3.4 Sabo Facility

(1) Present Condition of Sabo Works

Based on the Sabo planning which were proposed by the JICA Study Team on 1981 and 1983, DPWH Region V has constructed Sabo facilities around the Mayon volcano. The number of the existing facilities is summarized in the following table:

Existing Sabo Facilities on Each River in the Study Area

River	Existing Facilities (Total Number and Total Length)	Existing Condition
Yawa	Boulder Dike (7 dikes, 3,078m)	Good
Pawa-Burabod	Spur Dike , Training Levee (13 dikes, 6,496m) , Consolidation Dam (1)	Partially damaged
Budiao	Spur Dike , Training Levee (6 dikes, >5,135m)	Partially damaged
Anoling	Spur Dike , Training Levee (7 dikes, 1,850m) , Ground Sill (1)	Good
Quirangay	Spur Dike , Training Levee (10 dikes, 3,305m) , Consolidation Dam (1)	Good
Tumpa	None	No facility
Maninila	None	No facility
Masarawag	Spur Dike , Training Levee (8 dikes, 1,700m)	Good
Ogsong	Spur Dike (2 dikes, 80m)	Good
Nasisi	Ground Sill (3 dikes, 565m) , Consolidation Dam (2)	Good
Buang	None	No facility
Quinali (B)	None	No facility
San Vicente	Spur Dike (6 dikes, >770m)	Need to rehabilitate
Arimbay	Spur Dike (8 dikes, 2,680m), Consolidation Dam (1)	Good
Padang	Spur Dike (7 dikes, 2,340m)	Partially damaged
Basud	Spur Dike (15 dikes, 2,913m), Consolidation Dam (1)	Partially damaged
Bulawan	Spur Dike (9 dikes, 3,493m) , Consolidation Dam (1)	Partially damaged

The Study Term observed that a part of training dikes, consolidation works, and riverbed girdles were damaged or destroyed. The summary of the damage condition for the existing facilities is as follows::

1) Consolidation Dam

The Whole overflow portion of the consolidation dam in the Basud River failed to function properly and was destroyed. In addition, owing to erosion of foundation along left bank on the Pawa-Burabod River, the consolidation dams in this river was broken away and also failed to function properly.

2) Spur Dike, Training Dike

A part of spur dikes and training dikes were observed to be damaged or destroyed. In case of failure of spur dikes and training dikes, plenty of foundations for training dikes with stone pitching structure may be considered to be damaged or destroyed by erosion of basement or bump of boulders.

Especially many damaged and destroyed portions were observed in the Basud River, the Padang River, the Budio River, the Pawa-Burabod River, and the Anoling River, situated from the southeast area to the southwest area.

The whole overflow section of the consolidation work in the Basud River was destroyed, which failed to function properly.

(2) The Damaged Condition of the Existing Facilities

The damage condition of the existing facilities was verified by the field survey. The summary of the damage condition for the existing facilities is as follows:

1) Consolidation Dam

The consolidation dam failed to function properly and the whole overflow portion was destroyed. In addition, owing to erosion of original ground along left shore of the Pawa-Burabod River, the consolidation work of the upstream stretch of the river was washed away, which also failed to function properly.

2) Spur Dike, Training Dike

It can be observed that a part of spur dikes and training dikes were damaged or destroyed. In many case their foundations with stone pitching structure were found to have been damaged or destroyed by erosion of basement of being bumped by boulders.

Especially many damaged and destroyed portions were observed in the Basud Rive, the Padang River, the Budio River, the Pawa-Burabod River, and the Anoling River, situated from the southeast area to the southwest area.

(3) The Cause of Damage of the Existing Facilities

The cause of damage of the existing facilities to be supposed from the damage condition is as follows;

1) Consolidation Dam

The cause of failure of the consolidation dam are considered as follows:

- the failure of the front apron from being hit by boulders as they rolled over the dam.
- after the front apron was destroyed, a part of the foundation of the dam was eroded away

A typical example of the damage in the Basud River is shown as follows:

- The foundation of the consolidation dam consists of a loose fresh sediment material, so that the downstream of the facilities is easily eroded.
- It is considered that the apron length of the existing consolidation dam, which is been induced by the field empiric is too short to protect the piping of sand and gravel base.
- There are lots of large boulders 1.0 m - 1.5 m in diameter, along the channel downstream of the dam site, which are considered to be transported with mudflows. Although, the large boulders bumped the wing section of the consolidation work, both sides of it were not destroyed.
- The traces of sedimentation soils along both banks upstream of the consolidation work show that consolidation work itself was in a state full of sands.
- It is considered that the failure of the consolidation dam was caused by the destruction by erosion under vertical wall and impact of large boulders.
- The fundamental cause of failure of facility is that facility plan has been designed without doing a river bed longitudinal survey or considering prediction of river bed elevation changes.

A process of failure of the consolidation dam in the Basud River can be explained as follows:

- Since large cobbles had fallen to the main consolidation work, the front apron was under abrasion. At the same time, the vertical wall downstream of the body was broken away.
- A part of the front apron was destroyed by impact of cobbles. Then a large part of the foundation with the apron was scoured off, and the apron became unsteady.
- After both the front apron and the vertical wall were destroyed, the foundation of the body set out to erode away.
- Owing to enlarged erosion on the foundation, loose boulder concrete inside the dam body set out to run off.

- With the consequence that the failure of the dam body has proceeded, sediment materials have run off from the upstream and a part of consolidation work eroded away was backfilled.

2) Spur Dike, Training Dike

The causes of failure of the spur dike and the training dike are as follows:

- Some cracks on the concrete facing and the boulder facing have occurred from impact of cobbles flowing down.
- The foundation of the dike has been eroded because of a short penetration, and the dike material has been washed away.

It can be concluded that these two combined causes resulted in failure of the dikes for reasons the following:

- Loose autochthonous sand in the field has been used for the dike material. Therefore, the concrete facing and the boulder facing are breakable from the impact of a boulder.
- From the field survey gaps or openings were observed between the facing of the dike and a material for stuff in the dike, and there are floating portions of the levee crown relative to setting of the material for stuff in dikes.
- Gaps or openings between the facing of the dike and a material for stuff in the dike have extended furthermore by the inside materials wash away because of settling, flowing and eroding.
- The slope gradient of embankment in the existing dikes is very gentle at 1:2.5. This finding proves that the material for filling is not strong in compaction.
- The location of dike failure is on the undercut slope banks which we attacked directly by debris flow and boulder with a diameter of 1.0 - 2.0 m deposited area.
- It is recognized that a scouring of the downstream to the cross dikes and channel bank where spur dikes are situated reveals a short of foundation depth of facilities.

Causes of failure of the spur dikes in the Bulawan River, Anoling River, and the Padang River are summarised as below.

- The main cause of failure of the spur dike in the Bulawan River is considered it being bumped by a boulder.
- The main cause of failure of the spur dike in the Anoling River is considered both from the erosion of the basement and being bumped by a boulder.
- The cause of failure of the spur dike in the Padang River is considered that a part of the foundation of the dam was eroded away and was destroyed, so the

dike filling material was washed away, and the broken portion was expanded more by impact of boulder.

3.5 Flood Control Projects

(1) Present Condition of River Improvement Projects

The river improvement works planned by the Master Plan in 1981 have not yet been implemented in the Study Area. The following table shows the existing river improvement works which have been planned, designed, and constructed by DPWH. Most of the dikes in the two rivers are not continuous but partial, and they are supposed to be tentative structures. The original river width for the dikes was basically maintained with a dike height of 4.00m. The design flood for the existing river structures was not disclosed, but is roughly estimated to be around 10-20 years by the Study.

Present Condition of River Improvement Works by DPWH

River System	River Name & Location	Facility Name	Height (m)	Length (m)	Date of Completion	Existing Condition
Yawa	Yawa Legazpi City	a. Boulder Dike	4.00	320	14 Feb, 1989	Good
		b. Boulder Dike	4.00	1,200	2 June, 1991	Good
		c. Boulder Dike	4.00	1,250	1 November, 1989	Good
		d. Dike No. 1,2,3,4	4.00	308	N/A	Partially Damaged
Quinali (B)	San Vicente	a. Boulder Dike No.1	4.00	115	22 December, 1990	Need to rehabilitate
		b. Boulder Dike No.2	4.00	115	22 December, 1990	Need to rehabilitate
		c. Spur Dike No.1	4.00	240	N/A	Need to rehabilitate
		d. Spur Dike No.2	4.00	240	N/A	Need to rehabilitate

The dredging of the river channel in the Yawa river has continuously been carried out every year.

(2) Review of Previous Studies

The Master Plan for Mayon Volcano Sabo and Flood Control Project was prepared by JICA in March 1981. Subsequent to this master planning, Re-Study of Mayon Volcano Sabo and Flood Control Project was carried out by JICA and its report was submitted to GOP in March 1983. This re-study aimed to re-assess and review taking account of the disaster due to typhoon “Daling” in June and July 1981. The report presented the unchanged river improvement plan which was

established by the Master Plan (1981). The river improvement works were planned for three rivers such as the Quinali (A), Quinali (B) and Yawa rivers.

The Nasisi river which is one of the 17 rivers for the Study was included as an uppermost part of the Quinali (A) river improvement plan.

The river improvement works recommended by the Master Plan are summarized below:

River Improvement Plan by the Master Plan (1981)

Item	Nasisi River	River Basin	Yawa River
		Quinali (B)	
Improvement Length	7.6 km	21.8 km	2.3 km
Design Discharge	920 - 1,660 m^3/sec	270 - 2,420 m^3/sec	2,150 m^3/sec
Proposed River Slope	1/130 - 1/400	1/80 - 1/1,200	1/300 - 1/1,000
Proposed River Width	80 m	42 - 270 m	150 - 190 m
Proposed Levee	50-yr design flood	50-yr design flood	50-yr design flood
- Slope	1 : 2	1 : 2	1 : 2
- Top Width	4 - 5 m	4 - 5 m	5 m
- Free Board	1.0 - 1.2 m	1.0 - 1.2 m	1.2 m
Proposed River Cross Section	Simple	Simple and Compound	Simple and Compound

Note: Items of the Nasisi river are only presented in the above list.

The plans of river improvement in the Nasisi, Quinali (B) and Yawa are shown in Figures 3.5.1 to 3.5.3.

The design flood of this river improvement plan was selected to be 50-year probable flood, considering importance of the region, design discharge of other rivers in the Philippines, and the Japanese Standard of river planning. No economical evaluation was made by different protection levels of flood damage to determine the design flood.

3.6 Disaster Forecasting and Warning

(1) Forecasting system

The Study Area is one of the disaster prone areas in the Philippines.

The Government of the Philippines is aware of the situation and has endeavored to mitigate the disaster. The establishment of the disaster forecasting and warning system is one of the measures to be adopted by the government to reduce the vulnerability of the area through the enhancement of disaster preparedness.

Since the forecasting of each hazard requires specific technology, the government relies on the relevant agency in the forecasting and the estimation of the

significance of the disaster. The relevant agency in charge of each hazard in the Study Area is listed below:

- Volcanic eruption(pyroclastic and lava flow) : PHIVOLCS
- Mud and debris flow : Regional OCD
- Rainfall and river water level : PAGASA
- Typhoon : PAGASA

Present situations of monitoring and forecasting on each hazard are briefed as follows:

1) Volcanic eruption

PHIVOLCS has managed Lignon Hill observatory to monitor and forecast the activities of Mayon volcano and to disseminate warning to the each DCCS including ROCD which are mandated to take actions against an impending hazard to protect people in case the hazard is predicted to bring about disaster. The monitoring focuses on the movement of magma through seismograph system measuring at four sites as follows:

- Mayon rest house : Northwest
- Upper St.Misericordia : East
- Barangay Anoling : South
- Lingnon Hill : South

Real time seismic data are available at the observatory because the telemetering system by 400MHz radio is introduced. The supervisory control unit with recorder drafts seismic wave on the basis of the gathered data by means of pen-plotting system. Volcanic specialists in the observatory monitor the drafted graph for all day. Figure 3.6.1 shows the example of seismograph recorded by the system. To distinguish the wave generated by the activity of magma from ones by others is not easy but a well experienced volcanologist focus their attention on the frequency, degeneration of amplitude and duration to detect the movement of magma. In case any indication is detected, the observatory report the situation through the exclusive radio of 9MHz to the head office in Manila. At the same time a facsimile of the drafted graph is sent for more detailed examination. In parallel with the analysis, the observatory carries out ocular surveys of the crater and its vicinity through a telescope. Concentration analysis of gas is the other survey to confirm the activity as well since the concentration of sulphur dioxide (SO2) shows remarkable changes if an eruption is imminent.

Sampling of gas is made by airplane or mobile. The concentration of sulphur dioxide is analyzed by a gaschromatography .The results of the survey are sent to the head office in Manila and the possibility of eruption is judged thereby. E-mail has been availed to communicate to each other on this matter. Further, the observatory monitor the deformation of the mountain using the installed electronic distance meter (EDM) to predict the timing and the scale of the eruption. The timing and the scale of the eruption are projected in the head office in Manila referring the swell of the mountain. E-mail is effective as well for the communication. All those judgements made in the head office are duly informed to the observatory for warning to the local disaster coordinating councils such as provincial, municipal, city, and barangay.

The existing seismographs function well. Data transmission and recording are rather satisfactory. The maintenance works thereof are rather satisfactory. The locations of the existing measuring site are shown in Figure 3.6.2 together with those planned by PHIVOLCS. The specifications of the existing seismic measurement system are compiled and shown in Table 3.6.1.

2) Mud and debris flow

Regional Office of Civil Defense manages the existing mud and debris flow monitoring system installed by JICA in 1997. The system detects the occurrence of debris flow by means of the installed wire sensor. A debris flow cuts the wires when it pass through the section in which a wire is installed. The relay box connected to the wire generate a signal which indicate the break. The radio transmitter transmits the signal to the receiver of the supervisory control unit through 400 MHz radio in the main office of the regional OCD in Legazpi city. The indicator of the unit is to be automatically turned on to show the occurrence of the event.

So far four wire sensor systems were installed in four rivers as follows:

Monitored river	Numbers of section wired
Basud	3
Padang	3
Pawa-Burabod	3
Budiao	4

Up to now, all the wires were cut off by the mud and debris flows that occurred after the system installation.

The locations of the sensor installed sites are depicted in Figure 3.6.3 and the specifications are summarized in Table 3.6.2.

ROCD has managed the existing rainfall observing telemetering system as well to monitor the occurrence of mud and debris flow. The details of the system is briefed in 3).

3) Rainfall and water level

PAGASA has carried out the rainfall observation for the purpose of flood forecasting and warning for the Bicol river. The upper most reach of the Bicol river fall on the western part of the Study Area. Ligao rainfall gauging station of the flood forecasting and warning system thereof is located adjacent to the Study Area. The real time rainfall data obtained thereby might be available for the forecasting and warning of the Study Area. The system adopts telemetering system of poling method and the interval of data gathering is set at one hour for normal condition. The interval can be shortened up to fifteen minutes by manual operation of the control panel in Naga city. In this addition PAGASA has established several observatories in the Study Area .The locations thereof are as follows:

- Legazpi South of the Study Area
- Sant Domingo East
- Tabacco North
- Buang West

Each observatory is facilitated with a set of weather measuring equipment. The main equipment are as follows:

- Rainfall automatic recording
- Air temperature min. and max.(daily)
- Air pressure hourly
- Wind velocity and direction
- Relative humidity min. and max. (daily)

A weather observer stations in each observatory to study data measured therein. The observer disseminates weather forecast to municipal and city DCC, through VHF radio telephone referring data and information in wider area like national weather provided by the central office in Manila through the SSB radio installed for the exclusive use of PAGASA.

Legazpi city observatory develops 3 hours rainfall intensity based on the recorded data and send it to central office together with other data for weather forecast

through the SSB radio. The central office carries out the weather forecasting for 12 hours. The results of forecast are to be sent to the relevant observatories through SSB radio.

The JICA has established five rainfall gauging systems and donated them to ROCD to monitor the rainfall depth in strategic watershed area in 1997 together with wire sensor system which were discussed before. The river basins to be monitored by the system are as follows:

- Maninila river 2km upstream from barangay Maninila
- Pawa-Burabod river 4km upstream from barangay Mabinit
- Padang river 2.5km upstream from barangayBuyuan
- Basud river 4km upstream from barangay San Antonio
- Buang river at Mayon Rest House

The installed sensor is of tipping bucket type and measuring is of the event report telemeter . Except Maninila system, all the measuring equipment are usable . However, the defect of 400MHz radio communication impede the system to send valuable data to ROCD. The rainfall sensor in Maninila system was removed by unidentified person. The solar panel of Mayon rest house was broken by the strong wind of typhoon Loleng that hit on 22 October 1998. The power sources thereof are solar battery system. Supplement of dilution water is necessary for most of batteries. During the field survey the sound reaction of the sensor were confirmed.

There are several water level gauging stations established in the Study Area by various agencies. Such stations are :

- Benanuan Ogson river
- Nassisi Nassisi river
- Banao San Francisco river
- Legazpi Yawa river

Almost all are of staff gauges and measurement, recording and data transmission were carried out by manual. The recordings were commenced in late 1950s. However, the activities have ceased in early 1980s. Rehabilitation of these stations for flood forecasting purpose might not be effective.

The locations of the gauging stations are indicated in Figure 3.6.4. The features or specifications of the hydrologic measuring system are summarized in Table 3.6.3.

4) Typhoon

PAGASA central office in Manila receives and examines the international meteorological information to forecast the course and magnitude of typhoon as follows:

- GTS for weather charts
- GMS for meteorological map
- RSM by JMA for atmospheric pressure chart
- TYM by JMA for typhoon track forecasting chart

PAGASA disseminates the result of the forecasted course to its branch offices and observatories through the SSB radio to inform relevant authorities, agencies and DCCs.

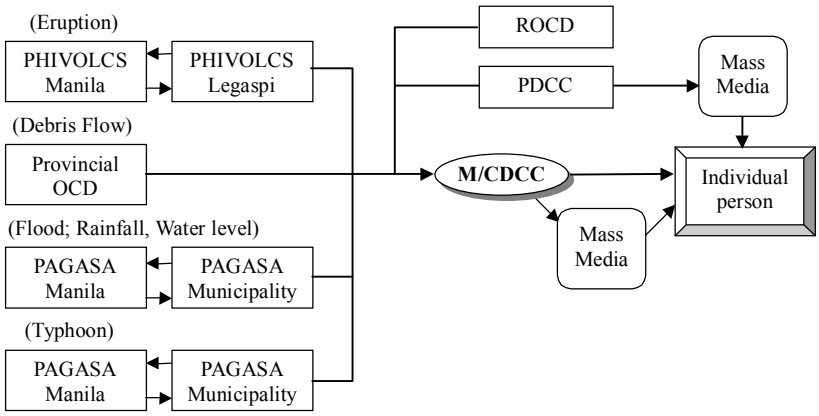
The contribution of local weather information itself is limited to forecast the route and intensity of typhoon. The weather report is then compiled in the central office based on the data from each of the observatories and its consolidated weather information is sent back to the central office. The weather forecasting equipment installed in the Study Area also contributes to increase the reliability of typhoon information.

(2) Warning system

In the Study Area, there is no system which disseminate warning automatically like a flood forecasting and warning system. All the warnings are to be once transmitted to receiver (Regional Office of Civil Defence and Provincial Disaster Coordinating Council) from the relevant agency through manual operation of communication system such as VHF and public telephone. Through PDCC, MDCC or CDCC, the local governments receive the warning and prepare for the impending hazard. Provincial disaster managing office(PDMO), the secretariat of PDCC possesses necessary communication facilities; a 24-hour Albay Provincial Radio Communication system, 17 UHF Porta Unit, 2 base units, 2 repeater sets and VHF hand held radio equipment. CDCC/MDCC relay the warning to barangay DCC through public telephone or house-to-house visit. However, for a remote barangay, MDCC expect the warning is received by the BDCC in proper manner through radio broadcast. In barangay, staffs of the BDCC in charge convey the warning and order to evacuate through house to house visit base.

PDCC, on the other hand , makes the warning public through mass media such as TV and radio. People can receive more general information on the hazard by broadcasting through of the mass media.

The following charts illustrate the dissemination flow of warning and order to evacuate :



Dissemination Flow of Warning and Evacuation

(3) Regulatory Background ,Institution and Organization

The Calamities and Disaster Preparedness Plan dated 24 August 1988, the Appendix B of the Presidential Decree 1566, provides the details for the creation of the operating unit for evacuation services. It defines the responsibilities and tasks of the local governments, regional, provincial, city/municipal, and barangay, with regard to the communication and evacuation in case an emergency arises. It also identifies the key organizations which will be involved in the evacuation activities as follows:

Agency	Main functions
PAGASA	monitoring and issues warning on typhoon and flood
PHIVOLCS	monitoring and issue warning earthquake and volcanic activity
OCD	prepares programs for disaster preparedness
PNP	provides security in the evacuation centers
AFP	provides transportation facilities and security
DPWH	provides transportation and communication facilities repairs damaged road and evacuation center

Although no regulatory mandate specified the responsibility on mud and debris flow, ROCD has managed mud and debris flow monitoring system in the Study Area.

DPWH also repairs the damaged river structures because Executive Order No. 124 of 1987 provides the responsibilities of DPWH as follows:

Plan construct, maintenance of infra structure facilities, especially national highways, flood control and water resources development systems

The numbers of staff of each agency in charge of forecasting is identified as follows:

Numbers of Staff in charge of Forecasting

Agency	Total	Forecasting	Maintenance
ROCD	5	1	0
PHIVOLCS Lignon	9	1	1
PAGASA Legazpi	12	1	1
DPWH Region V (Legazpi)	205	0	0
DPWH Region V	1,195	0	0

One staff who has good experiences in the monitoring system resigned in July 1998 from ROCD and a staff of the agency was assigned to monitor mud and debris flow in addition to lot of other important jobs and roles.

DPWH did not share the staff for forecasting works because no regulation assign any forecasting works to the agency, although Region V (Legazpi) holds ample engineers of 75 person out of 205 staff. It holds electrician and mechanics as well. Collaboration with them might be very useful for operation and maintenance work of the system.

(4) Problem of the Existing Forecasting and Warning System

1) System for volcanic eruption

Sensor

- The maximum period of one second might be too short considering the possible fall off of wave with high frequency during the propagation in soft material such as loose soil.
- One element (vertical) might not be sufficient because there might be the case where the horizontal element thereof is most prominent.
- No sensor is installed on the west of mountain and locating accuracy of active magma through the curve of travelling time is affected .
- The highest location of the sensor is Mayon Rest house of only 800m in elevation. This affect the estimation of the ascending movement of magma to some extent.

Recording of measured data for seismic analysis

- Analog data are pen-plotted to monitor and detect abnormal movement of the mountain , which impede a quantitative analysis.

Data transmission to the central office for seismic analysis

- Analog figure is sent by fax to the central office in Manila for analysis, which is liable to supply inaccurate data due to the deformation of the wave during data transmission.

Air sampling for sulfer dioxide analysis

- Air sampling site is selected arbitrarily in accordance with flight which induce a certain error in the analysis.
- Wind velocity and direction are measured at remote station from the sampling site. And certain error in adjustment is inevitable.

2) System for mud and debris flow

Sensor

- The Pawa-Burabod, Maninila, Basud and Padan are the only rivers monitored by wire sensor. Sensers therein were all broken by the mud and debris flow. There are many other rivers vulnerable to mud and debris flow.
- The maintenance of the sensor is costly because the sensor detect the debris flow when the wire is broken and should be re-installed after a heavy rainfall.
- Wire sensor is stable and sure to detect a debris flow but cannot afford sufficient lead time for evacuation, forecasting and warning purpose because the hazard may arrive at a barangay within 5 to 6 minutes after the sensor detected the occurrence. A method to afford longer lead time is necessary.

Data transmission and supervisory control unit for telemeter

- In general, technicians for system maintenance is insufficient.

3) System for rainfall and river water level

Sensor and monitoring

- The spatial distribution of rainfall is to be studied. However, it is apparent that telemetered 6 gauging stations including Ligao are insufficient to provide an accurate rainfall measurement in the Study Area.
- The existing rainfall gauging stations managed by PAGASA are located in urbanized areas with low elevation. The rainfall in the higher elevations in the watershed areas should be measured in order to estimate the rainfall effective to forecast and monitor flood and debris flow.

- It might be dangerous to observe manually the staff gauge during flooding. The sensor should be of automatic recording and telemetering type which afford 24-hour monitoring. In this respect, the effect of changeable riverbed due to silting should be considered.
- In order to monitor the drainage in Legazpi city, tide level at the Legazpi port should be measured because the rivers draining the city are affected by the tide level.

Data transmission and telemetering

- Manual data collection has a considerable difficulty especially under heavy rainfall. Telemetering system should be introduced .
- Ligao station may furnish useful data for flood forecasting because it is telemetered. The poling interval of one hour impede the applicability to mud and debris flow forecasting .

Forecasting

- In order to forecast mud and debris flow on the basis of measured rainfall, a certain modeling for decision making is necessary.
- In order to forecast flood on the basis of the measured rainfall and river water level, a certain modeling for decision making is necessary.
- In order to forecast the inundation on the basis of the measured rainfall and tide level, a certain modeling for decision making is necessary.
- Data on the structural conditions of the river channel are not informed to PAGASA and OCD.

4) Warning system

Public telephone is one of the substantial communication media to relay the issued warnings from C/MDCC to BDCC. Public telephone is the most easy communication measure. However, the traffic thereof is not controllable. VHF radio and SSB radio are supposed to be more useful. However, only 21 barangays are equipped with VHF radio facilities out of 112 barangays or 19% according to the result of Survey on Calamities and Casualties by the flood and debris flow. The same survey disclosed that barangays which equipped with cellular phone are only three, Donna Tomasa in Guinobatan, Balza and Awang in Marinao. To relay warning to barangay, house -to-house visit is still common practice.

3.7 Evacuation System

(1) Regulatory Background of Evacuation

1) Calamities and Disaster Preparedness Plan

The Plan which was formulated by NDCC in 1988 provides the details for the creation of the operating unit for evacuation services at the regional, provincial, city/municipal, and barangay levels to include the organizational set-up, the personnel selection criteria, the responsibilities and tasks of the said units. The main purpose of the evacuation service is to evacuate the populace and properties systematically in case an emergency arises. In addition, the plan also identifies the key organizations which will be involved in the evacuation activities as follow:

Roles of Agencies in Evacuation Activities

Name of Agency	Main Functions
DOST	
- PAGASA	- issues warning on typhoons and floods
- PHIVOLCS	- issues advisories on earthquakes, volcanic activities
DECS	- makes available suitable school buildings as evacuation centers
DOH	- provides medical services
DND	
- OCD	- develops and prepares programs for disaster preparedness
- PNP	- provides security in the evacuation centers
- AFP	- provides transportation facilities and security services
DPWH	- provides transportation and communication facilities, repairs damaged roads and evacuation centers
DSWD	- provides relief , counseling services and training
DOTC	- provides emergency transport services
NHA	- provides emergency or temporary housing facilities
PIA	- assists in disseminating warning
PNRC	- provides emergency relief assistance and training

2) Disaster management operation manual

In the Province of Albay, the PDCC has come up with the Disaster Management Operation Manual (July 1998) to serve as a guide on disaster management. One of its important components is the disaster response which outlines the specific responsibilities of the concerned organizations as well as the evacuation activity flow.

3) Disaster preparedness plans of the C/MDCCs

With the assistance of the PDCC, the municipalities of Bacacay, Daraga, Malilipot, Sto. Domingo, Tabaco and Legazpi City have formulated their own respective Disaster Preparedness Plans which also present the tasks of the organizations involved in the evacuation related activities. These plans basically follow the PDCC Disaster Management Operation Manual.

(2) Present situation

1) Institutional set-up

Evacuation is considered to be a local function. Hence the City/Municipal/ Barangay Disaster Coordinating Councils in the Study Area are held responsible for matters pertaining to evacuation based on the provisions of PD 1566. The Regional and Provincial Disaster Coordinating Councils are extending logistical support to complement the efforts of the lower DCCs concerning evacuation.

At the C/MDCC level, one of the service teams is the evacuation service term which is composed of a leader and his/her members. The number of members varies, oftentimes more than 15 members due to the involvement of the school district supervisors and principals in a specific city or municipality as team members. At the city and municipal levels, the key positions are usually manned by the LGU official or personnel. The other agency representatives and volunteers act as members of the evacuation service team.

At the BDCC level, the evacuation task team is headed by the team leader with 5 or more members. The members are called block leaders who supervise and expedite the movements of the residents concerned. Volunteers usually extend assistance at times of disasters since the limited Calamity Fund Allotment will not allow most of the BDCCs to hire permanent personnel (See Table in the next page).

Seven % of the barangays in the Study Area have not formed their BDCCs (Table in the next page). In this situation, the barangay council members automatically assume the roles and functions of the BDCC at times of disasters. It is also worth noting that in the survey on the Calamities and Casualties by Flood and Debris Flow conducted in relation to this Study, 60% of the 1,000 respondents from the Study Area are not aware of the existence of the BDCCs in their respective barangays.

The evacuation systems and procedures are supposedly an integral part of the Operations Manual of the Disaster Preparedness Plan; however, only a few of the

Barangay Councils/BDCCs have written Disaster Preparedness Plans. Hence, the barangay leaders/BDCC members usually undertake evacuation systems and procedures based on their previous experiences or from instructions issued by the C/MDCCs at times of disasters.

Information about BDCC

Cities and Municipalities	No. of Respon-dent Barangays	BDCC Organized		Ave. No. of BDCC Staff		Disaster Preparedness Plan (DPP)		Ave. Reserve for Calamity (1998)
		With BDCC	W/o BDCC	Officials	Volunteers	With DPP	W/o DPP	
City								
1. Legazpi	15	13	2	10	16	5	10	17,670
Municipalities								
1. Bacacay	5	4	1	10	31	3	2	35,811
2. Camalig	11	11	-	11	45	1	10	18,644
3. Daraga	13	13	-	11	18	3	10	53,534
4. Guinobatan	14	12	2	11	13	2	12	19,257
5. Ligao	8	6	2	13	16	1	7	16,547
6. Malilipot	10	10	-	11	21	2	8	17,983
7. Malinao	8	7	1	10	9	2	6	13,705
8. Sto. Domingo	9	9	-	10	10	1	8	19,106
9. Tabaco	19	19	-	11	49	3	16	19,971
Study Area	112	104	8 (7%)	11	23	23 (21%)	89 (79%)	23,222

2) Evacuation Procedures

The evacuation activities in the Study Area are mainly precautionary type in nature, meaning that the people generally are transferred to a safer place before the impact of disaster threatens their lives. Basically the evacuation activities can be described in the following phases:

Warning

In Albay Province, the institutionalization of the PDMO, which is also acting as the PDCC Secretariat, has made it possible to clearly define the flow of communication between the PDCC and the C/MDCC particularly in the issuance of the notice to evacuate in case of disasters. The PDMO is equipped with the necessary communication (a 24-hour Albay Provincial Radio Communication System, 17UHF Porta Units, 2 base units, 2 repeater sets, VHF hand held radios) and transportation facilities (i.e. rescue vehicle) as well as manpower (around 35) , albeit limited, to facilitate the early dissemination of the information to evacuate to the MDCCs concerned.

The PDMO acts as the communication center receiving information from PHIVOLCS or PAGASA or ROCD and other warning agencies as the case maybe and issuing advisories to those concerned which helps minimize incidence of miscommunication and confusion among the PDCC member agencies and the LGUs as well. However, the PDCC and MDCC admit to the existing problem of communication between the municipal government and the barangays particularly those in the remote areas. Hence, the upper DCCs depend mostly on the radio broadcast to relay the evacuation notice to the barangay officials as well as to the affected residents hoping for the timely receipt of such information. Other barangays have to be visited purposely by the LGU staff so that information will be communicated in time.

The results of the community surveys and the PRA sessions showed a high level of awareness of the residents on the alert signals and warning for typhoons but only a fair level for eruption of volcano.

Order to Move

- Mayon Volcano eruption and lahar

  In the case of the Mayon Volcano eruption, the order to move to evacuation centers will depend on the issuance of the warning by PHIVOLCS. Such decision will depend on the Mayon Volcano Alert signals which explicitly state the areas to be evacuated once a certain alert level is reached; i.e. Alert 3 = complete evacuation in PDZ; Alert 4 = evacuation of selected HDZ areas and Alert 5 = evacuation of additional or all HDZ areas (see Table 3.7.1). The message will be relayed by PDCC to the concerned C/M/BDCCs to facilitate the orderly evacuation of the residents living in the affected areas. Transportation facilities are usually required since the evacuation centers are far from the places where the evacuees live. Public as well as private vehicles are mobilized to transport the residents to the evacuation centers. The residents are sometimes escorted by the local officials in going to the evacuation centers. Figure 3.7.1 presents the evacuation steps if a mudflow (lahar) occurs.

- Typhoon

  The decision that the affected families will have to be transferred to the evacuation centers is issued by the barangay captains with or without the advice from the MDCCs since they can readily assess the situation at hand. The notice to evacuate is disseminated through house-to house visits by the barangay captain, councilors, and the block leaders. Each official is in

charge of a particular purok which enable the local officials to disseminate the information immediately to the affected residents. Within 48 hours after the issuance of Signal No. 3 for the typhoon, the residents are expected to transfer to the evacuation center. Within the remaining 10 or 12 hours, the P/MDCC will make the round of visits to confirm if the residents from the critical areas have followed the order to evacuate.

The affected families are advised to bring along evacuation kits such as water, food, medicines, milk for baby, flashlight, AM/FM radio receivers, and clothing, for the 1-2 days stay in the evacuation centers. However, others will not be able to follow such advice due to financial limitations. They will instead rely on the food rations to be provided by the P/M/BDCCs. In some instances, the residents refuse to leave their homes for fear of safety of their properties and livestock. Usually one or two male members of the family will remain in the house to look after their personal belongings and animals unless it is too dangerous for them to stay in the premises. This is due to the fact that the evacuation centers have no provisions nor facilities to house their livestock temporarily with the exception of the municipality of Daraga. Figure 3.7.2 reflects the flow of activities related to evacuation during typhoon.

The community surveys conducted in relation to the Study showed a high level of awareness of the barangay officials and the residents on the areas prone to disasters due to the eruption of the Mayon Volcano as well as those caused by typhoons and floods. They based their knowledge on their past experiences as well as from the information provided by the barangay officials. Hence, they are aware of the possibility of evacuation once the critical level in both the eruption and typhoon is reached.

In both cases of typhoon and eruption, the residents are very much aware of the identified evacuation sites which could be any of the following places: school buildings, chapel or church, barangay hall, municipal hall, private residences and buildings in their barangays or in the nearby areas. Such knowledge can be attributed to the information dissemination activities of the barangay officials. The barangay officials conduct house-to-house visits to reiterate the evacuation procedures as well as the specific site for evacuation to the affected residents.

The residents are also knowledgeable of the pick-up points that are usually located at the strategic places in the barangays such as the barangay hall, school premises or health centers in case that the evacuation centers are quite

far from their homes and vehicles will be required to bring them to safe places.

The children, women, persons with disabilities, and the elderly are evacuated first. There is hesitation to bring their other personal belongings to the evacuation centers particularly during typhoons since the residents are afraid that these will just get wet during the trip since most of the vehicles (trucks) are not properly covered.

A critical factor during the movement phase is the capability of the rescue and first aid team to provide the needed medical treatment on site. There is a problem of the limited skills and equipment for rescue operations and administration of first aid treatment by the rescue teams at the M/BDCC levels. Oftentimes, the rescue teams are not trained to handle emergency cases. They also do not have the basic equipment due to limited funds for disaster preparedness activities. The patient has to be brought to the hospital for proper medication instead of being administered first aid treatment.

Shelter

At the designated evacuation centers, the evacuees are registered and given room assignments. In giving room assignments, the center staff also consider the possibility of allocating rooms to families who express the intention of being together in a room. A leader per room is selected to facilitate monitoring and coordination of the evacuees.

There are 5 staff assigned to manage an evacuation center occupied by 300 families or less while 11 staff are assigned to manage an evacuation center occupied by more than 300 up to 500 families. The Principal or Head Teacher of the school or a Social Worker from the LGU assumes the overall supervision of an evacuation center (source : DSWD).

A standard stockpile of food commodities is supposed to be maintained at the evacuation centers from 1 week to 1 month. However, due to limited or absence of storage room in the schools, arrangements have been made with the NFA to supply the needed volume of rice as requested by the DCCs. Milk is usually included to serve infants/children as their primary food supplement. Canned goods are provided to the evacuees if ready-to-eat food is not available. The rate of food assistance while in the evacuation center is as follows: 1 kilo of rice for 6 persons/meal; 1 tin of sardines for 2 persons/meal, 1 cup of milk for 10 persons and additional 1 pack of 200 grams of milk per infant/day. Ready to eat food usually comprise of the following: boiled rice (1 pouch per person per meal) and

viand (1 pouch per 2 persons per meal). Non-food items like clothing, blankets, mats, mosquito nets, kerosene lamps, candles, matches, firewood, flashlights, laundry soap, water and food containers should be stored prior to disaster months (Source: DSWD).

In the evacuation centers the most common types of assistance received by the residents are potable water, medicines, food, and clothing. These are primarily provided by the government through the DSWD and the concerned LGUs. Such assistance is complemented by the non-government organizations such as the PNRC, the church-based organizations and other civic organizations.

Return

During typhoons, the residents usually make the decision on their own to leave the evacuation centers once the weather becomes clear and the floods subside in the place where they live. Since the evacuation centers are located near their residences, transportation facilities are not oftentimes provided.

In the case of Mayon Volcano, their stay in the evacuation centers can last up to 3 months until PHIVOLCS lower the alert level for them to return home. The information that they can do so is usually relayed to them by the local officials. They are usually provided with transportation facilities for their return home.

3) Standard or Criteria in Identifying the Present Evacuation Sites

The task of providing evacuation centers during disasters is given to the Department of Education, Sports and Culture (DECS) under PD 1566. As such, most of the evacuation centers in the Study Area are the school buildings which are oftentimes not provided with the required facilities to meet the needs of the evacuees.

For a Mayon Volcano eruption, the main criterion is that the evacuation centers must be located outside the danger zones. On the other hand, those which are used as evacuation centers during typhoons must be located in areas safe from floods and should have strong roofing to protect the evacuees. The DECS Region V has come up with the updated list of safe evacuation sites. However, there is a need to reassess the situation after the aftermath of Typhoon Loleng last October. Apparently, there are still school buildings located in inundated areas.

4) Present Identified Evacuation Centers

The data on the evacuation centers are regularly updated by the PDMO, the DECS and the LGUs. In 1998, a total of 209 evacuation centers in the Study Area were

listed by PDMO (Table below). These evacuation centers are identified for both volcanic eruption as well as typhoon and flood related evacuation activities.

Inventory of Safe Evacuation Centers, 1998

Cities and Municipalities	Estimated		Land Area		Estimated		No. of Safe Evac. Centers	Est. Total		Est. Population at Risk/Evac. Center	Est. Floor Area/Evacuee	No. of Evac. Center per km^2
	Population in 1998	%	km^2	%	Population at Risk	%		Floor Area m^2	%			
City												
1. Legazpi	155,786	21.70	153.70	11.67	81,191	18.47	49	5,400	12.75	1,657	3.25	0.32
Municipalities												
1. Bacacay	61,050	8.50	112.20	8.52	31,722	7.22	19	5,760	13.60	1,670	3.4	0.17
2. Camalig	55,130	7.68	130.90	9.94	31,161	7.09	13	4,908	11.59	2,397	2.04	0.10
3. Daraga	97,135	13.53	118.60	9.00	44,302	10.08	28	4,314	10.19	1,582	2.72	0.24
4. Guinobatan	69,624	9.70	203.00	15.41	45,354	10.32	11	3,840	9.07	4,123	0.93	0.05
5. Ligao	83,316	11.60	245.40	18.63	61,217	13.93	9	2,520	5.95	6,801	0.37	0.04
6. Malilipot	28,585	3.98	53.60	4.07	20,698	4.71	16	4,080	9.63	1,293	3.15	0.30
7. Malinao	35,482	4.94	107.50	8.16	29,271	6.66	17	9,360	22.10	1,721	5.43	0.16
8. Sto. Domingo	27,320	3.81	76.00	5.77	18,635	4.24	12		-	1,552		0.16
9. Tabaco	104,539	14.56	116.40	8.84	75,941	17.28	35	2,169	5.12	2,169	3.09	0.30
Study Area	717,967	100.00	1,317.30	100.00	39,492	100.00	209	42,351	100.00	24,965	24	1.84

Source: Provincial Disaster Management Office (PDMO)

Since the identified evacuation centers are not really intended to provide temporary shelter to the evacuees, the available facilities are insufficient to meet the needs of the evacuees creating discomfort especially among the children, women, persons with physical disabilites and the elderly. This is particularly experienced during the Mayon Volcano eruption, which entails staying at the evacuation centers for at least 3 months at times. Some of the schools like the Albay Central School and the Gogon Elementary Schools were provided with additional facilities like comfort/bath rooms and communal kitchens for use of the evacuees during the 1993 eruption. However, the facilities have been in dilapidated state since these are not properly maintained after serving their intended purpose.

There are no funds allotted for maintenance of facilities by DECS and the school authorities, are seeking the assistance of the local government on this matter. Some of the evacuation sites do not even have water facilities. The LGUs have to facilitate the delivery of water by fire trucks to the evacuation centers. The maintenance of sanitation is also aggravated by the lack of water supply and the situation adds to the discomfort of the families in the evacuation centers. The toilet facilities are also not sufficient to meet the needs of the evacuees.

Due to the limited available school buildings, it is common that a classroom (around 56 sq.m.) will provide accommodation to 10 families or around 55 individuals. Such a situation usually results in overcrowding and lack of privacy,

common complaints expressed by the evacuees. In the 1993 eruption of Mayon Volcano, the absence of back-up generators in case the power is cut off. The stay of the evacuees in the schools for prolonged period has also an effect on the studies of the school children. The teachers have to come up with remedial measures so that classes will be able to continue under the circumstances. Such measures include the merging of classes, having three shifts of classes in one day or conducting classes outside of the schoolrooms.

The existing evacuation centers have no space available for the livestock of the evacuees. It is only in Daraga that the LGU has designated an animal sanctuary (1,000 sq.m.) for the livestock of the affected families. The said sanctuary is located around 5 km. away from the evacuation center. The transport of the animals is arranged by the Municipal Agriculturist Office (MAO). The feeds provided by the evacuees are also complemented by the MAO while the animals are in the sanctuary.

5) Seminars and Drills

PD 1566 mandates the regular conduct of drills as an integral component of disaster preparedness and mitigation activities. In the Study Area, the conduct of such drills is being spearheaded by the PDCC in close collaboration with the Office of the Civil Defense. OCD is the organization primarily tasked with coordinating the disaster management functions at all levels of DCCs and monitoring the overall implementation of PD 1566.

Based on the survey results, the seminars and drills being provided to the residents are focused on general subjects like eruption of the volcano, functions of the BDCC, alert and warning signals, fire drills and rescue operations.

The evacuation drill entails the bringing together of representative families from several barangays in one site. They are told to bring provisions (food, water, clothing, kitchen utensils, etc.) and do a simulation of the evacuation procedures under the supervision of the concerned agencies. The Philippine National Red Cross (PNRC) which also plays an important role in the conduct of such drills is also involved in providing courses on first aid to equip the volunteers with the knowledge and skills in handling emergency cases during the evacuation process and during the stay of the families in the evacuation centers.

In 1997, the Bureau of Emergency Assistance of the Department of Social Welfare and Development (DSWD) in collaboration with the Social Welfare and Development Training Institute (SWADTRI) has come up with the Family and Community Disaster Preparedness (FCDP) Modules. This was an attempt to

integrate the various training programs being conducted by the Department in relation to disaster management. The modules are envisaged to provide tools for provincial/city/municipal social welfare development workers and trained volunteers in the conduct of family preparedness sessions and community teams at the barangay level.

The FCDP is comprised of eight modules on vital topics related to disaster management for families and communities especially those in the high risk areas. In Albay Province the DSWD Region V office has since adopted the training modules in the conduct of the training activities on disaster management at the municipal and barangay levels. The module on Disaster Preparedness, Response and Rehabilitation covers the topics on the following: (a) roles and functions of service providers in disaster preparedness, response and rehabilitation; (b) operationalization of the relief and rehabilitation service committee; (c) management of stockpile; (d) management of evacuation centers; and (e) operationalization of community kitchen.

The Department of Education, Culture and Sports (DECS) is also involved in the promotion of disaster awareness and preparedness through the inclusion of lessons on this topic in the social studies and scouting subjects of the students. The children are taught the basic lessons on disasters, first aid, etc. in these subjects.

Based on the interview survey to BDCC officials, a number of BDCC staff have participated in drills on disaster preparedness and other subjects. However, the frequency of BDCCs that did not participate is also significant. With a very poor participation rate, the BDCCs can not be expected to re-echo whatever skills gained on disaster preparedness. This could probably be one factor why the participation rate of barangay residents on the same subject is also poor.

3.8 Relocation and Resettlement

(1) Present Situation

There are at present six resettlement sites in the Study Area which are located in Daraga, Camalig, Tabaco, Guinobatan, Legazpi City and Ligao, as illustrated in Figure 3.8.1. These resettlement sites were established after the eruption of the volcano in 1993 under the joint cooperation of the Local Government Units (LGUs), government line agencies and other donor organizations. The management of these resettlement sites is undertaken by the respective LGUs. Total number of the families presently residing in these sites is estimated at 960 households as shown in the following table.

Profile of the Existing Resettlement Sites

Cities & Municipalities	Name of Resettlement Area	Area (Ha)	No. of Families to be Accommodated	No. of Families Resettled
City				
1. Legazpi City	Banquerohan	18.0 (Phase I)	504	326*
Municipalities				
2. Camalig	Batawon	9.8	480	408*
3. Daraga	Salvacion	1.7	149	142*
4. Guinobatan	Quitago	0.8	30	14*
5. Ligao	Baligang	0.35	46	45*
6. Tabaco	Buang	1.0	22	25*
Total		31.65	1,231	960*

Note : * with expanded family

The prime considerations in the site selection are the safety of the residents from the hazards brought about by the eruption of Mayon Volcano and the financial capability of the LGUs to purchase the land for the resettlement sites. Hence, with the exception of Baligang, Buang and Salvacion, the resettlement sites are located 7-20 km from the former residences of the resettled families. Due to limited funding, the site development of the resettlement sites was done in phases or subject to availability of fund. Such situation resulted in the delay in the completion of the physical infrastructure. Some sites have are not yet well provided with the basic facilities such as water and multi-purpose building up to the present times.

Although these families were relocated, their main source of income remains to depend on the cultivation of their lands that are located within the danger zones of Mayon Volcano. In some cases, the head of the family establishes a temporary dwelling place in the farm, stays there during the week and goes home during the weekend. Others commute everyday. Those who find this arrangement inconvenient simply return to their former dwelling places and use their homes at the resettlement site as “evacuation places” in times of disasters, like in Buang in Tabaco. According to the JICA questionnaire survey to the resettlers in 1998-99, around 50% of the resettlers in Quitago site were reported to have abandoned their housing units. forty-two percent of surveyed families in the existing resettlement sites expressed their problems in living there owing to the following reasons: lack of basic services, such as water supply and electricity and lack of employment opportunities.

The resettled families consider job creation as the most important activity that should be implemented in any resettlement program. This expectation is reflective of the basic needs of the family.

There is also an overwhelming preference for households in the danger zones to be relocated only within the boundaries of the Albay province. Unless the same opportunities are available in the resettlement area, the affected families will likely take the risk of going back to their previous places and face the consequences of the dangers brought about by the Mayon Volcano eruption rather than stay in the resettlement area.

(2) Settlement Issues and Constraints in the Resettlement Development

In the Albay Provincial Physical Framework Plan (1993-2002) drafted in 1997, one of the issues and concerns that was defined relative to settlement includes the existence of communities in volcanic hazard areas in the city/municipalities of Legazpi, Tabaco, Malilipot, Sto. Domingo, Daraga, Camalig, Guinobatan and Ligao. In this document, the efforts of the LGUs to resettle communities in high-risk areas were acknowledged, but it also mentioned the fact that there are still affected communities/families needing assistance. In view of continuing danger in high-risk areas, it further stated that the Provincial Government of Albay and the LGUs must fortify resettlement projects, and provision of livelihood opportunities and social services for the affected families must be undertaken.

Despite the PHIVILCS's declaration of "Permanent Danger Zone" and "High Danger Zone", there continue to exist a large number of people who cannot help but living in high-risk areas. According to the "Survey on Disaster Awareness and Preparedness including Evacuation (JICA)" in 1999, the reasons for their continued living in danger-prone areas are rather negatives ones (e.g., "cannot leave their own land", and "cannot find other places to live in"), rather than positive ones (e.g., "life is easier").

Among those living in the danger zone, "farming" is the major source of livelihood, comprising nearly 70% of the households. "Carpentry" and "pawnshop/money lending" constitute 12%, and 6%, while other types of livelihood actives are insignificant. The need to augment their present livelihood activities is apparent. The preferred choice for additional income-generation includes "handicraft and weaving" (36%), "farming" (11%), "livestock raising" (6%). In any resettlement, these livelihood activities are the ones that the affected families hope to initiate in their new locations of residence.

In the resettlement planning, it needs to contemplate a scheme, which enables the affected families to continue their livelihood activities they are used to (mostly "agriculture" by providing adequate land). At the same time, efforts should also be made to assist them in generating additional incomes through preferred choice for additional income generation.

When asked their preferences for livelihood activities, some of the resident brought up "lending/financing" (6%) and "cooperative" (1%). Resettlement projects and programs should entail financing schemes for the target populace to initiate new livelihood activities. In the question to those who already participated in the past resettlement schemes, about one-third answered that they were not satisfied with their new resettlement sites. Thirty-three point six percent of the interviewed resettlers state that their livelihood was affected by deprivation of working opportunities. The second major reason for their dissatisfaction is due to lack of electricity and water supply (26.4%). These indicate that, unless the above factors are addressed, any resettlement program is neither successful nor sustainable.

It is also to be noted that an overwhelming preference for households in the danger zone to be relocated only within boundaries of the native place. In reality, for the affected households around Mayon Volcano, it is usually difficult to find alternative sources of livelihood near resettlement sites. This implies that, unless similar or better economic opportunities are available in the resettlement area, the affected families are likely to take the risk of going back to their previous places and face the consequences of eruption rather than staying in the resettlement areas. Social and economic activities similar to what they have been used to in their previous residence will take time and resources to nurture in their new places.

(3) Planned Resettlement Sites

In addition to the expansion scheme of Banquerohan resettlement site (Phase I), there are four planned resettlement sites as shown below. These development plans are envisioned to provide housing to affected and poor families located in the municipalities of Daraga (Anislag), Sto. Domingo (San Andres), Tabaco (San Vicente) and Malilipot (Sta. Teresa, San Isidro Iraya and San Isidro Ilawod).

Profile of the Resettlement Development Plans

Municipalities	Name of Resettlement Area	Area (Ha)	Resettlers to be Accommodated
1. Legazpi City	Banquerohan (Phase II)	27.0	460
2. Daraga	Anislag	22.0	625
3. Malilipot	Sta. Teresa, San Isidro Iraya & San Isidro Ilawod	30.0	not defined
4. Sto. Domingo	San Andres	17.0	569
5. Tabaco	San Vicente	56.0	not defined
Total		152.0	1,654

Tables X 1.1 and X 1.2 in Supporting Report (1) give more detailed information about the features and issues of the respective resettlement sites, for both the existing resettlement sites and planned ones.