

*The Study on Comprehensive Disaster Prevention  
around Mayon Volcano*

**Volume II - MAIN REPORT**

*(Part II: Feasibility Study)*

To support the Five Anchor Projects, the Eight typical supporting Projects and Programs are proposed to be implemented abreast. These are:

**Livelihood Development for Resettles (Linked with Resettlement Sites Development)**

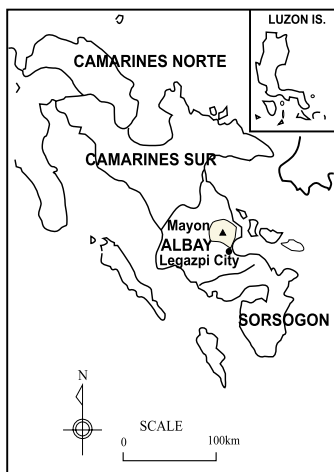
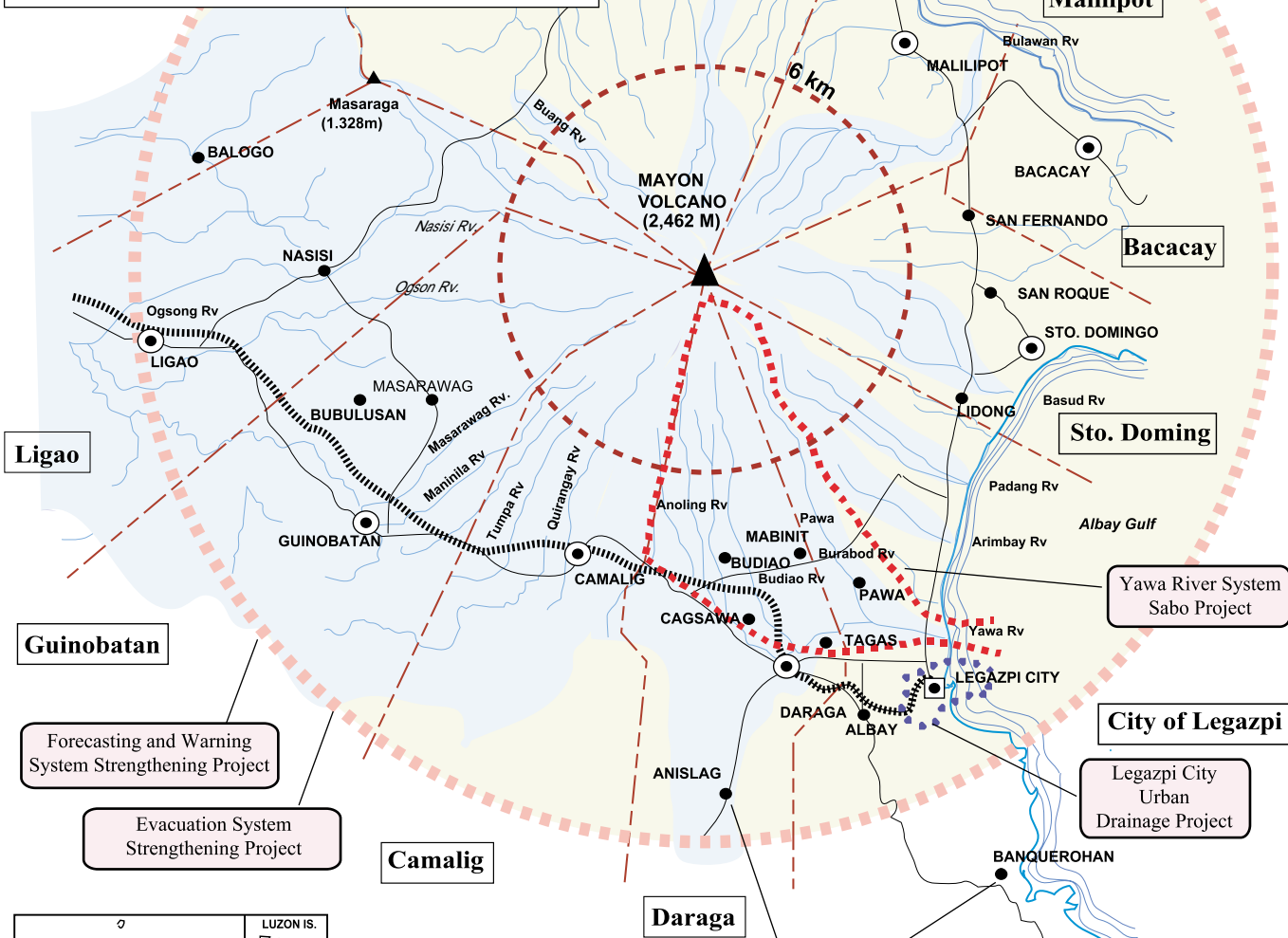
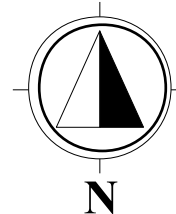
- (1) Organization and Strengthening of Multi-purpose Cooperatives with Micro-Lending Component
- (2) Agro-industry Development Project (Abaca, Pilinut and Coconut Processing)
- (3) Hollow Blocks Production

**Area Economic Development**

- (4) Aggregate Production Plant Project (Linked with Yawa Sabo Project)
- (5) Mineral Water Production Project
- (6) Productivity Enhancement Program in the Protected Area (Linked with Yawa Sabo Project)

**Institutional Strengthening**

- (7) Provincial Disaster Management System Strengthening
- (8) Community based Disaster Management System Strengthening



LEGEND:	
	Approximate Study Area
	City & Municipality Boundary
	6km PDZ (Permanent Danger Zone)
	River
	Target River Basin
	Major Road
	City & Municipality
	Railway

**LOCATION MAP OF THE STUDY AREA (Priority Projects & Programs Proposed in Feasibility Study)**



TIMBER LAND

PADANG

SANVICENTE

BIGAA

TINAGO

MATANAG

BAGONG ABRE

BONGA

ARIMBAY

MABINYI

SAN JOAQUIN

PAWA

PITA

TAMAQYAN

RAWIS

BOGTONG

CRUZAD

SAN ROQUE

BAGUMBAYAN

RIZAL

LBAY

DAP-DAP

PINARIC

TAGONTONG

PURO

LUBAS PT.

ESTANZA

BARIW TAYSAN

MALANGKA

LAMBA

PANGYAWAN

MASLOG

MARIAWA

PANGULO

BARAYONG

HOMAPON

BALISAY PT.

BANBANANONANG

POLIQUE BAY

TIGASIN

BAGACAY

CANAGATAN PT.

RUBURAN

DAWITAN

MAYDAJO

IMALNOR

BANLAGON

BAQUEROHAN

RAGONGRONG

SAN FRANCISCO

BARIIS

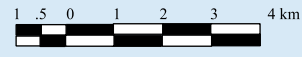
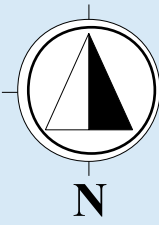
SAGRADA FAMILIA

BUENAVISTA

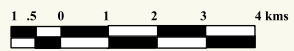
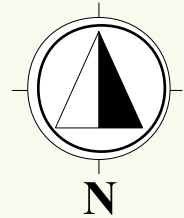
TO MANITO

EZPERANZA CAWALOG

CAGBACONG



MUNICIPALITY OF DARAGA  
 PROVINCE OF ALBAY  
 REGION V



- CONVENTIONAL SIGN**
- - - - - PROVINCIAL BOUNDARY
  - - - - - MUNICIPAL BOUNDARY
  - - - - - BARANGAY BOUNDARY
  - — — — PROVINCIAL / BARANGAY ROAD
  - BARANGAY
  - ~ ~ ~ ~ RIVER / CREEK
  - ||||| PNR TRACK

**MAP OF DARAGA MUNICIPALITY**

## **CHAPTER 7 PRIORITY PROJECTS FOR FEASIBILITY STUDY**

In consideration of the administrative procedures and formalities to be followed in GOP for formulation and adoption of the new projects/programs, allocation of the budget, establishment of the project organization, and set-up of the project monitoring and management system, the Master Plan was formulated so as to implement, up to the target year 2020, 16 projects/programs for comprehensive disaster prevention.

The projects/programs recommended to be immediately executed in this Master Plan were combined as “Short-term Plan” or “Priority Core Projects and Programs” which are subject to a feasibility study. The priority package consists of the five core projects and eight supporting subprograms.

### **7.1 Priority Core Projects Selected for Feasibility Study**

In screening out the priority package projects and programs for feasibility study, the evaluation criteria were established and used, based on the basic concepts and strategies formulated in the Master Plan and through discussion with the authorities concerned. The criteria for prioritization of the projects are composed of the following four key indicators:

- 1) Urgency of implementation  
Urgency might be assessed by the degree of imminence of the impending disaster.
- 2) Economic advantage  
The economic advantage can be represented by EIRR of the project.
- 3) Number of beneficiaries and affected people
- 4) Degree of representation as a model project

The core projects selected as priority ones satisfy the above criteria clearing the respective admissible levels, and more detailed studies are being carried out together with their typical supporting programs.

As mentioned in Subsection 2.2 (Chapter 2), all the priority package projects and programs selected for feasibility or pre-feasibility study are designed to “mitigate/reduce the hazards or vulnerabilities”, then contribute to strengthen the “Disaster Prevention Capacity (DPC)”.

The following are the five priority Core projects on which the feasibility study has been conducted:

(1) Yawa River System Sabo Project

- a. Objective: The project aims to trap all debris materials which devastate the downstream areas.
- b. Site:
  - Anoling and Budiao River
  - Pawa-Burabod River
- c. Beneficiaries: People living in the downstreams of the Yawa river system (Legazpi City and Daraga Municipality)
  - No. of Households : 3,900
  - Total Population : 21,000
- d. Components:
  - Sand Pocketing Work:
    - Sabo Dam (length) : 1,100 m
    - Spur Dike
      - CSG Type : 2,325 m
      - Combined (CSG and Embankment) Type : 5,825 m
      - Embankment Type : 375 m
  - Channeling Work:
    - Training Dike
      - CSG Type : 4,125 m
      - Combined Type (CSG & fill) : 925 m
- e. Implementing Body (Relevant Agencies): DPWH, Legazpi City & Daraga Municipality

(2) Legazpi City Urban Drainage Project

- a. Objective: The project aims to mitigate flood inundation in Legazpi City that situates in low-lying area frequently caused by interior flood and tidal flood.
- b. Site: Tibu river and Macabalo rivers & its upstream tributaries
- c. Beneficiaries: People living in Poblacion (Town proper) of Legazpi City
  - No. of Households : 13,300
  - Total Population : 70,400

d. Components:

- Design flood: 10 year probable flood
- River improvement plan:
  - Tibu (Total length = 834 m)
  - Macabalo (Total length = 1,700 m)
  - Tributaries (Total length = 315 m)Work volume for river improvement:
  - Excavation (Tibu: 1,500 m<sup>3</sup>, Macabalo: 36,400 m<sup>3</sup>)
  - Embankment (Tibu: 437 m<sup>3</sup>, Macabalo: 4,840 m<sup>3</sup>)
  - Riprapping (Tibu: 9,180 m<sup>2</sup>, Macabalo: 23,750 m<sup>2</sup>)
- Pump drainage plan:
  - Macabalo (Design total pump capacity = 3 m<sup>3</sup>/s, Horizontal shaft: 4 units)
  - Tibu (Design total pump capacity = 15 m<sup>3</sup>/s, Submersible: 2 units)
- Work volume for pump drainage:
  - Embankment (Tibu: 4,600 m<sup>3</sup>, Macabalo: 16,000 m<sup>3</sup>)
  - Reinforced concrete (Tibu: 3,200 m<sup>3</sup>, Macabalo: 6,700 m<sup>3</sup>)
  - RC pile (Tibu: 560 m<sup>3</sup>, Macabalo: 3,900 m<sup>3</sup>)
  - Floodgate (Tibu: 3 sets, Macabalo: 5 sets)

e. Implementing Body: DPWH & Legazpi City

(3) Forecasting and Warning System Strengthening Project

- a. Objective: The project is intended to furnish necessary and timely information and warning to residents person and relevant agencies for their preventive activities against disasters to be incurred by volcanic eruption, flood, inundation, mud and debris flow and typhoon.
- b. Site: Around Mayon Volcano
- c. Beneficiaries: People living around Mayon Volcano (within 17 km from the crater: about 400,000 persons)
- d. Components:

*(Upgrading of the Forecasting System)*

- Eruption monitoring system with 3 telemetered seismograph
- Slope deformation monitoring system with GPS
- SO<sub>2</sub> gas sampling and analyzing equipment (Existing)
- Mud and debris flow monitoring system with 36 telemetered event report type rainfall gauges

- Flood and inundation monitoring system with 6 telemetered water level gauges and 1 tidal gauge

*(Improvement of Warning System)*

- VHF radio system among agencies (Existing)
- Inter-agency disaster information network with WEB servers
- Radio paging system between MDCC/CDCC and BDCC

e. Implementing Body: DPWH, OCD & PHIVOLCS

(4) Evacuation System Strengthening Project

a. Objective: The project is intended to protect life and property from the disaster to be caused by volcanic eruption, flood, inundation, mud and debris flow and typhoon through evacuation to safer place.

b. Site: Around Mayon Volcano

c. Beneficiaries: People living around Mayon Volcano (within 17 km from the crater and in low lying areas: about 400,000 persons)

d. Components:

*(Extension of the Evacuation Centers and Their Facilities)*

- 56 evacuation centers for 9 municipalities and one city with the area of 37,200m<sup>2</sup>
- Water supply system with 929 faucets (165 faucets existing)
- 1,314 sets of toilets
- 857 shower facilities

*(Construction of Emergency Shelters)*

- 16 emergency shelter sites in 9 municipalities and one city
- 16 sets of telecontrolled siren systems in 9 municipalities and one city

*(Preparation of Livestock Sanctuary)*

- 9 livestock sanctuary sites in 9 municipalities and one city (One site existing)

e. Implementing Body: LGUs & DPWH

(5) Resettlement Sites Development Project

a. Objective: The project aims to improve the existing resettlement site and develop the new resettlement site for the people still residing within



the danger zone (especially 6 km-radius zone from the crater), and likewise for those to be relocated due to implementation of the physical projects around Mayon Volcano.

- b. Sites: Banquerohan (Legazpi City) and Anislag (Daraga Municipality)
- Banquerohan resettlement site : Phase I (18 ha) & Phase II (27 ha)  
= 45 ha
  - Anislag resettlement site : 22 ha
- c. Target beneficiaries:
- |                        | <u>No. of households</u> | <u>Population</u> |
|------------------------|--------------------------|-------------------|
| • Banquerohan Phase I  | 600                      | 3,180             |
| • Banquerohan Phase II | 460                      | 2,438             |
| • Anislag              | 635                      | 3,366             |
| <u>Total</u>           | <u>1,695</u>             | <u>8,984</u>      |
- d. Components:
- Lot allocation: Lot type I = 120m<sup>2</sup> & Lot type II = 210m<sup>2</sup>
  - Standard floor type: Floor type I = 21.7m<sup>2</sup>, Floor type II = 33.7m<sup>2</sup> & Floor type III = 42.7m<sup>2</sup>
  - Infrastructure: Core housing units, water supply system, power supply system, circulation system (major roads & alleys), drainage system, site cleaning & sanitary system
  - Community Facilities: School building, chapel, multi-purpose hall, health & day care center, productivity center and warehouse
- e. Implementing Body (Cooperating Agencies): Albay Province, Legazpi City & Daraga Municipality (DSWD, NHA & NDCC)

## 7.2 Proposed Supporting Projects and Programs

The following eight projects and programs are proposed for livelihood and area development and institutional strengthening to enhance and sustain the disaster prevention capacity:

*(Livelihood Development for Resettlers)*

- 1) Organization and Strengthening of Multi-purpose Cooperatives with Micro-lending Component

- 2) Agro-industry Development Project
  - Abaca Production and Handicraft Development
  - Pilinut Processing
  - Coco Coir Production
- 3) Hollow Blocks Production

*(Area Economic Development)*

- 4) Aggregate Production Plant Project
- 5) Mineral Water Production Project
- 6) Productivity Enhancement Programs in the Protected Area

*(Institutional Strengthening)*

- 7) Provincial Disaster Management System Strengthening
- 8) Community-based Disaster Management Strengthening

Note: The projects & programs proposed to be implemented in the respective development plans are to be promoted in parallel with the above projects & programs.

The profiles of eight support projects and programs are outlined below:

- (1) Organization and Strengthening of Multi-purpose Cooperatives with Micro-lending Component
  - a. Objective: The project aims to uplift the living standard of the resettled families through organizing multi-purpose cooperatives. The cooperative members will be given trainings on community organization, team building principles and practices, and project management.
  - b. Beneficiaries: Cooperative members of the Area including Banquerohan and Anislag resettlement sites.
  - c. Expected Benefits/Outputs:
    - The participants will be provided with the basic knowledge and skills necessary to undertake standard cooperative activities.
    - After the necessary skills training, the micro-lending will be provided to the eligible members so that they can engage in self-help livelihood projects.

- d. Conditions of the Project:
- Participants should be identified resettlers living in the two resettlement sites: Banquerohan (Legazpi City) and Anislag (Daraga Municipality).
  - The beneficiaries of the micro-lending scheme will have to be qualified members of the cooperative who have undergone all the pre-membership requirements of the CDA and all the trainings given.
- e. Implementing Body & Relevant Agencies: As implementing body, a cooperative is to be formed by the interested resettlers. LGU will act as leading agency and others as cooperating ones which include CDA, DSWD, DTI, TLRC, LBP, etc.

(2) Agro-industry Development Project

The agro-industry development project consists of the following three sub-projects, which are based on the use of the local indigenous products like abaca, pilinuts and coconuts.

1) Abaca Production and Handicraft Production

- a. Objective: The project is intended to provide the resettlers with livelihood to improve their living standard. It is designed to produce handicrafts using local quality abaca materials to provide a stable agro-based industry to be set up. This handicraft production will provide the resettlers additional household income.
- b. Beneficiaries: Cooperative members of the Area including Banquerohan and Anislag resettlement sites
- c. Expected Benefits/Outputs: Handicrafts made of abaca will be exported to abroad. Initial harvest will give a farmer an estimated net annual income of PHP30,000 for one hectare farm. The hand made abaca paper can give an estimated annual net income of PHP448,450 for organized cooperative of at least 30 members.
- d. Conditions of the Project:
- Intercropping with other crops is recommended to provide a stable income & livelihood
  - A productivity center and equipment are needed for handicrafts production

e. Implementing Body & Relevant Agencies: As implementing body, a cooperative is to be formed by the interested resettlers. The relevant agencies are composed of leading agency (LGU) and cooperating ones like CDA, FIDA, TESDA, DA, DTI, TLRC, DOST, DPWH, etc.

## 2) Pilinut Processing

a. Objective: The project aims to provide employment opportunities to the residents of the resettlement sites. They would be assured of a stable additional household income.

b. Beneficiaries: Cooperative members of Banquerohan and Anislag resettlement sites

c. Expected Benefits/Outputs: Harvests of 1 hectare pili plantation will give an estimated annual net income of PHP50,000. Processing of pilinuts into various handicrafts and food will give substantial and stable income to the engaged resettlers.

d. Conditions of the Project:

- Skills training and seed capital for livelihood are required.
- Productivity center with processing equipment is needed.

e. Implementing Body & Relevant Agencies: As implementing body, a cooperative is to be formed by the interested resettlers. The relevant agencies consist of leading agency (LGU) and cooperating ones such as CDA, TESDA, DA, DTI, TLRC, DOST, DPWH, etc.

## 3) Coco Coir Production

a. Objective: The project is to generate employment opportunities for the resettled people by developing labor-intensive industry in or around the resettlement sites by making the most of the indigenous local products or coconut husks.

b. Beneficiaries: Cooperative members of Banquerohan and Anislag resettlement sites

c. Expected Benefits/Outputs: The member-farmers will earn substantial income from engaging in this production. Using coconut husks for fiber production is ecologically advantageous and environmentally friendly. The estimated annual income of the cooperative with about 60 members is estimated at PHP946,090. It will further provide employment for

about 80 families who will earn PHP 25,620 per year for twine making and PHP101,694 for weaving.

d. Conditions of the Project:

- A productivity center with the needed manufacturing facilities and equipment, together with the basic infrastructure development coupled with skills training is very important and indispensable for realization of the project.

e. Implementing Body & Relevant Agencies: As implementing body, a cooperative is to be formed by the interested resettlers. LGU will act as leading agency and others as cooperating ones which include CDA, PCA, TESDA, DA, DTI, TLRC, DOST, DPWH, etc.

(3) Hollow Blocks Production

a. Objective: The project is intended to provide employment to the unemployed resettlers and improve their living standards.

b. Rationale: The sand to be used for making hollow blocks will be excavated inside the sabo facilities proposed in JICA Master Plan. The hollow blocks making will be then operated under a recycling scheme so as to ensure sound and sustainable O&M of the sabo facilities.

c. Target Beneficiaries: Members of the cooperative who are unemployed resettlers, and those residing in the neighboring barangays.

d. Market Aspect: The project will initially cater to around 1,000 houses and several public facilities to be constructed in both Banquerohan and Anislag resettlement development sites.

e. Implementing Body & Relevant Agencies: Project proponent is a cooperative to be formed in the site. The participating agencies are LGU, CDA, TESDA, and NHA.

(4) Aggregate Production Plant Project

a. Objective: The project is designed with a view to doing a business by making the most of aggregate to be trapped in the sabo facilities. Excavation of the aggregate is an integral part of the sabo project to ensure its sound O&M and sustainable management. The excavated aggregates will be used as construction materials for the sabo facilities and public infrastructures in the area.

- b. Plant Sites: Barangay Salvacion, Daraga Municipality (near Anoling River) and Barangay Pawa , Legazpi City (near Pawa-Burabod River)
- c. Production Capacity: 950,000 m<sup>3</sup>/year
- d. Excavation Area: Inside the sand pocket facilities
- e. Market: Provinces of Albay, Camarines Sur, Masbate and Sorsogon
- f. Capital Investment: PHP131.2 million
- g. Plant Components to be Equipped (required number): Crushing plant (3), Generator (6), Pay Loader (3), Dump Truck (3), Back Hoe (3), Office Building (1)
- h. Implementing Body & Relevant Agencies: Implementing body will be DPWH Regional Office or a third sector organization which is tied up with the interested LGUs and the private sector (ex. aggregate company).

(5) Mineral Water Development Project

- a. Objective: The project is to exploit mineral water in Barangay Karayukai, Sto. Domingo Municipality, and to sell it to the countries from which the Philippines is importing petroleum.
- b. Rationale: The project aims to contribute to develop the social and economic conditions of the country through bartering the water which is abundant in the area for petroleum, and to develop the regional economy by introducing a sustainable industry in the most economically depressed region in the country.
- c. Production Site: Santo Domingo Municipality and the half of Legazpi City adjacent to Santo Domingo
- d. Expected Benefits/Output: Carayucay mineral water development project will contribute to save the foreign exchange reserve of the Philippines and to stabilize the oil price in the country.
- e. Components of the Project: The project will construct facilities for water exploitation, treatment, stock, fill-up and transport. The project carries out the operations of production and all the necessary business works to export the product in addition to supply in the domestic market.
- f. Implementation Body & Relevant Agencies: Implementation body will be DPWH Regional Office, DT/or a third sector organization which is tied up with the interested LGUs and the private sector.

(6) Productivity Enhancement Project in the Protected Area

- a. Objective: The project is intended to increase the productivity of the land in the protected areas by constructing the sabo facilities, mainly through promoting agricultural production and agro-industry development.
- b. Rationale: The land area around Mayon Volcano is one of the best areas for agricultural production and agro-industrial development. On the relatively steep slopes, coconuts are planted with some inter-crops like corn, vegetables, and others, while the rice is cultivated in a zone from 8 to 10 km from the crater, where water is abundant. Siltation from the slopes of the volcano keeps the soil fertile and the constant supply of fresh water is suitable for irrigation and agro-industrial activities.
- c. Study Area: Foothills of the volcano in Legazpi City and Daraga Municipality
- d. Beneficiaries: Farming households and cooperatives, local communities & LGUs concerned, private investors (manufacturers, local processors, traders, etc.) and area economy
- e. Components of the Project: The project will include: (a) strengthening of the agro-management system, (b) pilot farms on the slopes of Mayon Volcano, (c) model rice farms, (d) technical support and training center, (e) farmer organization and financial support, (f) agro-industrial development including poultry & swine production, meat processing and soft drinks & mineral water plants, (g) market support program, and (h) pilot reforestation projects based on agro-forestry concept.
- f. Implementation Body & Relevant Agencies: Project proponent is a cooperative to be formed in the area. The participating agencies are LGUs, DA, CDA, DTI, and LBP.

(7) Provincial Disaster Management System Strengthening

- a. Objective: This program aims to upgrade the managerial and operational capability of the Provincial Government staff in charge of disaster management (especially PDMO and PDCC).
- b. Components:
  - Capability building activities for the Provincial officers and staff, especially those in the Provincial Disaster Management Office (PDMO)

- Provision of the disaster management training covering a wide range of functions and skills, like planning, organization, day-to-day management activities, counter-disaster operations, crisis management activities, logistic functions, recovery management, and others
  - Preparation of training courses by the higher Disaster Coordinating Council (DCC) and/or professional third parties (ex. Asia Pacific Disaster Management Center)
  - Establishment or improvement of an information network system by installing a set of the facilities and equipment such as radio transceivers or computer sets with internet communication connections
  - Upgrading of accuracy and reliability of the data and information on vulnerabilities to hazards, hazard areas and number of population residing in danger areas, etc.
  - Others:
    - Policy and legal arrangements to cope with the current disaster-related issues such as optimum land use, enforcement of laws and regulations, ownership, natural conservation, and so on.
    - Capability building of PDCC/PDMO officer and staff
    - Networking
- c. Implementing Body & Relevant Agencies: PDMO/PDCC is the proponent and implementing body as well. The cooperating agencies will be the higher DCCs and/or professional third parties (ex. Asian Disaster Preparedness Center).

(8) Community-based Disaster Management Strengthening

- a. Objective: This program aims to extend the ongoing efforts to upgrade/strengthen the disaster management system of the city/municipality and barangays concerned in the Study Area.
- b. Components:
- Capacity building for the city/municipality and barangay staff in charge of disaster management
  - Preparation of the training program by PDMO and/or professional third party considering the competence level of the target personnel
  - Disaster management training covering a wide range of functions and skills relating to planning, organization, day-to-day management



activities, counter-disaster operations, crisis management activities, logistic functions

- Improvement of information network system to assure quality communications among PDMO/PDCC, CDCC/MDCCs and BDCCs
  - Identification of equipment necessary for disaster prevention at community level
  - Vulnerable area mapping
  - Preparation of disaster awareness programs
  - Review, improvement and support for enforcement of building codes and land use planning
  - Help developing the incentives to involve private insurance in sharing disaster risk
  - Establishment and strengthening of communication with other municipalities using internet communication facilities
  - Disaster-related components:
    - Institutional consolidation of CDCC/MDCCs including BDCCs
    - Strengthening of volunteer disaster operation groups through organizing and training
    - Enhancement of disaster coping capacity through upgrading of the forecasting & warning and evacuation system through internet communication facilities
    - Preparation of the comprehensive city/municipal land use plan including hazard mapping & resource assessment, key commodity development strategy
    - Development of the integrated community disaster planning program
    - Awareness promotion campaign and enlightenment on disaster management through seminars, workshops and drills for general public, including the disaster-related education at primary and junior schools
    - Advocacy works through seminar, fora and symposia
    - Research studies on resettlement development
- c. Implementing Body & Relevant Agencies : LGUs concerned are the proponent and implementing bodies at the same time. The cooperating agencies will be the PDMO, higher DCCs, professional third parties and/or donor countries (technical & financial assistance).