affects other environment component such as: disturbance on rafting activities and disturbance on raw material supply for WTP on its lower land as well as disturbance on aquatic ecosystem below and in the dam. The water quality in the dam on the beginning of inundation is predicted very bad that disturbs the hydrobiota in the dam. This is very principal impact, it is cummulative and reversible. Hence it is categorized as unimportant negative impact (-TP).
- On the operational phase of the dam and its facilities, it is extremely different with the explanation above. The water resources potential in the dam have been abundant and the water has been inundated. In inundating system, generally, the water turns into more clear, due to the purification and chemical process that the water quality becomes better. The good water quality water will be useful for the next usages, such as irrigation, water

supply raw material and electricity generator. This impact affect such big numbers of society (>50 %), rather large impact spread area out of the project location [covering two regencies and a city]), the impact persists in a very long time (more than 30 years), it is cummulative and reversible. This impact is categorized as the important positive (+P).

- The dam and its facilities maintenace activities are very positive and related to each other in order to create sustainable efforts, including to create good water quality and qualified for the dam's requirements. It affects a quite big numbers of people (>50 %), rather large impact spread area out of the project location [covering two regencies and a city]), the impact persists in a very long time (more than 30 years), it is cummulative and reversible. This impact is categorized as the important positive (+P).
- The activities of conservation on protected area and dam surroundings are expected to be able to increase the potential of catchment area to trap and store the rain in such long term that the releasing can be done through steps and prevent erosion. Analyzed from the aspect of waterquality, this activity, eventually, purposed to increase the water quality of catchment area and for those fall in to the dam. *Hamparan hijau/tegakan hutan* (forestry area) is a natural filter so that the sedimentation which comes to the dam can be pushed. Inspite of it, the abundant nutrition can be absorped by the vegetation before it gets in the dam. It affects a quite big numbers of people (>50 %), rather large impact spread area out of the project location [covering two regencies and a city]), the impact persists in a very long time, it is cummulative and reversible. This impact is categorized as the important positive (+P).

Generally, the impact on water quality on operational phase of Ayung Dam is shown on Table 6.32.

8. Impact on Erosion and Sedimentation Level

The activities of dam and its facilities maintenace and conservation on protected area and dam surroundings are the activities which can give positive impacts toward decrease of erosion and sedimentation level during the operational phase. These activities are able to improve the land's physical characteristics which determine the erosion magnitude such as land structure stabilization and land permeability rehabilitation. The rehabilitation to the land's physical characteristics minimizes the land erodibility so that it can minimize the erosion on project location and sedimentation on project's downstream. The impact spread areas are on all of the project locations and its surroundings, including Ayung River's downstream. This impact is continuously and naturally persists, and becomes more positive as the longer time it takes, with the intensity from moderate erosion into the light erosion or from significant sedimentation into the low one. The other impacted environment components are aesthetics and land use, and water quality. This impact is cummulative and irreversible. The impact is categorized as important positive (+P).

Conservation on protected area and dam surroundings activities cause positive impact to the environment, such as improvement of ecologic, drainage, ergonomy and aesthetics functions.

On the erosion and sedimentation, there will be decrease of erosion soil and deposition soil. The impact spread area occurs all over the project locations and its surroundings. This impact continuously and naturally persists and becomes more positive as the longer time it takes, with the intensity from serious erosion and sedimentation into easy erosion and sedimentation. The other impacted environment components are land use and aesthetics and water quality. This impact is cumulative and irreversible. Therefore, this impact is important positive (+P). The explanation is shown on Table 6.33.

Table 6.32 The impact of activities on operational phase toward the water quality components

No	Determining factor of important impact	Plugging and impounding	Dam operational	Dam and its facilities' functions maintenace	Conservation on protected area and dam surroundings
1	The impacted community	Large community, > 50 %	Large community, > 50 %	Large community, > 50 %	Large community, > 50 %
2	The impact spread area	Very large, covering 2 regencies and 1 city	Very large, covering 2 regencies and 1 city	Very large, covering 2 regencies and 1 city	Very large, covering 2 regencies and 1 city
3	Term of impact	Very long, it takes more than 30 years	Very long, it takes more than 30 years	Very long, it takes more than 30 years	Very long, it takes more than 30 years
	Impact intensity	Intensive and principal	Intensive and principal	Intensive and principal	Intensive and principal
4	The other impacted environment component	Subak irrigation system, rafting activities, WTP, large community and hydrobiota	Subak irrigation system, rafting activities, WTP, large community	Subak irrigation system, rafting activities, WTP, large community	Subak irrigation system, rafting activities, WTP, large community
5	Impact's cummulative characteristics	cummulative	cummulative	cummulative	cummulative
6	Reversible or irreversible	reversible	reversible	reversible	reversible
Impact's criteria		Important negative (-P)	Important postive (+P)	Important positive (+P)	Important positive (+P)

Table 6.33 The impact of activities on operational phase to the erosion and sedimentation

No	Determining factor to important impact	Activity	
		Dam and its facilities' functions maintenace	**Conservation on protected area and dam surroundings**
1	The impacted area	-	-
2	The impact spread area	All over the project locations and its surroundings including Ayung's downstream	All over the project locations and its surroundings
3	Term of impact	During dam operational	During dam operational
	Impact intensity	From moderate erosion into the easy one or from serious sedimentation into the low one	From moderate erosion into the easy one or from serious sedimentation into the low one
4	The other impacted environment component	Aesthetics and land use, and water quality	Aesthetics and land use, and water quality
5	Impact's cummulative characteristics	Cummulative	Cummulative
6	Reversible or irreversible	Irreversible	Irreversible
Impact's criteria		Important positive (+P)	Important positive (+P)

9. Impact on Terrestrial Flora

The impact towards terrestrial flora on operational phase is due to the plugging and impounding; dam and its facilities' functions maintenance as well as consevation area and dam surroundings organizing activities.

- The plugging and impounding are the activities purposed to block the water cofferdam channel (plugging) which is done during the dam construction ($\pm$ 3 months) that the flow of Ayung River will fill the dam and will be functioned as irrigation, aquatic tourism, fishery and so on. Due to the plugging by leveling the soil used for the water channel of cofferdam during construction, a lot of organics (nutritions) will be settled along the channel and the soil will become rich of organics and mineral contained on the top soil to the sub soil. By this plugging, the soil becomes fertile and stimulate the radpid development and growt of the terrestrial flora, both the existing flora or the new ones. The growth of various new vegetation species (both new and the existing one) will push the ecosystem balance through producers availability in order to accelerate the food schemes for consument's requirements. So will the impounding activity, which will form complex freshwater ecosystem. As the consequence of this activity is the positive impact which is widelr spread toward its surroundings, therefore the impact is important positive (+P).

- The maintenance of dam and its facilities' functions is required indeed as an effort to keep the dam's condition through maintenances for its functions of the dam iitself or its primary and secondary facilities. Considering the multipurpose characteristic of Ayung Dam, both for ecological requirement, to keep the stability of aquatic and terrestrial components ecosystem, by the prodecers (flora), consumers (fauna) and decomposer, and also for economic requirement, in order to increase community's income through rafting and restaurants which have been well managed by the community of Badung and

Gianyar Regency and also aquatic tourism (rafting and other water sports) as the effort to keep, raise and increase tourism sector in Bali. Indirectly, the maintenance activity provides positive impact to the species of terrestrial vegetation around. However, this impact persists only on the dam area and its surroundings that the impact accumulation occurs on a narrow area, hence the impact is unimportant positive (+TP).

- The activities of conservation on protected area and dam's surrounding are very positive and related (synergic) to the terrestrial flora component. The reforestation on critical area, steeply slope, and hills on the upstream (catchment area) and dam's surrounding, certainly, will increase the flora biological diversity, density and, eventually, the important values as well as local values. Because it is proposed to plant the vegetations with local value and rare. dengan komponen flora darat. It affects a quite big numbers of people (>50 %), rather large impact spread area out of the project location [covering two regencies and a city], the impact persists in a very long time, it is cummulative and reversible. The other impacted environment components are terrestrial fauna, climate, physiography and hydrology. This impact is categorized as the important positive (+P).

The explanation and impact's criteria from the operational activity for the terrestrial flora environment component is shown on Table 6.34.

Table 6.34 The determining of important impact's weight of plugging and impounding activities, maintenance of dam and its facilities' functions to the terrestrial flora species on the operational phase.

No	Determining factor of important impact	Activity		
		Plugging and impounding	**Maintenance of dam and its facilities' functions**	**Conservation on protected area and dam surroundings**
1	The impacted community	none	none	Large community, > 50 %
2	The impact spread area	On the project site (6Ha) and its environs	On the project site (6Ha) and its environs	Very large area, covering catchment area and dam's surrounding
3	Impact's intensity and term of impact	Begins with small intensity and in such a long term it becomes widely spread (ecosystem stability)	Begins with small intensity and in such a long term it becomes widely spread (ecosystem stability)	Very long time (more than 30 years)
4	The other impacted components	Increase of air quality and aesthetics value	Increase of air quality and aesthetics value	Intensive and very principal
5	Impact's cummulative characteristic	Cummulative	Not cummulative	Terrestrial fauna, hydrology
6	Reversible or irreersible	Reversible after the activities persist	Reversible after the activities persist	Cummulative and reversible
Impact's criteria/weight		Important positive (+P)	Unimportant positive (+TP)	Important positive (+P)

10. Impact on Terrestrial Fauna

The operational phase of Ayung Dam Development, particularly on plugging and impounding activities; waduk operational; maintenance of dam and its facilities' functions, and conservation on protected area and dam's surrounding activities are predicted causing significant impacts to the terrestrial fauna. Those impacts are:

- The plugging and impounding activities persist for rather long time (1 year), certainly, lead to a change, from landscape into aquatic zone. Commonly, the aquatic zone is a stimulator to invite some species of terrestrial fauna, such as mammals, reptiles,or significantly, birds. The birds love the habitats around lake, river or dam. Esepecially for the water birds which will abundantly come to the dam during the inundation. It affects the people around, and persists only during the inundation. From its intensity, the impact is classified as the moderate and positive impact due to particular populations (species). Apart from that, this impact is such negative impact, especially for the terrestrial fauna as long tail monkey, porcupine, and scaly anteater. Hal of their habitats are damaged or even disappeared because of the inundation. The impact is not cummulative and reversible, because it will be normal as the phase has over. From the explanation above, the impact is small and unimportant negative (-TP).
- The dam is multi purpose. On this phase, the environment condition has already stable. The existing terrestrial fauna has adapted. On the other hand, it is predicted that some other species will come to get foods, spawn and make the dam as its habitat. There will be return migration to the dam, especially for *burung beber air/belibis kembang, kuntul, kokokan, trinil* and others. It affects quite big numbers of people, rather large impact spread area (dam's area and its environs), occurs in a very long time, cummulative and reversible. The other impacted environment components are the society and tourism activities development and local culture values. This impact is important positive (+P).
- The maintenance of dam and its facilities' functions is required indeed as an effort to keep the dam's condition through maintenances for its functions of the dam iitself or its primary and secondary facilities. Considering the multipurpose characteristic of Ayung Dam, both for ecological requirement, to keep the stability of aquatic and terrestrial components ecosystem, by the prodecers (flora), consumers (fauna) and decomposer, and also for economic requirement, in order to increase community's income through rafting and restaurants which have been well managed by the community of Badung and Gianyar Regency and also aquatic tourism (rafting and other water sports) as the effort to keep, raise and increase tourism sector in Bali. Indirectly, the maintenance of dam and its facilities' functions give positive impacts to the existing terrestrial vegetation, and implicate the terrestrial fauna. However, this impact persists only on small area that the impact accumulation towards the terrestrial fauna occurs on a narrow area, hence the impact is unimportant positive (+TP).
- The activities of conservation on protected area and dam's surrounding are very positive and related (synergic) to the terrestrial fauna component. The reforestation on critical area, steeply slope, and hills on the upstream (catchment area) and dam's surrounding, certainly, will increase the flora biological diversity, density and, eventually, the existence of terrestrial fauna. The new micro habitat with particular variation is predicted to be able to form new community systems. The impact of this activity affects a relatively big numbers of people (>50 %), quite large impact spread area (ou of the project location), persists for a very long time, cummulative and reversible. The other

impacted environment components are the society, income and cultural values. This impact is categorized as important positive impact (+P).

Generally, the activities on operational phase of Ayung Dam cause impacts to the terrestrial fauna. The impact's resultant to the terrestrial fauna is categorized as the important positive; improvement on habitat and no more noise disturbance to the terrestrial fauna. The terrestrial fauna's behaviour, especially birds, related to the communication among them which involves "calling". For example, for the young bird that always with its mother and always hatchling and yearling to commmunicate and begging for foods. The impact intensity is quite significant and principal, the impact is cummulative and reversible. Hence, the impact is classified as important positive impact (+P). The flow pattern and impact's criteria are shown on Table 6.35.

Table 6.35 The determining of important impact's weight from plugging and impounding; dam operational; maintenance of dam and its facilities' functions and conservation on protected area and dam's surroundings to the terrestrial fauna

No	Determining factor of important impact	Operational Phase Activity			
		Plugging and impounding	**Dam operational**	**Maintenance of dam and its facilities' functions**	**Conservation on protected area and dam surroundings**
1	The impacted community	-	-	-	The community > 50 %
2	The impact spread area	Quite large covering an area of 73,17 ha and its environs	Wide, covering quite wide terrestrial fauna's home range and birds' migration	Limited, only on project location and its surrounding	Wide, covering quite wide terrestrial fauna's home range and birds' migration
3	Impact intesnity and term of impact	Small impact's intensity, excpet that the mammals will be disturbed and lost their nest. The impact is permanent	Big impact's intensity and for a long time and permanent	Small impact's intensity and for a long time and continuous	Big impact's intensity and for a long time and permanent
4	The other impacted component	Cultural values	Tourism object development	Tousrim object development and cultural values	Tourism object development
5	Impact's cummulative characteristic	cummulative	cummulative	cummulative	cummulative
6	Reversible or irreversible	reversible	reversible	reversible	reversible
Impact's weight/criteria		Unimportant negative (-TP)	Important positive (+P)	Unimportant positive (+TP)	Important positive (+P)

11. Impact on Aquatic Flora and Fauna

On the operational phase of Ayung River Dam, especially on plugging and impounding activities, dam operational, dam and its facilities' functions maintenance, and conservation on protected area and dam's surrounding activities are predicted to cause significant impact to the aquatic flora and fauna. Those impacts are as below:

- Plugging and impounding which persist for quite long time (1 year), certainly, will change the land scape into aquatic zone. Generally, in the beginning of inundation, the water and habitat qualities are ver bad. Apart from that, main channel plugging and inundation activities are predicted causing decrease of Ayung River flow volume up to 70 %. Such condition lead to principal impact on biology component (aquatic flora and fauna) especially on the dam's area to the downstream. The impact is negative for the aquatic flora and fauna. This also afect the people around, and the term of impact is only during the inundation. From its intensity, this impact is categorized as a significant impact. Apart of macrozoobenthos habitat will be damaged or even disappeared due to the inundation. The impact is cummulative and reversible, because once the phase has over, it will get back to normal condition. As explained above, the impact is significant and important negative (-P).
- The dam operational is multi purpose. On this phase, the environment has already stable. The aquatic flora and fauna have been adapted. On the other hand, it is predicted that some species will occur, particularly, on dam's surroundings, both naturally or introductionally. The dam is predicted to be functioned as natural hatchery. The fish seeds born in the dam can be flushed naturally and continuously to the ecosystem below as restocking. The impact of this activity affects quite big numbers of community (>50 %), the impact spread area is quite large (dam's surrounding and aquatic zone on downstream), the impact persists in a very long time, cummulative and reversible. The other impacted environment components are the community and tourism object development, fishing tourism object, natural fishery and local cultural values. This impact is categorized as important positive impact (+P).
- The maintenance of dam and its facilities' functions is required indeed as an effort to keep the dam's condition through maintenances for its functions of the dam itself or its primary and secondary facilities. Considering the multipurpose characteristic of Ayung Dam, for ecological requirement, to keep the stability of aquatic and terrestrial ecosystem components, by the producers (flora), consumers (fauna) and decomposer. Indirectly, the maintenance activities will give positive impact to the aquatic flora and fauna components. Still, this impact only occurs on narrow area, so that the impact accumulation towards the flora and fauna is categorized as the unimportant positive (+TP).
- The activities of conservation on protected area and dam's surrounding are very positive and related to the aquatic flora and fauna components. Reforestation on critical areas, steeply slope and hills at the upstream (catchment area and around the dam), certainly, can increase the land stability that the erosion and sedimentation to the dam can be minimized. The success of these activities is predicted to able to keep the water quality in the dam and Ayung River. The impact from this activity affects relatively big numbers of people (>50 %), quite large impact spread area (out of the project location), the impact persists in a very long time, cummulative and reversible. The other impacted

environment components are the community, income and cultural value. This impact is categorized as important positive (+P).

Generally, the activities on operational phase of Ayung Dam cause impacts to the aquatic flora and fauna. The impact's resultant to the aquatic flora and fauna is categorized as the important positive. The impact's intensity is categorized as a quite significant and principal one, it is cummulative and reversible. Therefore the impact is classified as the important positive impact (+P). The flow pattern and impact's criteria are shon on Table 6.3.11

Table 6.36 The determining of important impact's weight from plugging and impounding activities; dam operational; maintenance of dam and its facilities' functions and conseravtion on protected area and dam's surroundings toward the Aquatic Flora and Fauna

No	Determining factor of Important Impact	Operational Phase Activity			
		Plugging and impounding	**Dam operational**	**Maintenance of dam and its facilities' functions**	**Conservation on protected area and dam surroundings**
1	The impacted community	Rather large, especially on downstream	A lot, community around	-	-
2	The impact spread area	Rather large, covering 73,17 ha area and its environs	Wide, covering the dam's surrounding and downstream area	Limited only on the project location and its environs	Wide, covering the dam's surrounding and downstream area
3	Intensitas dampak dan lamanya dampak berlangsung	Basic change due to drastic decrease of water quality and water discharge. Inundation on hydrobiota	Significant impact's intensity and persists for a long time and permanent	Small impact's intensity and persists for long tima and continuous	Significant impact's intensity and persists for a long time and permanent
4	The other impacted component	WTP, rafting tourism and the community	Local and outside community, community's helath	Dam's surroundings	fishers, tourism activites
5	Impact's Cummulative Characteristic	Cummulative	Cummulative	Cummulative	Cummulative
6	Reversible or irreversible	reversible	reversible	reversible	reversible
Impact's criteria/weight		Important negative (-P)	Important positive (+P)	Unimportant positive (+TP)	Important positive (+P)

12. Impact on Social, Economy, and Culture Components

a. Increase of Job and Business Opportunities

The existence of dam will increase the job and business opportunities for the community. It is because dam is considered as a lake which can be used for fishery, tourism and recreation activities.

From the interview result to the respondents, the existence of the dam is really required for the community, especially for agriculture, tourism and small industry development. This can be seen that most of the respondents (90,77%) agree that the dam is required for agriculture development and other development sector. New job opportunities and business activities are important positive significant impact (Table 6.37)

Table 6.37 The impact of Dam Operational Activity in increasing the job and business opportunities

No	Determining factor of important impact	Ayung River Dam Operational Activity
1	The impacted community	> 50 % of the community
2	The impacte spread area	Susut Buahan, Buangga- Getasan, and Payangan Desa and large community in four regencies and city
3	Intensity and term of impact	Very significant intensity and persists during project operational
4	The other impacted environment component	Community's health and income, jobless
5	Impact's cummulative characteristic	cummulative
6	Reversible or irreversible	reversible
Impact's weight		Important positive (+P)

b. Increase of income for the community and region

After the operational of Ayung River Dam operational, it is predicted causing positive impact to the community and region's income, both direct or indirectly. The increase of income is predicted occuring through: increase of technical irrigation agriculture land due to the dam is able to supply the irrigation requirements. The development of Ayung Dam is useful for 9.542 Ha agriculture land irrigation , which can increase the agriculture production from 4,23 ton/Ha into 4,74 ton/Ha. It is expected that the increase of water supply to the agriculture sector, it can increase community's income.

Apart from that, this activity plan can increase the availability of potable water's raw water, from such condition without project of 600 lt/sec to 3.600 lt/sec, and generate the hydraulic electricity of 12,3 MW. Certainly, the increase of raw water potential for regional government (Regencial PDAM) can increase the region's income as well. The economic activities, indirectly, will increase the fund contribution to the region.

The dam will become an interesting tourism object. This will increase the amount of visitors and tourists to the dam location so that there will be opportunities for the community to make business. This impact is positive and categorized as the important one.

Although most of the people on the location are farmers in agriculture sector, particularly foods agriculture, still, their irrigation on both subdistricts has not yet such technical irrigation.

The dam existence, automatically, will open new job opportunities, especially on fishery, tourism and other services. The impact is positive and categorized as the important one. The explanation of impact on income is shown on Table 6.38.

Table 6.38 The impact of Dam Operational Activity in increasing the job and business opportunities

No	Determining factor of important impact	Ayung River Dam Operational Activity
1	The impacted community	> 50 % of the community (covering large community)
2	The impact spread area	Area around the dam and outside area on four regencies and city
3	Intensity and term of impact	Very significant intensity and principal, and persists during project operational
4	The other imapacted environment component	Community's health and sanitation
5	Impact's cummulative characteristic	cummulative
6	Reversible or irreversible	reversible
Impact's weight		Important positive (+P)

c. Cultural Heritage and Holy Area/Place

The plugging and impounding activities cause inundation in the dam that becomes negative impact (inundating)on holy area/place,particularly the holy spring at Tangluk Temple, Susut-Buahan and holy spring along the river side on Banjar Badung (Payangan Desa) and holy area campuan Susut-Buangga. Despite it, the cultural heritage as an irrigation tunnel which is not functioned anymore, on Buangga and Susut will also be inundated. It is predicted that > 50 % of Susut and Payangan Desa Village's community are impacted, and the impact is categorized as important negative impact (-P). (Table 6.39)

Table 6.39 The Impact of Plugging and Impounding towards the Holy Place/Area

No	Determining factor of important impact	Activity
		Plugging and impounding
1	The impacted community	> 50 % of the community
2	The impact spread area	Susut Buahan, Buangga- Getasan, and Payangan Desa
3	Intensity and term of impact	High intensity and persists during the project operational
4	The other impacted component	Community's security and orderliness
5	Impact's cummulative characteristic	cummulative
6	Reversible or irreversible	Hardly back to normal condition
Impact's weight		Important negative (- P)

d. Community's Security and Orderliness Disturbance

The disturbance of community's security and orderliness can be caused by the unfinished workers demobilization. Once the dam and its facilities development has over, the workers should be sent back to their origin (outside Bali). If the contractor is not responsible, the workers can be negelected (cannot go back due to financial problem). Because they do not have any job and income as well as no identity and residence, such condition burdens the people, disturb the local security or Bali in general, it can be for as dangers of looting or robbery or other impacts that < 50 % of the community are impacted. Due to the contractors has decided the return or workers with particular monitoring from the related institution, so that the impact is unimportant negative (-TP).

Plugging and impounding will stop the flow of Ayung River to the downstream. It has been never happened before, where the water is decreased for several days and it will disturb the community who take the advantage of the water, such as farmer and subak, rafting, nganyut ceremony, and other washing, bathing, and toilet activities around the river. The people will be annoyed and angry, furthermore they will damage the dam's facilities/hydraulic electricity power and other violence, which will threat the personnels. Apart from that, the inundation of holy area/place around Tangluk Temple and Banjar Badung Payangan Desa will cause disturbance betwen the worshippers (penyungsung) and project. Due to this process is conducted on rainy season, where the rain potential is abundant, so that the impacted community is small and not significant for other environment component, therefore this impact is categorized as unimportant negative (-TP).

The disturbance on community's security and orderliness also can happen on the dam operational for irrigation, electricity generating, water supply and recreation (tourism). Based on the result of interivew with downstream's farmers, kelian subak and pekaseh, 100 % declared that they are difficult to get water and struggle for water for their irigation, especially on dry season. If on operation phase of the project water remain in the river body less than present conditions, its rising risk of demonstration by farmers

and rafting community as well as damaging act of dam's facilities and violence to the personnels. Still, the dam operation is completed with good security and control system, this impact is categorized as unimportant negative impact (-TP). The impact of community's security and orderliness disturbance is explained on Table 6.40.

Table 6.40 The impact of Actvities on Operational Phase toward the Community's security and orderliness

No	Determining factor of important impact	Activity		
		Workers demobilization	**Plugging and impounding**	**Ayung River Dam operational**
1	The impacted community	< 50 % of the community	< 50 % of the community	< 50 % of the community
2	The impact spread area	Villages around the project and area to the downstream	Villages around the project and area to the downstream	Villages around the project and area to the downstream
3	Intensity and term of impact	Moderate intensity and uncertain term of impact	High intensity and temporarry impact	Moderate intensity and the impact persists during the operational activities
4	The other impacted component	phsycology	Security and agricultural activities	Agricultural activities and change of land function
5	Impact's cummulative characteristics	cummulative	Not cummulative	cummulative
6	Reversible or irreversible	reversible	reversible	reversible
Impact's weight		Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)

e. Impact on Community's Health Component

Once Ayung River Dam is operated, it is predicted causing very positive impact to the community's health. This positive impact is due to that the dam is predicted to able to increase the water supply for the large community both around the project or community on the other areas. Water supply is a very vital need for human being's life. The fulfilled of this need will give double impacts and implication to the economy and prosperity of large community, because the healthier body will increase the work capacity so taht, eventually, able to increase the production on some life's lines.Apart from that, the dam is also able to increase the irrigation water for subak for 9.542 ha agriculture land on the downstream. This is very positive for increase of agricultural products in general meaning.

Then, the dam is also expected to be able to support the establishment of cooler micro climate around the project area and it is able to stimulate teh rain fall that the water availability of our small Island, bali, will be more guaranteed. Accumulatively and

entirely, Ayung Dam operational activities cause the important positive impact (+P) toward the community's health, both direct or indirect.

Table 6.41 The Impact of Activities on Operational Phase toward the Communit's Health

No	Determining factor of important impact	Operational Activities of Ayung River Dam
1	The impacted community	A lot, at least communities on four regencies (> 50 %)
2	Impact spread area	Very large covering the project area and Southern Bali
3	Intensity and term of impact	Very significant and principal intensity and persists during the project's operation
4	The other impacted component	Community's health,sanitation
5	Impact's cummulative characteristic	cummulative
6	Reversible or irreversible	reversible
Impact's weight		Important positive (+P)

f. Works Accident

Allover the operational activities of Ayung Dam development plan is predicted causing impacts toward the job safety and accident. The potential activities are plugging, impounding, dam operational and maintenance activities. The potential impacted people are only on small numbers, only on the workers and the impact is only accident. The impact spread area is only around dam's surroundings. The impact inrtensity is small due to its incidental characteristic, with unpredictable term of impact. The other impacted environment component is disturbance on health. Due to the characteristic of job accident is incidental, therefore this impact is categorized as the *unimportant negative (-TP)*.

Table 6.42 The Impact of Operational Activities toward Job Sefety and Accident (K3)

No	Determining factor of important impact	Activity		
		Plugging and impounding	Dam operational	Maintenance of dam and its facilities
1	The impacted community	small (<50 %)	small (<50 %)	small (<50 %)
2	Impact spread area	Dam's surroundings and around	Dam's surroundings and around	Dam's surroundings and around
3	Intensity and term of impact	Incidental and unpredictable	Incidental and unpredictable	Incidental and unpredictable
4	The other impacted component	health	health	health
5	Impact's cummulative characteristic	cummulative	cummulative	cummulative
6	Reversible or irreversible	reversible	reversible	reversible
Impact's weight		Unimportant negative (-TP)	Unimportant negative (-TP)	Unimportant negative (-TP)

g. Disturbance on Transportation

The operational activities which are related to the transportation aspect are recreation facilities and nature tourism. Based on the condition, obviously, the transportation aspect isimpacted, still it is very small impact and unimportant considering the rafting tourisms have been well developed, in which the transportation increase will not cause any significant change. Hence, the transportationimpact on operational phase is categorized as unimportant negative impact. The explanation of transportation impact is shown on Table 6.43.

Table 6.43 Determining of Important Impact's weight toward the transportation component on.Operational Phase

No	Determining factor of important impact	Activities of recreation facility and nature tourism development
1	The impacted community	Very small if there is any transportation disturbance (<50 %)
2	Impact spread area	Very narrow, around the project only
3	Term of impact	Short time
	Impact intensity	Small impact intensity
4	The other impacted component	Community's restlessness Traffic accident
5	Impact's cummulative characteristic	Not cummulative
6	Reversible or irreversible	reversible
Impact's weight		Unimportant negative (-TP)

CHAPTER VII

EVALUATION OF SIGNIFICANT AND IMPORTANT IMPACT

7.1 Analysis towards Significant and Important Impact

7.1.1. Holistic Analysis

Evaluation of significant and important impact is the next step of Andal study after the prediction of significant and important impact. In the impact evaluation the matters which are explained focusing on significant and important impact only. The analysis to significant and important impacts, both positive and negative, are conducted in such holistic way, which means an on a significant and important impact is investigated until the final causal impact by looking through tge environments involvement to each other in every phase of activity.

Method to evaluate the important impact degree is according to the Guideline of Important Impact Measurement of head of Bapedal No. KEP.056 ,1994. While the degree of important impact is categorized into two, the important impact and unimportant impact. The degree of impact interaction which covers the interacting components and interaction's characteristics can be divided into the temporarry impact with the category of small impact, moderate temporarry impact, and continuous significant impact (Table 7.1).

Holistic evaluation impact is shown by the relations among the activity's impacts and the environment components on the impacted area. If the source of impact is on different source so that the impact has various conversion values. The number of impacted people and cumulative characteristic of an impact are the parameter which are related to the qualitative and quantitative data obtained from the existing environment condition. While fast evaluation from professional judgment aspect is a comprehensive method in doing analysis to the magnitude and significance of an impact.

Based on the explanation on Chapter VI (Prediction of Significant and Important Impact), the types of impacts of AyungRiver Dam Development plan can be known, with the evaluation result shown on Table 7.2. On that table, the weight is shown by P (important) and TP (unimportant). (-) and (+) show the impact's character, it is (-) negative and (+) positive.

Table 7.1 Evaluation Criteria of Significant and Important Impact

NO	OBSERVED ASPECT		CATEGORY OF IMPACT EVALUATION	
			UNIMPORTANT	IMPORTANT
1	The Impacted Community	Numbers of community which will be impacted, still they do not get any benefits compared with those who get the benefits	Less than 50 %	Equal or bigger
2	Spread Impact Area	**Aspect which changed:** - Impact intensity - Reversible of impact - Cumulative	No basic change	There is basic change
3	Term of Impact	**Aspect which changed:** - Impact intensity - Reversible of impact - Cumulative	Persists during construction phase and or post-construction or not principal	Persists on one or more phases and principal
4	Impact Intensity	Changes on :		
		- Physical or biologic characteristic	Still on the threshold	Covering quality standard
		- Environment component	Still on the threshold	Over the admitted criteria
		- Rare and endemic species	Not endangered and there are habitats around the project	Endanger and damaging the habitat
		- Protected area	Not disturbing or damaging the protected area	Disturbing or damaging the protected area
		- Cultural/historical heritage	Not damaging the historical heritage	Damaging the historical heritage
		- Conflict or controversion	Not causing conflict or controversy	Causing conflict and controversy among the community and government
		- High natural aesthetics	Not changing the aesthetics value	Changing the aesthetics value
5	Other Impacted Environment Component	Primary or secondary impacted environment component	The number of secondary impacted environment less than those which are primary impacted	The number of secondary impacted environment equal or more than those which are primary impacted
6	Impact's Cumulative Characteristic	-	Once The environment is able to assimilate the impact Do not strengthen each other	Continuously persisted Environment cannot assimilate the impact Strengthen each other synergic
7	Reversible or Irreversible	Change on environment component	Able to be restored	Cannot be restored reversible even with human's intervention

Table 7.2 The Matrix of Identification and Evaluation of Important Impact of Ayung River Dam Development Plan On Buangga, Pangsan Village, Petang Sub District, Badung Regency, Bali

No	Environment component	Pre-construction Phase				Construction Phase												Operational Phase					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
A.	**Geophysics – chemical**																						
1	Climate																						
	- Micro climate								-TP									+P	+P		+P		
	- Air quality					-TP	-TP			-P		-P	-P	-P	-P	-P	-TP						
	- Noise and level						-TP			-P		-P	-P	-P	-P	-P	-TP						
2	Physiography																						
	- Topography					-P				-P				-P				+P					
	- Geology stability									-TP				-TP									
	- land physic-chemical					-P	-P			-TP	-P		-P	-TP				-P			+P		
3.	Space and aesthetics																						
	- Land use					-TP		-TP		-TP				-TP				-P		+P			
	- Aesthetic					-TP		-TP		-TP				-TP				-P		+P			
4.	Hydrology																						
	- Water potential																	-P	+P		+P		
	- Water quality					-P		-P		-TP		-P		-TP				-P	+P	+P	+P		
	- Erosion and sedimentation					-TP			-P	-TP				-TP				-P	+P	+P	+P		
B	**Biology**																						
1	Terrestrial Flora					-TP	-TP	-TP	-TP				-TP					+P	+P		+P		
2	Terrestrial Fauna					-TP	-TP		-TP	-TP		-TP	-TP	-TP	-TP	-TP		+TP	+P	+TP	+P		
3	Aquatic Flora and fauna								-P	-P		-TP		-P		-TP		-P	+P	+TP	+P		
C	**Socio-economy-cultural and community's health**																						
1	Community						-TP																
2	Job and business opportunities					-TP		-TP				-TP							+P			+P	

3	Income					+TP		+TP				+P						+P	+P	+P	+P	+P	+P
4	Community's attitude and perception	-P	-P	-P	-P	-TP	-TP			-P													
5	Community's security and orderliness	-P	-P	-P	-P	-TP	-TP												-TP			-TP	+P
7	K_3 (job accident and safety)					-TP	-TP					-P	-P	-P	-P	-P		-TP	-TP	-TP			
8	Holy area/place/local values		-P					-P	-P									-P					
9	Community's health					-TP		-TP		-TP		-TP	-TP	-TP	-TP	-TP		-P	-P	-P	-P	-P	-
10	Transportation					-P	-P							-P			-P		-TP			-TP	

Explanation : P = Important
TP = Unimportant

Explanation of Ayung River Dam Development Activity Plan

No Explanation

I. Pre-construction Phase

1 Determining the borders of activity plan location
2 Land procurement for dam and its facilities development
3 Socialization of dam development plan
4 Erection of information board and announcement on printed mass media

II. Construction Phase

5 Access road construction
6 Mobilization of man power and equipments
7 Base camp construction and operational
8 Land clearing and stripping
9 Cut and fill for cofferdam, main dam and spillway
10 Grouting
11 Stone and concrete construction for the dam
12 Material transportation to and from the project
13 Quarry development
14 Mechanical and electrical for the dam
15 Development of hydraulic electricity power scheme
16 Demobilization of equipment and man power

III. Operational Phase

17 Plugging and impounding
18 Dam operational for irrigation, water supply and electricity
19 Maintenance of dam and its facilities functions
20 Protected area and dam's surrounding organizing for ecologic, drainage, ergonomic and aesthetics functions
21 Development of recreation and tourism facilities
22 Dam and visitors security