The Study on Comprehensive Disaster Prevention around Mayon Volcano

SUPPORTING REPORT (2)

(Part II: Feasibility Study)

XXVI : ENVIRONMENTAL ASSESSMENT

SUPPORTING REPORT (2) - XXVI
ENVIRONMENTAL ASSESSMENT

Table of Contents

List of Tables

SUPPORTING REPORT (2) - XXVI
ENVIRONMENTAL ASSESSMENT

1. IMPACT ASSESSMENT AND MITIGATION

The different structural projects, although themselves are preventive/mitigating measures, should still be evaluated with respect to their effects/impacts on the socioeconomic and natural environment. This is required under Philippine environmental regulations since these projects are located in environmentally critical areas (ECA). The proposed Yawa River Sabo dam facilities has a storage/sand pocket capacity of 28.56 million cubic meters. It is, therefore, considered also as an environmentally critical project (ECP) requiring an environmental impact assessment (EIA) under the same government regulations. The project would require a relatively large area (979ha) where earth moving activities and vegetation clearing would be done. Some of the areas also need land conversion. It would also have a large investment cost. Furthermore, it would involve the relocation of significant number of families in the community to relocation sites. The Legazpi City Urban Drainage Project would also require an environmental impact assessment because of the magnitude and cost of the project. A considerable number of people would also be dislocated by this project.

Preliminary assessment seems to indicate more beneficial than adverse effects would be generated by the different projects. Businessmen who are reluctant to invest in Legazpi City because of the risk of mud/debris flow might think otherwise and invest knowing that all measures are being done to protect the city and nearby municipalities. It might also generate more tourism-related businesses. The flood control project will boost economic activities in the city. It will also lessen air pollution generated by flood-induced traffic jams. It would also have a positive effect on health issues.

However, serious socioeconomic problems could emerge if the issues on lack of livelihood opportunities in the resettlement areas or in their immediate environs are not resolved. Extra attention should also be given to the selection of the resettlement sites. Safety should be a paramount consideration. It would be very tragic if some calamity-triggered accident (e.g. landslides) would befall the people who were relocated to protect them from the dangers of lahar/mudflows. Accessibility is also another factor. The site should not be very far from business and educational centers. The resettlement projects are considered as environmentally critical projects and as such would require environmental impact assessments. The projects would require large areas (27ha in Banquerohan and

22ha in Anislag) that would involve earth works, clearing of vegetation, and land conversion. Furthermore, their operation will result in the generation of considerably large volume of solid wastes and wastewater including possible contamination of groundwater.

The need for environmental impact assessment for the different supporting projects would depend on the size/magnitude of the project, fragility of the project site, the project components and production processes and capital investment.

1.1 Socioeconomic Impact

The Yawa River System Sabo Project would have tremendous positive social impact not only to those people who would directly benefit from its construction but also to others especially businessmen in Legazpi City and nearby municipalities. The project once completed would boost the confidence of people in the areas that the facility would protect. This could encourage farmers to improve their farm management practices with their consequent effects on improved production.

Improved productivity, in general, would eventually be translated into better lives resulting to immeasurable improvement in the social status of people who otherwise would have stagnated.

The knowledge that the government is serious in its effort to protect the city and nearby municipalities would give positive signals to prospective investors. Tourism would also benefit from the project. All these activities would generate employment and consequently their positive effects on the socioeconomic life of people. However, the project would displace about 65 families. Displacement of people from areas where they grew up or lived all their lives is a very traumatic experience. This feeling normally leaves a lasting scar in the minds/psyche of people in spite the promise of better opportunities in relocation sites. This feeling is normally experience by people who were separated from their community. This is not so apparent if the whole community is relocated to a single site. It is, therefore, important to provide counseling services to displaced people prior to or immediately after relocation.

The establishment of the relocation/resettlement sites, in general, would have more beneficial than adverse effects. It would give another chance for displaced families to start their lives anew. If given the proper support, these people could have better lives than they had in their previous places of residence. A sense of security against the dangers of natural disasters would promote emotional stability and its consequent positive effects on the productivity and civility of people. A

promise of a better and safer resettlement community would lessen opposition of people who would be displaced to the structural projects.

However, resettlers could experience severe socioeconomic problems if livelihood opportunities are not provided in or near the resettlement site. This is a very important issue that should be resolved before relocation/resettlement is undertaken. Lack of livelihood could spawn more serious social problems (e.g., theft/burglary, alcoholism, drug pushing/use, etc.) which would be difficult to solve if not immediately prevented/mitigated. Lack of livelihood could also result in the resettlers abandoning their homes in the resettlement site and returning to their previous places within the 6-km permanent danger zone. This would defeat the very purpose for which the comprehensive plan was conceived.

The integration of a modern forecasting, warning and evacuation system could have a tremendous positive impact on the confidence/morale of people living around Mayon Volcano. People would feel secure with the knowledge that they would be forewarned of imminent dangers from natural calamities. And if it becomes necessary that they be evacuated, there are functional evacuation centers ready for their safety. This feeling could translate to better productivity and serenity in the communities.

The Legazpi City Urban Drainage Project would also produce more positive than negative social impacts. The elimination/minimization of floods in the low lying areas of the city would minimize if not prevent flood- and pollution-related health problems. It would also enhance economic activities in these areas. Furthermore, it would bring an immeasurable feeling of relief to people who live in chronically flooded areas of the city and to others who do business there. However, the project would displace some families. The negative effect of displacement, however, would not be as great because urban residents are known to cope better with dislocation than their rural counterparts.

The different supporting projects are expected to give overwhelming positive social impacts. Their successful implementation would enhance the socioeconomic well being of both primary and secondary beneficiaries. The very purpose of resettling people - to protect their lives would be attained since the fundamental reason why resettlers go back to their places of origin (livelihood) would be solved. The success of the other projects would also have a multiplier effect on the other economic sectors.

1.2 Socioeconomic Considerations in Resettlement Projects

In most development programs that include construction of structural projects, the problem of dislocation of people are often encountered. Dislocation of people from their community, through involuntary resettlement, is a very traumatic experience. This is particularly true if only some members and not the whole community are affected. Dislocation affects people's lives in various ways. Kinship groups are separated and informal social networks that are part of regular sustenance systems are dissolved. Local organizations and formal and informal associations disappear because of the separation of its members. The existing economic system is also disrupted. Links between producers and their customers are often severed and local labor markets are disrupted.

Filipinos give very high value on family ties and special community-based social relationships. They are, therefore, vulnerable to the effects of dislocation. The effects are often manifested in mental depression and emotional instability that normally is more pronounced on rural folks than on their urban counterparts. Any government or non-government organization that is planning to relocate people should, therefore, recognized and consider this Filipino trait and its possible effects/consequences early in the planning stage of relocation/resettlement. This would make them aware of possible problems that could arise, hence, design appropriate solutions like providing counseling service. This should be provided prior to or immediately after relocation. However, there are mitigating measures by which problems associated with this trait could be alleviated. Experiences in successful resettlement projects such as Miisi in Daraga revealed that proximity/easy accessibility of the resettlement site to resettlers place of origin and/or to livelihood centers would greatly alleviate the problems associated with dislocation. Likewise, providing them with the necessary sources of livelihood that would keep them occupied would also produce the same effect. These would indicate that the primary concern of resettlers would be security of livelihood, the provision of which could overcome the traumatic effects of dislocation.

A comprehensive socioeconomic assessment of the prospective people to be relocated should be done before relocation/resettlement. Their knowledge and skills, absorptive or mental capacities, goals, preferences, attitudes, financial capabilities and other relevant socioeconomic characteristics, in addition to the characteristics of the resettlement site and surrounding environs, are important basis in the design of appropriate livelihood and associated training programs. The training program, as much as possible, should be undertaken before relocation and should continue after resettlement if it is needed. Likewise, the necessary livelihood programs should be in-placed in the resettlement sites immediately

after resettlement. The present sources of family income should also be considered. This could have an important bearing on why people are not willing to relocate or abandon resettlement sites that are far and/or inaccessible to their sources of livelihood.

Results of survey conducted in Banquerohan and Salvacion revealed the following sources of income and their corresponding percentages: contract laborers/wage earners-40.0; agriculture-related activities-27.0; salaried employees-15.0; business-9.0; remittances from abroad-7.0; others-2.0. The figures could probably indicate why a significant number of resettlers abandoned Banquerohan. This site is far and not easily accessible to the urban centers where wage earners and salaried employees derived their income.

The most common, yet one of the most important, issues associated with relocation/resettlement projects is the lack of appropriate livelihood opportunities in or near the resettlement sites. This is a very important issue that should be resolved before relocation is undertaken. If this issue is not resolved, it could spawn more social problems like theft/robbery, alcoholism, drug dealing and addiction, etc. However, once the government had established the socioeconomic infrastructures for a livelihood program, it should be made clear that the success and sustainability of the program is more of the responsibility of the beneficiaries than of the government. This aspect should be impressed upon the beneficiaries very early in the program implementation. It should be explained that the government has very limited resources and can only help in a limited way. The bulk of the work, if they are aspiring for better lives, rests squarely on their shoulders with government playing a supporting role. The government should be straightforward in explaining this aspect of resettlement and should not give false hopes to those who will be resettled. Otherwise, wrong impressions might be created that would generate more problems than the government can later handle. The success of the livelihood program greatly depends on the beneficiaries with government assuming a minor role. The general view that the government alone is responsible for its success should be corrected.

The success of a resettlement project depends to a large extent on the basic understanding of the social and cultural characteristics of the people to be resettled. This is usually a reflection of the general culture tempered by regional idiosyncrasies. Although the Filipino culture is very complex and has intricate interacting components, the government should try to understand and consider it in the planning and implementation of resettlement projects. The positive traits/values should be enhanced and the negative ones neutralized or mitigated. The basic Bayanihan (cooperative) spirit of the Filipino is still prevalent in

Banquerohan and Salvacion. This is supported by the survey conducted by the Bicol Small Business Institute Foundation that showed 51% of the respondents are willing to cooperate in some community undertakings. However, this trait should be expanded to include cooperation in business/economic undertakings. Normally, this trait is limited to cooperating with other members of the community in providing manual labor to residents who need assistance or to the community in general. This would not include cooperation in community-based economic undertakings. This is illustrated by the fact that more than 83% of the respondents would prefer to have their own business venture. This is further reinforced when more than 80% said that sole proprietorship had more chance of success than group endeavor. These findings reflect the individualistic and suspicious nature of a Filipino. However, these traits can be exploited even in community-based economic endeavors by carefully matching the individual knowledge/skills with appropriate work assignments. It could also be exploited by providing these individuals, who could not really fit in cooperative endeavors, with other livelihood activities requiring individual knowledge/skills. Another Filipino trait that could be harnessed to ensure the success of the relocation project is his innate tendency to help other people in need even if they are total strangers. Closely link to this is his/her hospitality to visitors. These traits could be made to bear on the suspicious nature of Filipinos toward others that are not close relatives or confidants. These traits should be enhanced during the initial stage of resettlement to remove barriers between people coming from different communities. The earlier the suspicions between different groups of resettlers are overcome, the better it is for the resettlement community to function normally. And the better is its chance of succeeding as a community of responsible citizens. A Filipino is industrious, however, he/she is also fun loving. This is shown by his expenditure patterns wherein he is willing to spend more on non-productive items such as fiestas and merry-making activities than on farm inputs (2.9% vs. 2.6%). Expenses for alcoholic drinks and cigarettes (1.9%) are higher than repayment of farm loans (0.11). These two characteristics, however, balance each other. Money is not everything to a Filipino. He also values recreation that gives him/her fun or personal satisfaction. It is a common saying among ordinary Filipinos that an individual who dies can not bring his money to heaven. Therefore, it must be used while living on this earth. The love for fun takes the strain out of the rigors of daily living. This is especially important for poor people doing hard manual work. The balance is manifested in the low suicide rates for ordinary Filipinos even if they are poor. It is very important, therefore, for planners to include recreational areas and for those who will manage the resettlement sites to design appropriate recreational activities.

The negative traits/characteristics of the people will also influence the success of resettlement programs. If the negative traits predominate and no remedial actions are taken, then there would be a great probability that the resettlement program would fail. Filipinos have numerous negative traits/characteristics/values/attitudes. One glaring example of these is the "manana" habit or his/her tendency to put off work that could be done today for tomorrow. This could have bad repercussions on many things particularly in business such as missed deadlines, lowered productivity and cancellation of business contracts. Another is his/her "mahala na" attitude. It is a sense of resignation or acceptance of whatever happens. A Filipino with this attitude would take things for granted and would not prepare even if he/she already knows the requirements of a work to be done. He/she would accept the result of his/her work even if this is of low quality or he/she could have done better. Similar to the previously mentioned habit, this attitude could also have negative effects in almost all aspects of life, particularly in business undertakings. There are other negative traits that if no corrective measures are taken would place the success of a resettlement program in jeopardy. This is where the government should come in. It should take the lead in providing counseling and guidance service. The government could likewise conduct value-forming seminars/workshops that would enhance the positive side of a Filipino and lessen if not eliminate his/her bad side. This aspect of resettlement work should be given great importance for this would greatly influence the success of the resettlement program. Furthermore, all other efforts, money, time and other resources spent on the other aspects of the resettlement program would come to naught if this particular subject is not properly addressed. The key role of the government is to find ways of cultivating and nurturing the innate goodness of a Filipino and channel it towards productive work while minimizing if not eliminating his bad traits.

2. IMPACT PREDICTION AND EVALUATION

2.1 Future Environmental Conditions With the Project

Natural Environment

The construction of the Yawa River System Sabo Facility would not generate any serious negative impact on the natural environment. The sites where the different structures (dams, spur and training dikes) will be located, were already devastated by past mudflows. These sites are, at present, barren land and grassland (Imperata cylindrica and Saccharum spontaneum). The riverbeds of Anoling and Pawa-Burabod are dry (dead) and water flows only during heavy rains. The project once

completed, on the other hand, is expected to enhance the natural environment by protecting the areas it was designated to protect. It will also lessen tremendously siltation and sedimentation of Yawa River if not totally protect it from devastation if a catastrophic event affects the Anoling and Pawa-Burabod Rivers.

The establishment of the resettlement areas, however, would have some negative impacts on the natural environment. Their construction would irreversibly alter/modify the natural landscapes of the sites. Moderate to severe erosion is expected to occur during land development activities with its consequent effects of siltation and sedimentation of creeks and other natural drainage outlets. The degree of erosion would depend on the topography of the relocation sites and the rainfall intensity during earth works. The resettlement areas once completed would generate other negative effects on the natural environment (e.g. increase in solid and liquid wastes, groundwater pollution, etc.) if facilities are poorly designed and constructed, and if no remedial measures are implemented.

The implementation of the Legazpi Urban Drainage Project would negatively affect, to a certain degree, the natural environment. Air quality in the city proper would deteriorate during the construction phase. Flooding would also be exacerbated, during this period, in low-lying areas and the immediate vicinities of the construction sites due to temporary clogging of drainage canals resulting from construction activities. Heavy vehicular traffic would also occur during construction of some components of the project due to the presence of men and machines, etc. on the road. The combined effects of flooding and construction activities would result to severe traffic congestion and its consequent negative effect on air quality. The project, however, once completed would significantly improve the air and river water qualities in the city. Less traffic due to the prevention of flood would mean less gaseous emissions (pollutants) from motor vehicles. Improved river flows as a result of the removal of silt and sludge, together with proper garbage disposal, would tremendously improve the river ecosystem.

The forecasting, warning and evacuation system project would have an insignificant effect on the natural environment. However, when people have been evacuated and billeted in evacuation centers, severe negative environmental impacts could be experienced due to the high concentration of people in a very small area. Groundwater pollution could be experienced from overflowing septic tanks (toilets). Pollution of the immediate environs could also take place from the disposal of solid and liquid wastes. Proper management is essential to prevent negative effects in the natural environment in the evacuation centers for people

and livestock. However, the immeasurable benefits of protecting the lives of a great number of people from disaster would negate all these negative impacts.

Socioeconomic Environment

Most of the structural projects would have immense positive effects on the socioeconomic environments of the direct and indirect impact areas. The Yawa Sabo Facility and Urban Drainage Projects would boost the confidence of businessmen to invest in Legazpi City and nearby municipalities. Knowledge of the government's effort to protect/improve the area would give positive signals to prospective investors. Tourism would also benefit from these projects. A sense of security against catastrophic events would enhance tourist confidence and therefore increase their arrivals. Business opportunities will improve in what used to be chronically flooded low-lying areas of the city. Health problems, associated with air and water pollution including floods, are expected to decrease significantly. Agricultural productivity in areas to be protected by the Sabo Facility is expected to increase tremendously. A sense of security might encourage farmers to improve their farm management practices with their consequent effects on improve production. A very important positive impact would be on the emotional stability of people in the threatened areas. A feeling of general security/lessening of anxiety normally have a great positive effects on the productivity and civility of people.

Resettlement on the other hand would give another chance for displaced families to start their lives anew. If given the proper support, these people could have better lives than they had in their previous places of residence. They could engage in other livelihood activities in addition to their traditional activity, which is mainly farming.

However, these projects would also produce negative socioeconomic effects. The construction of the Yawa River System Sabo Facility would displace about 65 families. Displacement of people from areas where they grew up or live all their lives, is a very traumatic experience. This feeling normally leaves a lasting scar in the minds/psyche of people despite the promise of better opportunities in relocation sites if proper counseling is not provided this could result to emotional instability and its consequent negative effects on the overall life of an individual. People who would be displaced by the implementation of the Legazpi City Urban Drainage Project could suffer the same experience. It is, therefore, very important to provide counseling service to these people prior to or immediately after relocation.

Resettlers could also suffer severe socioeconomic problems if livelihood opportunities are not provided in or near resettlement sites. This is a very important issue that should be resolved before relocation/resettlement is undertaken. Lack of livelihood could spawn more serious social problems (e.g. theft/burglary, alcoholism, drug pushing/use, etc.) which would be difficult to solve if not immediately prevented/mitigated. The same may also result to resettlers abandoning their homes in the site and/or returning to the 6km PDZ to resume their previous livelihood activities.

2.2 Future Conditions Without the Project

2.2.1 Natural Environment

Under normal conditions, there would be a gradual deterioration of the natural environments in the immediate areas of the Anoling and Pawa-Burabod Rivers. Siltation and sedimentation of the remaining rice fields will continue and eventually increase. These would result in lower productivity if not eventual abandonment of the rice fields. Silt, sand and other debris carried by floodwater from Anoling and Pawa-Burabod into Yawa River will result to continuous siltation and sedimentation of Yawa and its consequent effects on flooding in Legazpi City.

In the event of a catastrophic event, other than a major volcanic eruption where the Sabo facility would not serve its purpose, the areas to be protected by the facility would be partially or totally devastated.

Without the Legazpi Urban Drainage Project, the chronic problem of flooding will worsen and would lead to the gradual deterioration of air and river water quality in the urban areas of the city.

2.2.2 Socieconomic Environment

If the Yawa River System Sabo Facility is not constructed, there might be a slow down if not stagnation of investments in Legazpi City and nearby municipalities. The element of risk, particularly from catastrophic natural events, is a major consideration in investment planning. Stagnation or non-investment would generate other negative economic and social effects. Divestment, flight of capital or business relocation could happen if major catastrophic event, other than a major volcanic eruption, devastating large areas of the city would occur. Equally devastating would be the loss of lives and properties of the most vulnerable section of society* the rural poor that are in the direct path of lahar/mudflows.

Likewise, the destruction of the portion of the national highway and railway would disrupt vehicular traffic and therefore business activities. The Yawa River, which was never directly affected by lahar/mudflows, would be very vulnerable to such events. If Yawa River is damaged by mudflows, severe flooding might occur not only in chronically flooded areas but also in other parts of the city. This would further result to negative socioeconomic impacts (loss of business opportunities, health problems, etc.)

Without the Urban Drainage Project, there would be increased in areas where business opportunities are lost due to flooding. This would mean less income for both businessmen and drivers of utility vehicles. Health problems would also increase due to flooding, and air and water pollution.

If resettlements are not established, severe opposition to the structural facilities could be experienced from those who would be displaced. People residing within the 6-km permanent danger zone would be at risk.

3. ENVIRONMENTAL MANAGEMENT PLAN

An environmental management plan is a very important component of any development project that requires an environmental study. This component of the study contains the environmental protection measures to be taken to mitigate negative environmental impacts, provide in-kind compensation for lost environmental resources, and enhance environmental resources. The plan outlines environmental protection measures that will be undertaken to ensure compliance with environmental laws and regulations and to reduce or eliminate adverse impacts.

3.1 Mitigation Measures

3.1.1 Measures to Minimize Social Problems

Properties that will be affected by the construction of the Yawa River Sabo dam facilities should be properly evaluated to provide the appropriate financial package to affected families. This should be done in accordance with established government procedures. The affected families should be allowed to decide whether to relocate in any locality of their choice. They should not be forced to relocate in designated resettlement sites. However, they should be provided with proper guidance/advice on the different options available to them. This would lessen to a certain extent the psychological pain of being displaced or separated

from their community. The affected families should also be given preference in employment during the construction of the Sabo facilities.

A comprehensive socioeconomic assessment of prospective resettlers should be done prior to resettlement. Their job preference, present technical knowledge/capabilities, mental capacities, goals, financial capabilities, and other relevant social characteristics are important bases in designing appropriate training and livelihood programs. As much as possible, training programs should be undertaken before relocation/resettlement. Likewise, the necessary livelihood programs should already be in-placed in the resettlement sites immediately after resettlement. Resettlers should be kept busy with productive work so that they would not be preoccupied with the thought of displacement. However, a counseling service should always be available during the early periods of resettlement to provide professional help to people who should need it.

Families that will be displaced by the construction of some components of the Legazpi City Urban Drainage Project should also be accorded the same privileges given to those displaced by the Yawa River Sabo Project. Although urban residents are known to cope with dislocation better than their rural counterparts, professional counseling services should be provided for those who requires it.

All construction activities that will generate too much noise should be scheduled during daytime to prevent disturbing the rest period of people. This is particularly important in rural environments where noise tolerance is lesser than in the urban areas and where people normally go to sleep earlier.

In emergency evacuation, professional medical and counseling services should be provided during the entire period of temporary shelter to treat and prevent the spread of highly communicable diseases and provide psychological advice to people who will need it. Diseases could easily spread in camps and confined conditions in evacuation centers. Sanitation measures should, therefore, be strictly enforced to prevent such problems.

3.2 Erosion Control Plan

3.2.1 Construction Phase

The land development activities during the construction of the resettlement sites would involve clearing of vegetation and alteration and modification of the topography thus exposing the soil to erosion. To minimize or prevent soil erosion, the following mitigating measures should be considered by whoever would develop the resettlement site:

Timing of land development activities. Land clearing and earthwork should be undertaken during the dry season. If this is not feasible, the contractor should take into account the rainfall distribution in the area and confine earthwork during days without rains. This is particularly important in areas with steep and fragile slopes.

Stabilize embankments and cut slopes. If earthworks are undertaken during the rainy season, immediate stabilization of embankments and cut slopes should be done. The contractor could employ bioengineering erosion control measures, e. g., the used of coconut coir made into fiber nets, fascines and gabions together with planting of grasses and shrubs, to stabilize the embankments and cut slopes. This would prevent excessive soil erosion that could otherwise clog and/or cause siltation and sedimentation of creeks and natural drainage outlets.

For the Legazpi City Urban Drainage Project, rip rapping should be done immediately after the preparation of the riverbank for such activity to prevent erosion. Preparation and rip rapping works should be properly coordinated to prevent leaving the prepared riverbanks exposed to the elements for several days. If possible this should be implemented during the dry months.

3.2.2 Groundwater Protection

The design and construction of toilet facilities should be given careful attention to prevent contamination of groundwater. The pollution of groundwater is a real possibility considering the concentration of people in resettlement sites. The geomorphological characteristics of the area also promote this possibility. This was amply demonstrated by the 1996 JICA report on bacteriological examinations on 15 groundwater samples from Daraga and Camalig that showed contamination with coliform bacteria. Nine out of 15 samples were contaminated with fecal coliform bacteria despite the water coming from deep wells.

The same precaution should also be taken in the design and construction of additional toilet facilities in the different evacuation centers. Repairs, if needed, of present toilet facilities should also be done. These measures would go a long way in preventing the contamination of groundwater.

There should be regular inspection and maintenance of toilet facilities in both the resettlement sites and evacuation centers. This activity could be a community-based undertaking in the resettlement sites while the DECS/LGU could do this for the evacuation centers.

3.2.3 Proper Waste Disposal

Wherever there is a large concentration of people, problems in the proper disposal of solid and liquid wastes arise. This problem should be taken into consideration during the planning stage of the resettlement project. Proper disposal, particularly, of liquid wastes should be factored in the design of the different facilities of the resettlement sites. Disposal of solid waste could be a community-based effort in coordination with the concerned local government unit.

Likewise, provisions for proper waste disposal should be provided in the evacuation centers. The government agencies managing the evacuation centers should have ready contingency measures to address this problem.

3.3 Enhancement Measures

The livelihood programs provided the resettlers should be sustained through continuous institutional support (appropriate training courses, financial and marketing support, etc.) during the periods when these are still required. The resettlers could also be encouraged to form a multi-purpose cooperative and the necessary training provided to its officers and members. This would not only enhance the success of their business but would also cultivate their sense of community. Sense of belonging is very important for dislocated families coming from different villages to feel secure in a new community. This would determine, to a great extent, the success of any community-based social undertakings.

If possible, community-organizing activities should be provided during the initial period of relocation. This is to lessen the suspicions/hostilities that may exist between people coming from different communities/villages. It would also enhance inter-family relationships that would foster harmony in the community.

4. ENVIRONMENTAL MONITORING PROGRAM

This will involve the systematic collection of data and monitoring activities to determine the actual effects of the project. In addition, it determines compliance with regulatory standards and the degree of implementation of environmental protection measures. The information generated by monitoring programs provides the feedback necessary in assessing the effectiveness of protection measures. The environmental management plan for the proposed projects is presented in Table XXVI 4.1.

5 RECOMMENDATIONS/CONCLUSIONS

The five priority core projects and the eight supporting projects and programs would produce more positive than negative effects on both the natural and socioeconomic environments. The Yawa River System Sabo Project and the Legazpi City Urban Drainage Project would displaced some families, however, far greater number of people would benefit from their construction and operation. Their positive impacts go beyond the areas they are designed to protect. In addition, the Resettlement Sites Development Project would offer new opportunities to dislocated families aside from offering safe dwelling places. The Forecasting and Warning, and Evacuation System Strengthening Projects would complement the other anchor projects in preventing/mitigating the adverse effects of natural calamities on the socioeconomic life of the people in the Study Area . However, the priority anchor projects would not attain their potential effectiveness if the eight supporting projects and programs are not implemented. They are an integral part of the comprehensive disaster prevention strategy.

The structural priority anchor projects, although mitigating measures themselves, would require environmental impact assessment because of the large area that would require earth works/land development, vegetation clearing, land conversion and huge investment cost. The construction of the Yawa River System Sabo Project and the Legazpi City Urban Drainage Project would also displaced families. The Resettlement Sites Development Project, on the other hand, is expected to generate considerable amounts of solid and liquid wastes that could potentially pollute the groundwater.

The need for an environmental impact assessment for the various supporting projects would depend on their magnitude/size of operation and their specific locations. This is particularly true with respect to the aggregate production plant project, the mineral water production project, and the integrated animal production project.

Table XXVI 1.1 Initial Environmental Impact Assessment of Yawa River Sabo Project

PROJECTS/ACTIVITIES	IMPACTS		MITIGATING/ENHANCEMENT MEASURES
YAWA RIVER SABO PROJECT			
	● Prevent sediment-related disaster by trapping lahar, ash and debris . from upstream.	(+), HS	
		(-),NS	
	● Protect large agricultural lands, urban areas, archaeological and infrastructures in the downstream.	(+), HS	
	● Protect lives, and improve safety of people in downstream areas.	(+), HS	
I. Pre-Construction Phase			
1. Survey of Construction Sites	● Temporary employment of local laborers.	(+), NS	● Employ local residents.
2. Acquisition of Right-of-Way/Land	● Displacement of people. (65 households, 324 people).	(-), S	● Relocation and resettlement of affected families. ● Financial compensation for land and property according to established government procedures.
	● Loss of production/income .	(-), S	● Employ local people during construction with those being displaced being given preference.
3. Temporary leasing of land for establishment of base camp (field, office crew bankhouses, fuel depots, etc.	● Employment generation.	(-), NS	● Payment of compensation.
II. Construction Phase			
1. Land clearing, excavation and leveling	● Employment generation.	(+), S	● Employ local residents.
	● Change of topography.	(-). NS	
	● Air pollution due to dust and gas emissions from construction vehicles.	(-). NS	● Provide masks to workers if excessive dust is experienced at the sites. ● Sprinkle roads with water if dust is too excessive.
	● Temporary increase in noise levels .	(-). NS	● Provide ear muffs to workers operating heavy equipment/machineries. ● Avoid as much as possible night operations.
2. Construction of Sabo structures			
	● Improve business activities.	(+), HS	
	● Employment generation.	(+), S	● Employ local residents.
	● Air pollution due to dust and gas emissions from construction vehicles.	(-), NS	● Provide masks to workers. ● Sprinkle roads with water if dust is too excessive.
	● Increase in noise levels .	(-), NS	● Provide ear muffs to workers operating heavy equipment/machineries. ● Avoid as much as possible night operations.
	● Pollution due to solid wastes and oil/grease/lubricants.	(-), NS	● Strict enforcement of waste disposal.
III. Operation/Maintenance Phase			
1. Dredging	● Employment generation.	(+), HS	● Reforest the upper reaches of the river basins.
2. General Maintenance	● Improve business activities.	(+), HS	● Regular inspection and maintenance of the facilities.

(+) = positive impact
(-) = negative impact

NS = Not significant impact
S = Significant impact

HS = Highly significant impact

Table XXVI 1.2 Initial Environmental Impact Assessment of Legazpi City Urban Drainage Project

PROJECTS/ACTIVITIES	IMPACTS		MITIGATING/ENHANCEMENT MEASURES
LEGAZPI CITY URBAN DRAINAGE			
I. Pre-Construction Phase		(+), HS	
1. Survey of Construction Sites	● Employment generation .	(+), S	● Employ local residents.
2. Eviction of squatter families on waterways and affected river banks (to be determined)	● Displacement of people.	(-),NS	● Relocation and resettlement of affected people.
II. Construction Phase			
1. Excavation/Digging and Installation of Culverts in tertiary and secondary channels	● Employment generation. ● Prevent/minimize flooding. ● **Temporary** air pollution due to dust and and gaseous emissions from heavy vehicular traffic. ● **Temporary** increase in noise levels .	(+), S (+), HS (-), NS (-), NS	● Employ local residents. ● Vehicle operator should wear mask. ● Provide vehicle operator with ear muff.
2. Rip-rapping of river channels	● Employment generation. ● **Steam bank** erosion control . ● Protection of houses/other properties from sliding into the river. ● Temporary erosion of river banks due to soil disturbance. ● **Maintain better quality of river** water.	(+), S (+), HS (+), S (-), NS (+), S	● Employ local residents. ● Rip-rapping should be done immediately after river bank preparation.
3. Channel Excavation	● Improved river water quality due to the removal of silt, sludge and other pollutants. ● Regeneration of river flora and fauna. ● Elimination/minimize flooding due to better water flow as a result of increased drainage capacity.	(+), HS (+), HS (+), HS	● Strict enforcement of city ordinance on garbage disposal. ● Provision of garbage disposal bins in areas along river channels.
4. Flood gates construction and Establishment of Pumping Stations	● **Flood control.** ● Employment generation. ● Increase in noise levels during construction and pumping.	(+), HS (+), S (-), NS (-), NS	● Employ local residents. ● Avoid doing noise-generating activities at night. ● Provide ear muffs to workers.
III. Operation/Maintenance	● Minimum or no flooding in low-lying areas of the city. ● General improvement in water quality of the rivers. ● Increase business activities in areas that used to be flooded.	(+), HS (+), HS (+), HS	

(+) = positive impact
(-) = negative impact

NS = Not significant impact
S = Significant impact

HS = Highly significant impact

Table XXVI 1.3 Initial Environmental Impact Assessment of the Relocation and Resettlement Component of the Project

PROJECTS/ACTIVITIES	IMPACTS		MITIGATING/ENHANCEMENT MEASURES
RELOCATION AND RESETTLEMENT			
I. Pre-Construction Phase			
1. Survey of Sites	● Employment generation.	(+), S	● Employ local residents.
II. Construction Phase			
1. Land Preparation (leveling, excavation, earth moving, etc.)	● Employment generation	(+), S	● Employ local residents.
	● Irreversible transformation of landscape.		
	● Soil erosion.	(-),NS	● Schedule land development during dry season.
	● Siltation and sedimentation of rivers and creeks.	(-),NS	● Implement bioengineering erosion control measures.
2. Construction of housing units and other buildings.	● Employment generation.	(+), S	● Employ people who were displaced by Sabo Facility construction.
	● Increase in the amount of solid waste from construction crew in base camps.	(-), S	● Proper disposal of both solid and liquid waste.
III. Operation/Maintenance			
1. Occupation of the different housing units by beneficiary resettlers.	● General feeling of security from natural hazards.	(+), HS	
	● Problems with domestic wastes, both solid and liquid.	(-), NS	● Formulate and implement community-based waste management system.
	● Contamination of ground water due to faulty construction of . septic tanks.	(-), NS	● Regular inspection and maintenanceof toilets (a community-based undertaking).
	● Social problems due to lack or inadequate livelihood.	(-), NS	● Livelihood program should be in-placed before relocation of families. Continuing training programs on skill development should be provided.
	● Emotional problems due to phy - sical separation from close relatives and other social groups.	(-), S	● Counselling and provision of other money-earning activities.

(+) = positive impact
(-) = negative impact
NS = Not significant impact
S = Significant impact
HS = Highly significant impact

Table XXVI 1.4 Initial Environmental Impact Assessment of the Forecasting, Warning and Evacuation component of the project

PROJECTS/ACTIVITIES	IMPACTS		MITIGATING/ENHANCEMENT MEASURES
FORECASTING, WARNING AND EVACUATION			
1 Installation of additional monitoring and warning equipments	● **Prevent/minimized damage during disaster.**	(+), HS	
2 Evacuation	● **Safe place for affected people to** stay during disaster.	(+), S	
	● Productive assets including livestocks will be saved.	(+), S	
	● Possible ground water pollution due to the concentration of people in evacuation camps.	(-),NS	● Septic tanks (toilet) in evacuation centers should be properly constructed.
	● Health problems due to congestion.	(-),NS	● Provide medical staff to monitor health of evacuees.
	● Problems with solid and liquid wastes.	(-), NS	● Provide safe disposal areas for wastes.
	● Problems with animal/manure in livestock evacuation centers.	(-), NS	● Devise ways for proper disposal of animal waste.

(+) = positive impact
(-) = negative impact

NS = Not significant impact
S = Significant impact

HS = Highly significant impact

Table XXVI 1.5 Initial Environmental Impact Assessment of Supporting Projects

PROJECTS/ACTIVITIES	IMPACTS		MITIGATING/ENHANCEMENT MEASURES
LIVELIHOOD DEVELOPMENT FOR RESETTLERS			
• Organization and Strengthening of Multi-purpose cooperatives with Micro-lending component.	• Acquisition of skills.	(+) S	
	• Provision of livelihood to resettled families through establishment of multi-purpose cooperatives.	(+) HS	
	• Seed capital for own livelihood.	(+) S	
• Abaca Production and Handicraft Development.	• Acquisition of knowledge and skills.	(+) S	
	• Provision of employment or means of livelihood.	(+) HS	
• Pili Nut Processing.	• Acquisition of knowledge and skills.	(+) S	
	• Provision of employment or source of livelihood.	(+) HS	
	• Environmental-friendly by-products (pulp is used as animal feed, compost additive or processed as desert; shells are made into handicrafts).	(+) S	
• Coco Coir Production	• Acquisition of knowledge and skills.	(+) S	
	• Provision of employment or source of livelihood.	(+) HS	
	• Utilization of farm waste which would otherwise be harmful if burned or cause floating debris in coastal areas or clogging of drainage systems.	(+) HS	
	• Environmental-friendly products.	(+) S	
	• Health problems from coir dust.	(-) NS	• Workers should use protective face masks in factories.
• Hollow Block Production	• Acquisition of knowledge and skills.	(+) S	
	• Source of livelihood or employment.	(+) HS	
AREA ECONOMIC DEVELOPMENT			
• Aggregate Production Plant Project	• Employment generation.	(+) S	
	• Mining/extraction of aggregates in pocket area.	(+) HS	
	• Air pollution due to dust and gas emissions from trucks and crushers.	(-) NS	• Sprinkle roads with water if dust is too excessive. Provision of necessary air filtration system for crushers.
	• Noise pollution from operation of crusher.	(-) NS	• Avoid operation at night.
• Mineral Water Development Project	• Employment generation.	(+) S	
	• Salt water intrusion due to lowering of water table as a result of excessive extraction.	(-) NS	• Strict adherence to extraction guidelines issued by DENR.
• Productivity Enhancement Program in the Protected Area.	• Increase farm income.	(+) S	
	• Sustainable production and increased productivity.	(+) S	
	• Land reclamation.	(+) S	
	• Air and water pollution from animal waste.	(-)N S	• Install biogas digesters and utilize sludge as organic fertilizers.
INSTITUTIONAL STRENTHENING PROGRAMS			
	• Effective and efficient disaster management capability.	(+) HS	
	• Increase public awareness on disaster.	(+) HS	

Table XXVI 4.1 Environmental Monitoring Plan

Project Activity	Parameter	Location	Frequency	Responsibility
Yawa River Sabo Project				
I.Pre-Construction Phase				
1.Land acquisition	1 Payment of just compensation	1 Affected areas in project site	1 During land acquisition	1 Provincial government and concerned NGOs
2.Relocation	1 Provision of adequate shelter and livelihood programs	1 Banquerohan and Anislag Resettlement	1 Before actual relocation and regular monitoring after resettlement	1 DSWD and NGOs
II. Construction Phase				
1.Earth work and actual construction of Sabo facilities	1 Health status of workers	1 Project site	1 Semi-annually	1 DOH and NGOs
	1 Air quality	1 Air space above the construction sites	1 One-hour bi-monthly measurements during construction	1 EMPAS-DENR and multi-partite monitoring team (MMT)
	1 Noise levels	1 Residential areas near construction sites	1 Regularly during construction especially if there are night operations	1 EMPAS-DENR and MMT
Legaspi City Urban Drainage Project				
I.Pre-Construction Phase				
1.Land Acquisition	1 Payment of just compensation	1 Affected areas in project site	1 During land acquisition	1 Provincial government and concerned NGOs
2.Relocation	1 Provision of adequate shelter and livelihood programs	1 Banquerohan	1 Before actual relocation and regular monitoring after resettlement	
II. Construction Phase				
1. Dredging and widening of river channels and construction of dikes, flood gates and pumping stations	Hydrological and biological condidtions of waters in the rivers		1 Before start of construction and quarterly to semi-annually	1 EMPAS-DENR and MMT
	1 Water quality (dissolved oxygen, trace elements and nutrients	1 river water in the site	depending on the degree of changes	
	1 Water transparency	1 river water in the site		
	1 Noise levels	1 areas near sites of pumping stations and flood gaters	1 during peak periods of construction especially if there are activities at night	1 EMPAS-DENR and MMT
2.Construction of secondary and tertiary drainage	1 Air quality	1 Air space above site	1 during peak periods of construction especially if heavy traffic occurs	1 EMPAS-DENR and MMT
Resettlement Sites Development Project				
I.Construction Phase				
1.Earth work/site development	1 Soil erosion,siltation and sedimentation of creeks	1 downslope areas of the site and nearby creeks	1 during heavy rainfall	1 EMPAS-DENR and MMT
II.Operation/Maintenance	1 Disposal of solid and liquid wastes	1 resettlement site	1 monthly	1 LGU
Evacuation System	1 Disposal of solid and liquid wastes	1 evacuation centers	1 during emergency evacuation	1 LGU/MDCC
	1 Groundwater quality	1 evacuation centers faucets	1 during and after evacuation	1 EMPAS-DENR/DOH
	1 Health status of evacuees	1 evacuation centers	1 during emergency evacuation	
Supporting Projects/Programs	1 The environmental monitoring plan would depend on the magnitude/size of the particular project and its location.			