

*The Study on Comprehensive Disaster Prevention
around Mayon Volcano*

Volume II - MAIN REPORT

(Tables)

Table 1.1 List of Study Team Experts and Their Counterpart Personnel

No.	JICA Study Team	Counterpart Personnel (GOP)	Major Priority Items for Technology Transfer
1.	Mr. Hideki SATO Team Leader	- Mr. Bernardo P. AMAN Assistant Project Director, PMO-MFCP DPWH, Manila - Mr. Orlando B. ROCES Assistant Director, DPWH Region-V	<ul style="list-style-type: none"> • Overall supervision of the Study • General monitoring of the technology transfer plan
2.	Mr. Fumihiko FURUICHI Deputy Leader/ Non-structural Measures	- Mr. Eduardo B. TALASTAS Chief, Planning and Design Division, DPWH Region-V	<ul style="list-style-type: none"> • General arrangement and supervision of soft management sector in the Study
3.	Masayuki SHIRAISHI Hydrology/ Hydraulics/ River Planning	- Mr. Teodoro M. CERALDE Engineer II, Bureau of Design, DPWH (Manila) - Mr. Benjamin BUITRE Engineer III, DPWH Region-V	<ul style="list-style-type: none"> • Meteo-hydrological survey • Climatic and rainfall data analysis • Discharge data and rating curves • Sediment data analysis
4.	Mr. Hiroshi FUKASAWA & Sabo Planning	- Mr. Orlando CASIO Engineer III, Planning Service, DPWH (Manila) - Mr. Dexter I. ATUTUBO Engineer III, DPWH Region-V	<ul style="list-style-type: none"> • Investigations on topography and geology (for disaster&hazard mapping) • Sabo planning • Delineation of hazard areas
5.	Mr. Toshinori KONDO & Mr. Nobuhiko INO Facility Design	- Mr. Nelson LIVARRA Engineer III, Bureau of Design, DPWH (Manila) - Mr. Vicente A. MIRABALLES Engineer III, Planning and Design Division, DPWH Region-V	<ul style="list-style-type: none"> • Inventory of existing structures and facilities • Determination of facility planning criteria • Basic design of the proposed facilities
6.	Mr. Koji KOGA Construction Planning/ Cost Estimate	- Mr. Ignacio ODIAMAN Engineer III, DPWH Region-V - Mr. Tirso PERLADA, Jr. Engineer III, Bureau of Construction	<ul style="list-style-type: none"> • Construction planning • Cost estimate (preliminary) • Procurement plan
7.	Ms. Kumi SAITO Land Use Planning	- Ms. Eleanor BERTILLO Engineer II, DPWH Region-V	<ul style="list-style-type: none"> • Review of the existing land use • Land use planning & land tenure • Determination of resettlement area
8.	Mr. Itaru NAGAMINE Surveying/ Aerial Photo/ Satellite Image Analysis	- Mr. Francisco GUIRINDOLA Engineer III, Bureau of Design, DPWH (Manila)	<ul style="list-style-type: none"> • Supervision of surveys • Analysis of aerial photos and satellite image
9.	Mr. Takashi HARADA Mapping Supervision	- <i>None for GOP Counterpart (To Staffs of CERTEZA)</i>	<ul style="list-style-type: none"> • Aero-triangulation • Topographic mapping
10.	Mr. Justino R. ARBOLEDA Agricultural Production/ Agro-Industry Development	- Mr. Angeles L. NIEVA, Provincial Agriculturist, Provincial Agriculture Office, Provincial Government of Albay	<ul style="list-style-type: none"> • Supervision of surveys • Analysis of aerial photos and satellite image
11.	Ms. Anita AMBROSIO Evacuation System	- Mr. Alex MANDAC Civil Defense Officer II, Office of Civil Defense (OCD)	<ul style="list-style-type: none"> • Review of evacuation system • Designing evacuation system • Preparation of educational materials
12.	Mr. Norio TAKAYANAGI Forecasting & Warning System	- Mr. Orlando AREVALO, Civil Defense Officer I, Office of Civil Defense (OCD)	<ul style="list-style-type: none"> • Design of forecasting and warning system • Standardization & Judgement of disaster levels
13.	Mr. Tetsuya ISHII Institutions/ O&M Planning	- Mr. Jose ABARETA Engineer III, DPWH Region-V	<ul style="list-style-type: none"> • Legal framework • Organization for disaster prevention
14.	Mr. Katsuhiko MASAKI & Mr. Kiminari TACHIYAMA Socio-economy/ Financing	- Mr. Victor B. UBALDO Engineer V, NEDA Region-V - Mr. Guillermo T. TULOD, Jr. Chief Economic Development Specialist	<ul style="list-style-type: none"> • Socio-economic analysis • GRDP modeling • Integration of disaster prevention into area development
15.	Mr. Israel G. BENTILLO Environmental Assessment	- Mr. Frederick RICO, Sr. Environmental Management Specialist, DENR Region-V	<ul style="list-style-type: none"> • Initial Environmental Examination (IEE) • Spocial survey and preparation
16.	Mr. Taro TSUBOGO & Mr. Shinichi FUKASAWA Logistics Support	- Ms. Marlyn BRISTOL Clerk II, DPWH Region-V - Ms. Jennifer BAILON Clerk II, DPWH Region-V - Ms. Ma. Fe VALENZUELA, Engineering Assistant, DPWH Region-V	<ul style="list-style-type: none"> • Purchasing • Bookkeeping and accounting • Filing of documents • Operation of vehicles
	JICA Study Team	- Mr. Jaime J. CASTAÑEDA Technical Support Staff, PMP-MFCP	<ul style="list-style-type: none"> • Work procedure and arrangement
		- Mr. Rommel P. RAMIREZ Draftsman, DPWH Region-V	<ul style="list-style-type: none"> • Work procedure and arrangement

Table 1.2 List of Members of the Steering Committee and Technical Working Group

(1) Steering Committee

Name	Position
1) Mr. Teodoro T. Encarnacion (Chairman)	Undersecretary, DPWH
2) Mr. Jesus P. Cammayo (Vice-chairman)	Assistant Secretary, DPWH
3) Mr. Nonito F. Fano (Member)	Project Director, PMO-MFCF
4) Mr. Eleno U. Colinares (Member)	Regional Director, DPWH Region V
5) Mr. Bienvenido C. Leuterio (Member)	Director, Bureau of Design-DPWH
6) Ms. Clarita A. Bandonillo (Member)	Director, Bureau of Construction-DPWH
7) Mr. Oscar D. Abundo (Member)	Director, Legal Service, DPWH
8) Ms. Marlene P. Rodriguez (Member)	Regional Director, NEDA Region V

(2) Technical Working Group

Name	Position
1) Mr. Bernardo P. Aman (Chairman)	Deputy Project Director, PMO-MFCP
2) Mr. Resito V. David (Vice-Chairman)	Project Manager I, PMO-MFCP
3) Mr. Manuel S. Alconis (Member)	Engineer V, DPWH-Planning Service
4) Mr. Salvador L. Manto (Member)	Engineer V, DPWH-Bureau of Construction
5) Ms. Sofia T. Santiago (Member)	Project Manager I, Bureau of Design-DPWH
6) Mr. Eduardo B. Talastas (Member)	Engineer V, DPWH-Region V
7) Mr. Alejandro A. Sosa (Member)	Engineer V, PMO-MFCP
8) Mr. Guillermo T. Tulod Jr. (Member)	Chief, Infrastructure Division, NEDA Region V
9) Representatives from DSWD, OCD, PHIVOLCS, DENR, etc.	-

Table 1.3 List of Members of Advisory Committee and JICA Philippines Office Representatives

(1) Advisory Committee

Name	Position
1) Mr. Masayuki Watanabe	Leader, JICA Advisory Committee
2) Mr. Shinichi Kusano	Member, JICA Advisory Committee (Disaster Prevention Planning)

(2) JICA Philippines Office Representatives

Name	Position
1) Mr. Yukihiko Sakatani	JICA – DPWH Sabo Expert
2) Ms. Noriko Bamba	Assistant Resident Representative

Table 1.4 Work Schedule

Phase I : Basic Study and Formulation of a Master Plan

1st Field Work in the Philippines (1st October 1998 to Mid-March 1999)

- (1) Data Collection and Review of Existing Studies/Programs
- (2) Information Collection by Means of Aerial Photographs or Satellite Images
- (3) Field reconnaissance Survey
- (4) Disaster Mitigation Facility Survey
- (5) Hydrological Survey
- (6) Survey on Calamities and Casualties by Floods and Debris Flows
- (7) Sediment Yield Survey
- (8) Survey on Disaster Awareness and Preparedness including Evacuation
- (9) Socio-Economic Framework
- (10) Preparation of Pilot Project
- (11) Preparation of Progress Report (1)

2nd Field Work / 1st Home Work (17 May to 31 July 1999)

- (1) Determination of Project/Program Dimensions
- (2) Damage Analysis
- (3) Formulation of Master Plan
- (4) Initial Environmental Assessment
- (5) Cost Estimate
- (6) Project Evaluation
- (7) Selection of Priority Projects
- (8) Formulation of the Pilot Project
- (9) Preparation of Interim Report
- (10) Preparation of Technical Transfer Seminar

Phase II : Feasibility Study on the Priority Projects & Programs Selected in the Master Plan

3rd Field Work in the Philippines (Mid-August to Mid-December 1999)

- (1) Discussion of Interim Report (Master Plan)
- (2) First Technical Transfer Seminar
- (3) Supplemental Data Collection and Survey
- (4) Implementation of Pilot Project
- (5) Formulation of Planning Framework
- (6) Social Environment Impact Study
- (7) Preparation of Progress Report (2)

2nd Home Work in Japan (Mid-January to Mid-March 2000)

- (1) Facility Design and Construction Plan
- (2) Implementation and Operation & Maintenance Plan
- (3) Cost Estimate
- (4) Project Evaluation
- (5) Preparation of Draft Final Report
- (6) Preparation of Second Technical Transfer Seminar

4th Field Work in the Philippines (15 days in May 2000)

- (1) Discussion on Draft Final Report
- (2) Second Technical Transfer Seminar
- (3) Review of Technical Transfer

3rd Home Work in Japan (15 days in July 2000)

- (1) Preparation of Final Report

Table 1.5 Logical Framework Matrix of the Comprehensive Disaster Prevention Plan

Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification (MOV)	Important Assumptions
<p>GOAL : To protect the life and property of the people living around Mayon Volcano and establish the sustainable comprehensive disaster prevention system</p>	<p>Indicator: 1. No loss of life, no casualties, and restricted damage 2. Improvement of living standard due to mitigation of disaster and increase in per capita GRDP</p>	<p>Source of Information and Methods Used : - RDCC & PDMO/PDCC disaster evaluation reports - Statistical data</p>	<p>Assumptions for achieving Goal Targets : - The Philippine governments (NGAs & LGUs) and the people recognize and support the long-term objectives and benefits of the comprehensive disaster prevention</p>
<p>PURPOSE : To reduce the vulnerability and strengthen the "disaster prevention capacity" of the communities and their people, through taking the disaster prevention measures, both structural and non-structural, and incorporating disaster mitigation into specific area development projects.</p>	<p><i>Conditions which will indicate that purpose has been achieved:</i> 1. Reduction of Vulnerability • Structural measures such as prevention & mitigation facilities • Establishment of prompt evacuation system Relocation/ Resettlement of the people living in PDZ and disaster prone areas 2. Upgrading of the Disaster Prevention Capacity • Accurate and timely forecasting and warning • Awareness raising</p>	<ul style="list-style-type: none"> - DPWH-5 Annual Reports - Project status and monitoring reports - Regular inspections by the authorities concerned - Vulnerability analysis reports 	<p>Assumptions for achieving Purpose : 1. The Philippine governments (NGAs & LGUs) maintains political support and commitment for implementation of the Plan 2. Sustained community and public support is generated and maintained for the structural and non-structural measures proposed in the Plan 3. Comprehensive Disaster Prevention Plan implemented, together with accelerated area socio-economic development projects and programs</p>
<p>OUTPUTS : 1. Reduction of the damages by mud and debris flows by constructing the sabo facilities and enhanced land use in the protected areas 2. Mitigation of the flood damage in the flood prone area 3. Flood mitigation in Legazpi City by implementing the urban drainage project 4. No loss of life, no casualties and mitigated damages through upgrading the forecasting, warning and evacuation system 5. Resettlement site development with livelihood support 6. Upgraded disaster coping capacity of the gov. agencies and communities</p>	<p>Magnitude of Outputs : 1. Reduced damage (PHF) and protected area • Amount : PHP64,914 million (for 50 years/ 1999 prices) • Area : 6,468 ha (20-year return period) 2. Flood mitigation and target beneficiaries • Area : 3,229 ha 3. Strengthen forecasting & warning and evacuation system • Area covered by effective warning system • No. of evacuation centers 4. Improved resettlement sites with livelihood • Increased occupancy rate (% as of Nov. 1999) 5. Report on small toll, less damage and quick response and recovery</p>	<ul style="list-style-type: none"> - OCD/RDCC & PHIVOLCS regular reports - DPWH-5 monitoring reports - PDMO/PDCC disaster evaluation reports - CDCC/MDCCs & BDCCs disaster evaluation reports - CSWDO/MSWDOs monitoring reports 	<p>Assumptions for achieving Outputs : 1. The magnitude of Mayon Volcano eruptions is the same as those affected by the 1984 & 1993 eruptions 2. 20-year probable rainfall for mud & debris flow and flood (As for urban drainage, 10-year) 3. The Philippine governments (NGAs&LGU) allocate the necessary fund for implementation of the projects 4. Adequate local funds are allocated for their O/M and supporting services by the NG and LGUs 5. Suitable human resources development program for staffs of the agencies concerned and target beneficiaries</p>
<p>ACTIVITIES : 1. Sabo Facility Construction 2. Yawa River Improvement 3. Legazpi City Urban Drainage 4. Forecasting, Warning & Evacuation 5. Relocation/ Resettlement Projects 6. Institutional and Supporting Services Strengthening</p>	<p>INPUTS : Services (Consultants/ experts in sabo & drainage, forecasting & warning, sociology, social welfare, agro-industry, marketing, accounting, etc.) Construction, equipment & materials Personnel & labor Land, Housing & materials Training</p>	<ul style="list-style-type: none"> - Monthly billing and reports - Quarterly project status reports 	<p>Assumptions for achieving Inputs : 1. Comprehensive Disaster Prevention Plan approved and ratified by GOP 2. Timely financing based on clear cost sharing 3. Implementing organization is well coordinated with definite role sharing 4. The member agencies provide qualified staffs</p>

Table 2.1 Extent of Calamities Caused by the 1993 Eruption and Following Typhoons, Albay Province, 1993-1998

Casualties & Damages		Unit	Eruption Feb. 1993	Typhoon "Akang" Jan. 1994	Typhoon "Garding" Dec. 1994	Typhoon "Rosing" Nov. 1995	Typhoon "Loleng" Oct. 1998
Population & Families	Death	No. of People	77	45	2	37	3
	Injured	No. of People	5	111	1	18	11
	Missing	No. of People	0	18	0	2	0
	Affected	No. of Barangays	76	104	0	719	561
		No. of Families	12,359	4,501	1,453	78,666	49,595
		No. of People	63,055	25,172	6,799	410,325	218,374
	Evacuated	No. of Families	12,359	4,501	0	7,546	49,595
		No. of People	63,055	25,179	0	36,950	218,374
		No. of Areas	52	4	1	130	202
	Agriculture	Crop Loss	Ha	11,916	1,419	2,887	4,479
PHP '000			71,073	26,540	57,249	302,651	195,686
Livestock		No. of Heads	1,688	0	0	19,562	33,963
		PHP '000	2,198	727	14	3,590	4,264
Fishery		Ha	7,285	0	0	304	97.5
		PHP '000	19	10	0	482	915
Forest		Ha	350	0	0	0	442
		PHP '000	4,380	0	0	37	4,552
Public facility		PHP '000	-	70,350	11,350	234,592	201,000
Totally destroyed homes		No.	-	593	46	15,203	13,547
	PHP '000	-	29,650	2,300	760,150	677,350	
Partially destroyed homes	No.	-	1,029	97	64,664	60,411	
	PHP '000	-	15,435	1,455	969,960	906,165	
Total Damages	PHP '000	77,760	142,712	72,368	2,271,425	1,989,932	

Note : " - " means [data is not available] .

Source : Data of PDCC/PDMO and Survey on Calamities and Casualties by Flood and Debris Flow, Final Report , March 1999.

Table 2.2 Damages Observed in Study Area at the Time of Typhoon Loleng, October 1998

No	River	Site	Description
1.	Yawa	Bogton Barangay (middle reach)	Scouring of foundation broke concrete revetment works on the right bank.
2.	Yawa (downstream reach)	Yawa Bridge (spillway site)	Both banks were eroded. The erosion of left bank developed up to the abutment of Yawa bridge.
3.	Padang	Highway crossing	Riverbed was damaged by boulder by 1 meter at the upstream reach from the highway crossing. The river water flew into the adjacent areas of the left and right bank levees constructed by dredging. The small stream, 2 km east from the Padang river, which bounds Padang barangay was buried with the sand. The sand also buried the houses located along the stream at 13:00 on 22 October. The depth of the silted sand was around 1 meter.
4.	Basud	Highway crossing (downstream reach)	The dredged river channel was destroyed by boulder by 2 meters at the upstream reach from the highway crossing. The width of the channel at this reach was enlarged from 150 meter to 250 meter.
5.	Basud	Consolidation dam (middle reach)	Riverbed was destroyed by 1 meter by boulder. The riverbed of the up and down stream reaches was connected smoothly without step. Destruction of the riverbed increased the vulnerability of the right bank area to debris flow.
6.	Budiao	Barangay road crossing (ground sill)	Left bank of upstream from the groundsill was scoured for 200 m long and 70 m wide. Riverbed was more or less deteriorated.
7.	Anoling	Barangay Busay (downstream reach)	Riversands were scoured. There were no distinct traces of debris flow but a considerable amount of sand had silted on the barangay road bridge.
8.	Anoling	Barangay road crossing (upstream reach)	Riverbed conditions along the right bank revetment works were deteriorated, but the opposite site (left) was only scoured. Immediate downstream reach from the road crossing was scoured by 40 cm.
9.	Masarawag	Barangay Masarawag (downstream reach)	Debris flow was traced at this site, but the revetment work provided on the left bank and embankment on the right bank had functioned well to control the debris flow.

No	River	Site	Description
10.	Buang	Highway crossing (bridge)	Riverbed degradation was observed. Riverbed of right bank at immediately downstream from the bridge was seriously scoured and the foundation of revetment works was breached away. No trace of debris flow was observed.
11.	Bulawan	Highway crossing	The revetment works located at 70 meters upstream from the bridge on the left bank was broken for 50 meters due to the scouring of the foundation. There were traces of debris flow from upper reach.
12.	---	Legazpi City	Most of areas were submerged by rising water due to poor drainage. The drainage capability of channel was insufficient. In addition, debris consisting of trees and leaves clogged the channel especially at culvert sites.
13.	---	Study Area	Up-rooted trees cut down power distribution lines in many places. Such lines had impeded the traffic of roads. Especially the line hanged on the highway between Bulawan bridge and Tabaco was dangerous and might cause traffic accidents.
14.	Gully	South-east	There were two slope failures in a southeastern gully. The failed sites were located up and down in a line at the elevation of around 2,000 meters. The gully is supposed to be the uppermost reach of the Budiao river.
15	Gully	West	There were two slope failures in a western gully. The failed sites were located up and down in a line at the elevation of around 1,800 meters. The gully is supposed to be the uppermost reach of the Nasisi river.

Source : Observation Report on the Disaster Brought about by Typhoon "Loleng" (October 21 and 22, 1998 around Mayon Volcano, JICA Study Team.

Table 2.3 National Calamity Funds Received by Region (1996-1998) with Breakdowns Region V

Regions/Provinces&Cities in Region V	Calamity Fund (PHP)						Population in 1998*	Calamity Fund per Capita (PHP)	Land Area (km ²)	Calamity Fund per km ² (PHP)
	1996	1997	1998	Average (1996-1998)	%					
Philippines	907,343,349	340,703,400	968,219,977	738,755,575	100.00	71,443,111	10.34	300,000	2,463	
• Region V (Bicol)	293,299,343	104,450,000	144,407,200	180,718,848	24.46	4,610,644	39.20	17,633	10,249	
- Albay	48,073,610	52,200,000	18,717,200	39,663,603	(5.37)	1,074,802	36.90	2,553	15,559	
- Legaspi City (Albay)	20,023,000	20,500,000	0	13,507,667	(1.83)	-	-	-	-	
- Camarines Norte	53,502,733	300,000	0	17,934,244	(2.43)	485,680	36.93	2,113	8,490	
- Camarines Sur	81,450,000	17,000,000	108,000,000	68,816,667	(9.32)	1,562,366	44.05	5,267	13,066	
- Iriga City (Camarines Sur)	5,028,000	0	3,440,000	2,822,667	(0.38)	-	-	-	-	
- Naga City (Camarines Sur)	6,868,000	0	0	2,289,333	(0.31)	-	-	-	-	
- Catanduanes	37,790,000	3,150,000	5,000,000	15,313,333	(2.07)	219,818	69.66	1,512	10,131	
- Masbate	6,513,000	0	0	2,171,000	(0.29)	668,879	3.25	4,048	536	
- Sorsogon	34,051,000	11,300,000	9,250,000	18,200,333	(2.46)	599,100	30.38	2,141	8,499	
<i>(Other Regions)</i>										
• ARMM (Autonomous Region for Muslim Mindanao)	250,000	5,100,000	8,916,750	4,755,583	0.64	2,085,503	2.28	11,410	417	
• CAR (Cordillera Administrative Region)	63,760,000	64,318,000	24,200,000	50,759,333	6.87	1,307,974	38.81	18,294	2,775	
• NCR (National Capital Region)	3,200,000	2,000,000	135,300,000	46,833,333	6.34	9,804,990	11.92	636	73,637	
• Region I (Ilocos)	25,790,000	15,582,900	76,917,027	39,429,976	5.34	3,928,277	14.95	12,840	3,071	
• Region II (Cagayan Valley)	21,914,500	24,100,000	12,300,000	19,438,167	2.63	2,637,326	2.70	26,838	724	
• Region III (Central Luzon)	63,124,703	39,011,500	367,379,000	156,505,068	21.18	7,210,187	14.99	18,231	8,585	
• Region IV (Southern Tagalog)	211,777,803	31,400,000	20,600,000	87,925,934	11.90	10,442,801	14.71	46,924	1,874	
• Region VI (Western Visayas)	169,637,000	9,391,000	2,000,000	60,342,667	8.17	5,978,340	11.58	20,223	2,984	
• Region VII (Central Visayas)	9,400,000	7,250,000	2,000,000	6,216,667	0.84	5,208,782	1.77	14,952	416	
• Region VIII (Eastern Visayas)	19,640,000	4,300,000	16,200,000	13,380,000	1.81	3,507,271	4.57	21,432	624	
• Region IX (Western Mindanao)	9,500,000	1,100,000	4,000,000	4,866,667	0.66	2,925,255	1.18	15,997	304	
• Region X (Northern Mindanao)	4,500,000	9,000,000	5,000,000	6,166,667	0.83	4,133,175	1.16	14,033	439	
• Region XI (Southern Mindanao)	6,250,000	8,900,000	32,000,000	15,716,667	2.13	5,321,791	6.37	27,141	579	
• Region XII (Central Mindanao)	5,300,000	14,800,000	117,000,000	45,700,000	6.19	2,468,848	18.51	14,571	3,136	

Note : * Population in 1998 is estimated by JICA Study Team.

Source : 1999 Philippine Statistical Yearbook, NSCB

Table 2.4 Profile of the Italian Government Assisted Community-based Disaster Prevention Project, 1989-1992

Project Title :	Disaster Preparedness and Response Pilot Project at the Community Level
1. Period :	Project Preparation - 3 months from August 1989 (after Typhoon "Sisang") Project Implementation - January 1991 to November 1992
2. Inputs :	Two Italian Experts specialized in project planning, monitoring and supervision participated in the Project. PDCC was in charge of planning and coordination, implementation of the Project. This Project was carried out in cooperation with 45 Filipino consultants. Total Budget : US\$700,000-
3. Objective :	The Project aimed to prevent and reduce the adverse effects of natural disasters on the community by minimizing its vulnerability through the strengthening of its coping capacity, and promoting and sustaining the community development. The project covered seven municipalities such as Sto. Domingo, Rapu-Rapu, Bacacay, Malilipot, Tabaco, Manito and the City of Legazpi. Barangays in these areas are mostly coastal and usually affected hardly by typhoon and storm surges.
4. Activities & Major Achievements	The Project has the following three major components : 1) Organizational Set-up, Human Resources Development and Awareness Promotion on Disaster Prevention <ul style="list-style-type: none"> • Establishment of Disaster Preparedness Committee (now transformed to PDMO) within Provincial Disaster Coordination Center • Provision of training to PDCC, C/MDCC members • Provision of training to various volunteer teams (DOH 627 staffs, DSWD 504 staffs, PNR 1,282, ALERT 38) • Provision of technical advice to BDCC (3-day seminar for 700 barangays, preparation of risk and resource map, preparation of disaster preparedness plan) • Preparation of disaster education curriculum and teaching manual • Preparation of disaster prevention campaign posters (9,000 sheets) and drama for radio broadcasting, and opening of local theatres 2) Strengthening of the Disaster Management Facilities and Equipment <ul style="list-style-type: none"> • Renovation of the Provincial Disaster Coordinating Center (700m², etc.) • Installation of the VHF radio equipment at LGUs and organizations concerned • Provision of the relief and rescue equipment and stockpiles • Upgrading of the disaster prevention facilities at 23 barangays 3) Other Activities <ul style="list-style-type: none"> • Supports to promote the livelihood development projects • Provision of water supply and sanitation facilities like toilet materials (4,500 bowls), deep wells, water supply, etc.
5. Problems :	1) Inappropriate project design which lacks in comprehensive approach based on the needs of the communities and people concerned and in overall coordination. 2) Insufficient coordination with local NGOs (except PNR) from the planning stage through its implementation. 3) Lack of project implementation records for further monitoring and feedback.
6. Issues to be Tackled (or Lessons Learnt)	1) To enhance the effectiveness of the Project, it needs to introduce an appropriate technology for project design, by taking into account the inter-relation of the respective project components. 2) For the sound implementation and sustainability of the Project, it is important to make involve the locally active NGOs from the planning stage. 3) To serve as a model project and make the most use of their outputs, it is essential to continue to monitor the Project, and make a record on its implementation, which contains the factors of success and failure identified in its post-evaluation.

Source : Provincial Disaster Management Office (PDMO)

Table 2.5 Strengths, Weaknesses, Opportunities, Threats (SWOT) of the Study Area (1/2)

Strengths/ Opportunities	Weaknesses/ Threats
<p>1. PHYSICAL</p> <ul style="list-style-type: none"> 1.1 Strategic geographical location of Legazpi City and its metropolitan towns vis-à-vis the country 1.2 Gateway to the Visayas and Mindanao thru air, sea and land transportatoin 1.3 Blessed with natural resources like coastlines/ marine, mineral, agricultural and forest resources and tourist attractions like Mayon Volcano, beaches and untapped caves. 1.4 Accessible to all modes of transportation (sea, land and 1.5 Presence of transport infrastructure such as airport, seaport, railroads and roads including bus terminal 1.6 Adequate source of construction materials, e.g. and and gravel 1.7 Advantageous water gravity flow system of distribution 1.8 Existing of a developed financial and banking system 	<ul style="list-style-type: none"> 1.1 Degradation of forest lands, coastal and marine resources 1.2 Deficiency in support infrastructure 1.3 Mayon Volcano eruption causing sedimentation in internal waters and damages to infrastructure 1.4 Occurrence of typhoons 1.5 High power rates 1.6 High cost of land in urban areas 1.7 Zigzag roads in southern areas
<p>2. SOCIAL</p> <ul style="list-style-type: none"> 2.1 Empowered and organized groups of women, youth, elderly, persons with disabilities, day care workers and barangays integrated health workers 2.2 Strong linkages of line agencies, NGOs and LGUs 2.3 Available land for relocation 2.4 Presence of low-cost indigenous construction materials 	<ul style="list-style-type: none"> 2.1 Presence of squatter enclaves concentrated in urban coastal areas and along railroad tracks 2.2 Rapid increase in the number of squatter families 2.3 Price speculation on real estate properties 2.4 Presence of flood-prone and danger areas 2.5 Insufficient number of law enforcement personnel and equipment facilites
<p>3. ECONOMIC</p> <ul style="list-style-type: none"> 3.1 Dominant land use is agricultural 3.2 Soil faivable to agricultural development 3.3 Cheap labor (agricultural labor) 3.4 Available manpower for agri-industry 3.5 Relatively literate farmers given to easy supervision in technology transfer 3.6 Existence of a developed financial and banking system 3.7 Existence of community structures, e.g. Cooperatives and Farmers' Associations which lead themselves to group activities/ action. 3.8 Presence of various classes of tourist accommodation like hotels/ lodging houses, restaurants/ food chains offering culinary spacialites 3.9 Investment incentives to buisnesses located within the identified Priority Development Areas (PDAs) and Priority Investment Areas (PIAs) 3.10 Presidential Proclamation designating certain lands in Legazpi City as the site of SEZ and BRAIC 3.11 Creation of Investment Promotion Center which shall implement SP Ordinance No.96-016 or the Legazpi Investment Code of 1996. 	<ul style="list-style-type: none"> 3.1 Conversion of agricultural land to non-agricultural 3.2 Continuous deforestation 3.3 Lack of irrigation facilities/ post harvest facilities 3.4 Lack of grazing areas 3.5 Illegal fishing 3.6 Low capacity of the economy to absorb the expanding labor force 3.7 High unemployment and underemployment and underemployment rate 3.8 Out-migration of economically active and highly educated population 3.9 Stringent requirement by financial institutions for small entrepreneurs in accessing loans 3.10 Low adoption of recommended agri-technologies and low agricultural productivity 3.11 Poor access to market information

Table 2.5 Strengths, Weaknesses, Opportunities, Threats (SWOT) of the Study Area (2/2)

Strengths/ Opportunities	Weaknesses/ Threats
<p>4. ENVIRONMENTAL/ ECOLOGICAL</p> <p>4.1 Presence of laws, decrees and local ordinances regarding environmental protection such as PD984 otherwise known as the Pollution Control Law, Water Code of the Philippines, DENR Administrative Orders, Charter 9 of the National Building Code regarding sanitation</p> <p>4.2 Networking and linkage of NGOs, GOs, POs, academy to maximize information dissemination and support for ecological preservation</p> <p>4.3 Women's group which strongly support clean and green program</p>	<p>4.1 Degradation of the coastal and marine environment as a result of the unrestrained cutting of mangroves and coral reefs, as well as the unconscious disposal of solid wastes in water</p> <p>4.2 Poor drainage system absence of a dumping site/ sanitary landfill</p> <p>4.4 Weak enforcement of government regulations in addressing environmental concerns</p>
<p>5. INSTITUTIONAL/ ADMINISTRATIVE</p> <p>5.1 Enhanced LGU capabilities under the Local Government Code</p> <p>5.2 Presence of Research and Development Centers for area economic development, e.g. PCA, FIDA, etc.</p> <p>5.3 Active NGOs including women's organization</p> <p>5.4 Several academic institutions offering short-term vocational courses</p> <p>5.5 Center of 74 national regional government offices</p> <p>5.6 Availability of training opportunities thru various government agencies (e.g. NEDA, DILG, etc.)</p> <p>2.7 Well-organized and functional city/ barangay disaster coordinating councils</p>	<p>5.1 Insufficient financial resources of LGUs</p> <p>5.2 Export of labor/ experts (brain-drain)</p> <p>5.3 Weak law enforcement</p>
<p>6. CULTURAL VALUES/ TRAITS</p> <p>6.1 Positive attitude of the LGUs and other line agencies towards industrial development and promotion</p> <p>6.2 Generally amiable, hospitable and friendly population</p> <p>6.3 "Bayanihan" spirit</p> <p>6.4 Ability of the people to adjust to and recover from natural calamities</p> <p>6.5 Strong religious orientation</p> <p>6.6 Strong family ties</p>	<p>6.1 Complacency</p> <p>6.2 Lack of concern for the environment</p> <p>6.3 Reluctance to take risks in investment</p> <p>6.4 Self-centeredness</p>

Sources : The Legazpi City Development Plan (1999-2003) & Socio-economic Profile of Daraga Municipality

Table 2.6 Average Annual Income, Poverty and Per Capita Poverty Thresholds, 1994 and 1997

	AVERAGE INCOME, 1988 PRICES			POVERTY INCIDENCE (%) ^a			PER CAPITA POVERTY THRESHOLDS ^b					
	Percent Change			1994	1997	(Order)	All Areas		Urban		Rural	
	1994	1997					1994	1997	1994	1997	1994	1997
Philippines	42,800	51,790	21.0	35.5	32.1		8,885	11,388	9,831	12,642	7,946	10,248
Urban	58,220	75,059	28.9	24.0	18.5		9,831	12,642				
Rural	27,526	30,682	11.5	47.0	44.4		7,946	10,248				
1. NCR	82,745	104,934	26.8	8.0	7.1	(15)	11,230	14,360	11,230	14,360		
2. CAR	39,155	49,976	27.6	51.0	42.3	(5)	10,853	12,744	11,054	13,477	10,766	12,439
3. Ilocos	34,279	43,813	27.8	47.9	37.6	(10)	10,022	11,981	10,326	12,755	9,822	11,620
4. Cagayan Valley	36,957	38,637	4.5	35.5	31.6	(12)	8,316	9,873	9,457	11,594	7,942	9,406
5. Central Luzon	50,209	58,544	16.6	25.2	16.8	(14)	9,757	12,037	10,607	13,063	8,566	10,742
6. Southern Tagalog	45,998	55,998	21.7	29.7	25.7	(13)	9,537	12,506	10,082	13,207	8,948	11,735
7. Bicol	28,080	32,084	14.3	55.1	50.1	(2)	8,319	10,497	8,679	11,229	8,165	10,224
8. Western Visayas	33,150	36,720	10.8	43.0	41.6	(6)	8,197	10,800	8,432	10,624	8,053	10,906
9. Central Visayas	28,294	34,742	22.8	32.7	34.2	(11)	6,425	8,726	7,148	9,374	5,826	8,214
10. Eastern Visayas	26,339	29,318	11.3	37.9	40.7	(7)	6,444	8,755	7,327	10,058	6,083	8,267
11. Western Mindanao	26,519	38,472	45.1	44.7	39.8	(8)	7,074	9,670	8,449	11,205	6,360	9,000
12. Northern Mindanao	34,570	44,607	29.0	49.2	46.8	(4)	7,938	10,455	8,783	11,294	7,253	9,867
13. Southern Mindanao	41,968	44,807	6.8	40.3	37.9	(9)	8,201	10,489	8,851	11,783	7,644	9,683
14. Central Mindanao	33,125	35,763	8.0	54.7	49.1	(3)	8,971	11,155	10,078	12,486	8,364	10,620
15. ARMM	25,461	29,328	15.2	60.0	58.6	(1)	7,450	11,214	10,035	13,477	8,537	10,760
16. CARAGA /c	29,765	33,167	11.4									

^a = Proportion of families whose annual income fall below the annual capita poverty threshold to total families

^b = Per capita threshold is the minimum amount required by an individual to satisfy basic food and non-food requirements in a year

^c = For 1994 and 1997 poverty estimates, CARAGA provinces fall under Northern and Southern Mindanao

Sources : Preliminary results of the 1997 Family Income and Expenditure Survey; and National Statistic Coordination Board

Table 3.2.1 Land Classification by Usage in Albay Province, 1996

Cities & Municipalities City:	Agricultural Land (%)	Forest Area (%)	Fishpond Area		Commercial & Industrial Land (%)		Idle & Vacant Land (%)	Water Ways & Roads	Others		School Site	Unclassi- fied	Total		
			Total	Freshwater	Brackishwater	Industrial Land (%)			Commercial Land (%)	Research				Residential	Parks
1. Legaspi	8,473.4 (5.4)	1,722.6 (4.4)	413.7 (2.1)	22.0 (0.9)	391.7 (6.6)	79.5 (4.3)	0.0 (-)	247.0	0.0	1,586.3	78.0	421.0	11,220		
Municipalities:															
1. Bacacay	7,505.7 (4.7)	838.8 (2.1)	15.8 (0.9)	15.8 (0.9)	-	213.5 (11.5)	777.5 (3.0)	267.1	2.0	751.1	57.8	173.9	13,090		
2. Camalig	10,484.2 (6.6)	345.8 (0.9)	0.4 (1.1)	0.4 (1.1)	-	280.0 (15.1)	50.0 (0.2)	626.0	0.0	300.0	1,303.6	0.0	11,860		
3. Daraga	8,823.0 (5.6)	427.1 (1.1)	29.0 (1.5)	29.0 (1.5)	-	493.5 (26.6)	2,233.4 (8.7)	101.4	73.5	3,609.1	93.7	78.9	20,300		
4. Guinobatan	13,007.0 (8.2)	578.5 (1.5)	27.5 (10.3)	27.5 (10.3)	30.0	21.3 (1.1)	532.6 (2.1)	71.1	5.0	168.7	52.4	0.0	24,640		
5. Ligao	19,628.0 (12.4)	4,052.1 (10.3)	15.3 (1.6)	1.5 (0.1)	13.8	2.5 (0.1)	2,810.2 (11.0)	15.0	0.0	251.6	12.7	76.2	5,360		
6. Malilipot	1,560.0 (1.0)	616.4 (1.6)	131.2 (2.9)	4.0 (0.3)	127.2	5.3 (0.3)	3,171.0 (12.4)	162.5	25.8	508.8	32.0	1,145.6	10,750		
7. Malinao	4,419.2 (2.8)	1,148.6 (2.9)	32.4 (3.5)	0.4 (0.1)	32.0	120.0 (6.5)	1,692.2 (6.6)	140.0	247.0	206.0	11.7	0.0	7,660		
8. Sto. Domingo	3,810.8 (2.4)	1,400.0 (3.5)	52.6 (1.9)	8.4 (0.3)	44.2	71.0 (3.8)	1,529.0 (6.0)	197.0	0.0	385.4	82.5	0.0	11,640		
9. Tabaco	8,590.6 (5.4)	732.0 (1.9)	826.8 (30.0)	111.1 (0.1)	715.7 (0.5)	1,366.8 (1.0)	12,795.9 (9.7)	2,070.6 (1.6)	353.3 (0.3)	8,681.4 (6.6)	1,905.8 (1.4)	1,895.6 (1.4)	131,890 (100.0)		
Study Area (%)	86,301.9 (54.5)	11,861.8 (9.0)	826.8 (0.6)	111.1 (0.1)	715.7 (0.5)	1,366.8 (1.0)	12,795.9 (9.7)	2,070.6 (1.6)	353.3 (0.3)	8,681.4 (6.6)	1,905.8 (1.4)	1,895.6 (1.4)	131,890 (100.0)		
<i>Municipalities out of the Study Area:</i>															
1. Jovellar	5,706.7 (3.6)	159.7 (0.4)	5.0 (0.4)	5.0 (0.4)	0.0	62.4 (3.4)	660.0 (2.6)	610.0	-	3,245.0	65.0	25.3	10,540		
2. Libon	14,371.0 (9.1)	3,302.8 (8.4)	104.6 (8.4)	1.7 (0.1)	102.9	9.9 (0.5)	520.2 (2.0)	6.1	-	142.0	83.3	-	18,540		
3. Manito	6,483.0 (4.1)	3,553.4 (9.0)	162.0 (9.0)	0.0 (0.0)	162.0	148.0 (8.0)	- (-)	-	-	346.5	44.2	-	10,740		
4. Oas	14,567.6 (9.2)	6,315.5 (16.0)	43.0 (16.0)	11.0 (4.0)	32.0	5.0 (0.3)	3,552.4 (13.9)	129.0	-	2,477.0	40.0	-	27,130		
5. Pioduran	9,657.1 (6.1)	660.6 (1.7)	100.5 (1.7)	15.0 (0.5)	85.5	9.3 (0.5)	2,236.6 (8.7)	123.7	-	166.7	41.5	368.5	13,370		
6. Polangui	10,211.3 (6.5)	863.1 (2.2)	4.0 (2.2)	4.0 (2.2)	0.0	30.0 (1.6)	2,830.0 (11.0)	-	-	541.7	50.0	-	14,530		
7. Rapu-Rapu	6,462.2 (4.1)	6,792.0 (17.2)	463.9 (17.2)	0.1 (0.1)	463.8	2.4 (0.1)	2,328.8 (9.1)	42.3	-	57.9	30.6	-	16,180		
8. Tiwi	4,551.0 (2.9)	6,012.3 (15.2)	7.0 (15.2)	1.0 (0.1)	6.0	220.2 (11.9)	710.5 (2.8)	293.9	-	109.8	13.1	421.6	12,340		
Sub-Total (%)	72,009.8 (58.4)	27,659.3 (22.4)	889.9 (70.0)	37.8 (0.0)	852.2 (0.7)	487.2 (0.4)	12,838.5 (10.4)	1,204.9 (1.0)	0.0	7,086.6 (5.7)	367.7 (0.3)	815.3 (0.7)	123,370 (100.0)		
Provincial Total	158,311.6 (100.0)	39,521.1 (100.0)	1,716.7 (100.0)	148.8 (100.0)	1,567.9 (100.0)	1,854.0 (100.0)	25,634.4 (100.0)	3,275.6 (100.0)	353.3 (100.0)	15,768.0 (100.0)	2,273.5 (100.0)	2,710.9 (100.0)	255,260 (100.0)		

Source : Provincial Agricultural Profile, Province of Albay, 1996

Table 3.3.1 Public Investment Achievements of Bicol Region (Region-V), 1993-1998

(Unit : Thousand Pesos, Current Prices)

Sub-Sectors	1993	1994	1995	1996	1997	1998	Total (%)
1. Highways							
- Arterial roads	365,232	584,605	-	380,465	601,626	1,369,115	3,301,043 (58.3)
- Secondary roads	95,785	113,877	54,505	214,620	580,945	331,145	1,390,877 (24.6)
- Urban roads/expressways	-	-	-	-	-	-	- (0.0)
2. Flood Control and Drainage	25,338	114,882	17,248	192,647	148,000	170,130	668,245 (11.8)
3. Water Supply	32,973	81,482	3,752	-	-	-	118,207 (2.1)
4. Urban Infrastructure	3,000	5,300	-	-	8,000	11,441	27,741 (0.5)
5. Various Projects	26,001	7,055	890	70,657	-	50,781	155,384 (2.7)
Total	548,329	907,201	76,395	858,389	1,338,571	1,932,612	5,661,497 (100.0)

Notes : The amounts for disaster prevention works are included in the sub-sector of "Flood Control and Drainage".

Source : Department of Public Works and Highways (DPWH), Region-V

Table 3.6.1 Specifications of Eruption Monitoring System

No.	System	Equipment	Specifications	
1	Seismograph	Sensor	Structure	Pendulum Dual coil
			Measurement	1 element
			velocity element	vertical
			Max. period	1.00Hz
			Min. period	0.05Hz
		Transmitter/ Receiver	Radio	UHF 400MHz
			Data	Analog
			Yagi	5 elements
		Antenna Controller	Channel discrimination	125Hz
			Others	Pen recorder control
			Pen recorder	
		Recorder	Ligao	
		Repeater	Mayon Skyline Hotel Mayon Skyline Hotel	
		Installation	Upper St. Misericordia Upper Anoling Lignon Hill	
		Power source	Public electricity	Mayon Skyline Hotel Ligao Lignon hill
			Solar Battery	Upper Misericordia Upper Anoling
2	Monitoring of topographic displacement	Distance meter	Deodolite	Class 1 laser
		Prism	Line 1	4
			Line 2	4
		Benchmark	1	
3	Gas analysis	Sampling	Airplane Vehicle	
		Analyzer	Gaschromatography	
		Adjustment	Wind velocity Wind direction	

Note: A cable data communication is adopted to transmit data from Lignon Hill measurement station to Lignon Hill observatory.

Table 3.6.2 Specifications of Lahar Monitoring System

System	Equipment	Specifications	
Wire sensor	Sensor	Sensor cable	50m
		Junction box	
		Control board	
	Transmitter	Radio	UHF
			400MHZ
		Data	Digital
	Antenna	Yagi	5 elements
		Pole	5 m
		Arrester	coaxial
	Repeater Station	Transmitter	
		Receiver	
		Radio	10 W
		Antenna	Yagi 8 elements
Control Station	Monitor	Pole 15m	
	Display		

Table 3.6.3 Specifications of Hydrologic Monitoring System (PAGASA/OCD)

No	System	Equipment	Specifications
1	Rainfall gauging (1)	Sensor	Tipping bucket Resolution 1.0 mm Recording automatic pencoder
2	Rainfall gauging (2) (Bicol River FFWS)	Data collection Plotting standard Sensor	Manual Interval 6.3 hours Tipping bucket
3	Rainfall gauging (3)	Sensor	Resolution 1.0mm Recording automatic pencoder
		Data collection	Telemeter poling 60,30, 15min.
		Transmission	UHF 400MHz
		Installed site	Ligao
		Controlled station	Naga
		Sensor	Tipping bucket Resolution 1.0 mm Recording automatic digital card
		Data collection	Telemeter Event report
		Radio eq.	Trigger 1.0 mm
		Antenna	UHF 400 MHz Yagi 5 elements Arrester coaxial Pole 5m
		Repeater Station	Repeater equipment Radio eq. 10w Transmitter receiver Power amplifier Antenna Yagi, 8 elements Pole 15 m Arrester coaxial Installation Maninila Mabinit Buyuan Mayon Skyline Hotel

No	System	Equipment	Specifications	
4	Water level gauging	<p data-bbox="635 255 847 293">Monitoring station</p> <p data-bbox="635 584 791 622">Power source</p> <p data-bbox="635 741 719 779">Sensor</p>	<p data-bbox="920 255 1059 293">Supervision</p> <p data-bbox="920 300 995 338">Alarm</p> <p data-bbox="920 344 1002 383">Printer</p> <p data-bbox="920 456 979 495">CRT</p> <p data-bbox="920 584 1034 622">Solar cell</p> <p data-bbox="920 629 1007 667">Battery</p> <p data-bbox="920 741 1054 779">Staff gauge</p> <p data-bbox="920 786 1050 824">Resolution</p> <p data-bbox="920 831 1066 869">Observation</p> <p data-bbox="920 875 1054 913">Installation</p>	<p data-bbox="1171 255 1289 293">16 stations</p> <p data-bbox="1171 300 1315 338">Alarm Lamp</p> <p data-bbox="1171 344 1289 383">Automatic</p> <p data-bbox="1171 389 1289 427">09:00 AM</p> <p data-bbox="1171 434 1321 472">Daily Report</p> <p data-bbox="1171 479 1278 517">14 inches</p> <p data-bbox="1171 524 1262 562">640 dot</p> <p data-bbox="1171 568 1273 607">400 lines</p> <p data-bbox="1171 613 1283 651">12v, 2.6w</p> <p data-bbox="1171 658 1270 696">Alkaline</p> <p data-bbox="1171 703 1257 741">Storage</p> <p data-bbox="1171 748 1257 786">Battery</p> <p data-bbox="1171 792 1230 831">1 cm</p> <p data-bbox="1171 837 1362 875">7, 12, 18 o'clock</p> <p data-bbox="1171 882 1262 920">Legazpi</p> <p data-bbox="1171 927 1283 965">Benantuan</p> <p data-bbox="1171 972 1283 1010">Nobonton</p> <p data-bbox="1171 1016 1267 1055">Malinao</p>

Table 3.6.4 Assessment of Candidate Monitoring System

System	(1)	(2)	(3)	(4)	(5)	(6)	Over All
System for volcanic eruption							
Seismic sensor	B	A	A	B	A	B	1
GPS	A	A	B	B	A	C	2
Gas analyzing	A	A	A	C	B	C	2
System for mud and debris flow							
Wire sensor	A	C	A	C	C	B	2
Optical sensor	A	C	C	B	C	B	3
Seismic sensor	C	B	C	B	B	C	1
Supersonic w/ gauge	C	C	C	B	B	C	6
Acoustic sensor	C	B	C	B	B	C	4
Rainfall gauge	A	A	A	B	B	B	1
System for flood							
Water level							
(pressure)	A	A	B	B	C	B	3
(float)	A	A	A	B	A	B	1
(supersonic)	A	A	C	A	B	C	2
System for inter agency communication							
Client server	A	A	A	C	B	B	2
WEBB server	A	A	A	B	B	A	1
VHF radio	C	B	A	A	B	A	2
System to convey warning to barangays							
Radio paging	B	A	A	A	B	A	1
WEBB server	A	A	A	C	B	C	2

- Notes: (1) Technical reliability (accuracy and reliability)
 (2) Compliance to needs (lead time and quick judgement)
 (3) Availability (existing facility, infrastructure and system)
 (4) OMR (cost, manpower required to OMR should be small)
 (5) Durability (system should function well even under critical condition)
 (6) Economy (system should require low cost and small space)

Remarks: A: high accuracy, longer lead time, high availability high durability ability and low cost
 B: medium
 C: low

Table 3.7.1 Main Feature of the Recent four (4) Eruptions and Their Precursors

Eruption Event	1968	1978	1984	1993
Main Eruption Period	22-Apr	May 22-27	September 23-25	February 2 (March 20-21)
Eruption Type	Vulcanian	Strombolian	Vulcanian	Vulcanian (-Strombolian)
Start of Eruption	20-Apr	3-May	9-Sep	February 2
End of Eruption	20-May	4-Jul	6-Oct	Beginning of April
VEI	3	2	3	2
Volume of Ejecta (million m ³)	35	20	70	45
Height of smoke column (km)	3-10	2.5-3 (May.15)	16 (September 23-25)	4.5 (February 2), 5 (March 21)
Pyroclastic Flow(PF) and Pyroclastic Blast	Pyroclastic Blast occurred, Pyroclastic Flow 7km SW	No Pyroclastic Blast occurred	Pyroclastic Blast occurred, Pyroclastic Flow 6km SE	Pyroclastic Flow 6km SE(Feb. 1), 5km SE(Feb. 21)
Lava Flow	3.5km SW	4.2km SW	4.2km SW (2 million m ³)	5.4km SSE (6 million m ³)
Lahar (Volcanic Mud Flow)	During and After Eruption	After 2 years from Eruption	After Eruption	Small Scale
Precursor Earthquake	Since November, 1967	An Increase in the frequency of volcanic earthquakes	A slight increase in seismicity	Stable
Precursor Rumbling	From April 21	From May 1		No Precursor
Crater Glow	From April 20	From November 6	Crater Glow	No Precursor
Increase in the volume of Steam Emission		From December 22	Increase in the volume of Steam in the Plume	No Precursor
Blue Colored Gas	Blue Colore Smoke	Blue Colored Gas		No Precursor
Ash-laden Clouds		Brown colored Clouds	Brown coloured Clouds	No Precursor
Collapse from near the Summit	Landslides and Rockfall		Rockfall	No Precursor
Well Level			dried up	5-10 feet down
Others	Decrease in magnetic field strength	New Crater Appeared	New Dome in a Crater	
Casualties	Death toll 6	Death toll 40 (1980)	No Casualties	Death toll 70-75 (By PF)
Evacuated People		8,000-15,000	16,000-73,000	About 60,000

Data: Ramos et al., 1985 and PHIVOLCS, 1990

Table 4.3.1 Figures for Land Use Plan for Each Protected Area by Options

Municipality	Masilipot	San Andres	17ha	Banquerohan (Phase I+II)	46.90ha	Legazpi	Daraga	Camalig	Guinobatan	Tabaco
Existing & Planning Resettlement Site	San Isidro, San Teresa	San Andres	17ha	Banquerohan (Phase I+II)	46.90ha	Legazpi	Daraga	Camalig	Guinobatan	Tabaco
	30ha	7,660.00	15,370.00	11,860.00	13,090.00	20,300.00	11,640.00	50ha	1,036.41 ha	1,000ha
Area of municipality (Existing Land)	5,360.00									
Hazard Area (Area Size)	373.93 ha	648.00 ha	835.88 ha	2,658.55 ha	600 ha	800 ha	1,036.41 ha	800 ha	1,036.41 ha	118.69 ha
Existing Land Use	Basud	Padang	Yawa	Burabod	Quirangay	Matawang	San Vicente	Buang		
	33.88 ha	85.50 ha	360.75 ha	1,177.40 ha	42.75 ha	245.60 ha	359.75 ha	359.75 ha		
	24.75 ha	126.00 ha	253.38 ha	724.90 ha	300.00 ha	250.00 ha	281.13 ha	281.13 ha		
	0.40 ha	6.00 ha	3.00 ha	12.00 ha	6.00 ha	1.00 ha	0.00 ha	0.00 ha		
	6.40 ha	3.40 ha	1.00 ha	11.00 ha	10.40 ha	5.40 ha	0.40 ha	0.40 ha		
	124.50 ha	32.30 ha	29.20 ha	191.93 ha	17.00 ha	27.45 ha	67.60 ha	67.60 ha		
	0.00 ha	67.50 ha	6.75 ha	225.25 ha	17.00 ha	36.00 ha	67.50 ha	67.50 ha		
	0.00 ha	0.00 ha	0.00 ha	0.00 ha	0.00 ha	23.50 ha	3.38 ha	3.38 ha		
	182.50 ha	324.60 ha	180.00 ha	310.00 ha	178.10 ha	204.75 ha	254.25 ha	254.25 ha		
	1.50 ha	2.70 ha	1.80 ha	1.35 ha	2.40 ha	4.80 ha	2.40 ha	2.40 ha		
	0.00 ha	0.00 ha	0.00 ha	4.72 ha	0.60 ha	1.50 ha	0.00 ha	0.00 ha		
Sabo Facility Area & Protected Area	171.00 ha	200.00 ha	337.5 ha	955.13 ha	42.75 ha	108.00 ha	300.38 ha	300.38 ha		
	202.93 ha	448.00 ha	498.38 ha	1,723.42 ha	557.25 ha	692.00 ha	736.03 ha	736.03 ha		
Development Plan of Municipality related to the Protected Area	Industrial Park (140ha)*	Industrial Park (78ha)								
Alternative 2	77.50 ha	85.50 ha	164.38 ha	741.19 ha	231.25 ha	213.00 ha	505.62 ha	505.62 ha		
	0.00 ha	243.50 ha	299.20 ha	761.23 ha	290.00 ha	383.75 ha	156.03 ha	156.03 ha		
	10.00 ha	78.00 ha	3.00 ha	12.00 ha	6.00 ha	1.00 ha	0.00 ha	0.00 ha		
	1.40 ha	6.00 ha	1.00 ha	11.00 ha	10.00 ha	37.00 ha	1.00 ha	1.00 ha		
	0.00 ha	32.30 ha	29.00 ha	191.93 ha	17.00 ha	27.45 ha	67.60 ha	67.60 ha		
	1.50 ha	2.70 ha	1.80 ha	1.35 ha	2.40 ha	4.80 ha	2.40 ha	2.40 ha		
	0.00 ha	0.00 ha	0.00 ha	4.72 ha	0.60 ha	1.50 ha	0.00 ha	0.00 ha		
Alternative 3	77.50 ha	85.50 ha	330.75 ha	707.11 ha	215.25 ha	213.00 ha	505.62 ha	505.62 ha		
	0.00 ha	243.50 ha	118.83 ha	622.24 ha	297.00 ha	370.75 ha	156.03 ha	156.03 ha		
	10.00 ha	78.00 ha	10.00 ha	109.00 ha	12.00 ha	10.00 ha	1.00 ha	1.00 ha		
	1.40 ha	6.00 ha	6.00 ha	11.00 ha	10.00 ha	37.00 ha	1.00 ha	1.00 ha		
	112.53 ha	32.30 ha	31.00 ha	268.00 ha	20.00 ha	31.45 ha	67.60 ha	67.60 ha		
	0.00 ha	0.00 ha	0.00 ha	0.00 ha	0.00 ha	23.50 ha	3.38 ha	3.38 ha		
	1.50 ha	2.70 ha	1.80 ha	1.35 ha	2.40 ha	4.80 ha	2.40 ha	2.40 ha		
	0.00 ha	0.00 ha	0.00 ha	4.72 ha	0.60 ha	1.50 ha	0.00 ha	0.00 ha		

* The area of 10ha out of 140ha of the total Industrial Area situated in the Protected Area.

Table 4.11.1 Environmental Impact Matrix for IEE of Possible Structural Projects for Debris Flow Control (Preliminary Assessment)

Environmental Element	Class I										Class II			Class III			Class IV		Class V							Class VI	Class VII	Class VIII	Class IX									
	Surface Water	Groundwater	Soil	Geology/Geological Hazards	Climate	Wildlife Habitat	Ecology of Fisheries	Natural Vegetation	Hazardous Substances	Solid Wastes	Water Resources	Agricultural Production	Timber Production	Mining and energy resources	Air quality	Noise	Community facilities and services	Infrastructure	Transportation	Community Population	Resettlement	Income	Ethnic Distribution	Lifestyle	Accessibility	Activities	Historical Sites and Structures	Archaeological sites	Natural landscape	Cultural Landscape	Dislocation of Industries	Employment	Local Economy					
Potential Projects	Phase																																					
Spur Dikes	PP	1																																				
	CP					1					2											1										2	2					
	OP			3								3																						2				
Sand Pockets	PP																																					
	CP	1				1					1											1											1	2				
	OP			3								3																						2				
Consolidation Dams	PP																																					
	CP	1							1																									1	2			
	OP			2																															2			
Diversion Channel	PP																																					
	CP	1				2	2				2																								1	2		
	OP	1		3								2																							2	2		
Levees	PP																																					
	CP	1				1					1																									1	2	
	OP					1						2																								1	2	
Sabo dams	PP																																					
	CP	1				1					1																										1	2
	OP			3								2																									1	2
Reclamation	PP																																					
	CP	2																																			1	1
	OP	2				1																															1	3

Environmental Elements:
I Natural and Biological Environment
II Environmental Hazards
III Resource Conservation and Use

Environmental Impact Score:
④ Significant negative impact
③ Moderate negative impact
② Negligible negative impact
① Negligible positive impact
③ Significant positive impact
② Moderate positive impact
① Negligible positive impact
U Unclear

Project Phases:
PP: Pre-construction Phase
CP: Construction Phase
OP: Operations Phase

Classifications:
IV Air Quality and Noise Environment
VII Historic Resources
V Community facilities/Services and Structures
VIII Visual Resources
VI Open Space and Recreation
IX Economic Environment

Table 4.11.2 Environmental Impact Matrix for IEE of Possible Structural Projects for Flood Control (Preliminary Assessment)

Environmental Element	Class I										Class II			Class III			Class IV		Class V							Class VI	Class VII		Class VIII		Class IX					
	Surface Water	Groundwater	Soil	Geology/Geological Hazards	Climate	Wildlife Habitat	Ecology of Fisheries	Natural Vegetation	Hazardous Substances	Solid Wastes	Water Resources	Agricultural Production	Timber Production	Mining and energy resources	Air quality	Noise	Community facilities and services	Infrastructure	Transportation	Community Population	Resettlement	Income	Ethnic Distribution	Lifestyle	Accessibility	Activities	Historical Sites and Structures	Archaeological sites	Natural landscape	Cultural Landscape	Dislocation of industries	Employment	Local Economy			
Potential Projects	Phase																																			
River Dredging	PP																																			
	CP	②				②			①						①	①	①															②	①			
	OP	③		③						②												③										②	②			
Raising Existing Dike	PP																																			
	CP	①							①	①					①	①	①																②	①		
	OP			②							②											②											②	②		
River Channel Widening	PP																																			
	CP	②				②			①	①					①	①	①																②	①		
	OP			②							②											②											②	②		
New Pawa-Burabod Floodway	PP																																			
	CP	②				②			①	①					①	①	①																	②	①	
	OP	②		②		②			②	②						②	②																②	②		
Urban Estero Widening	PP																																			
	CP	②							①	①					①	①	①																	②	①	
	OP	②		②					②	②							②																	③	③	
Drainage Rehabilitation / Upgrading	PP																																			
	CP	②							①	①					①	①	①																		②	①
	OP	②		②													②																	③	③	
Bridge Construction/ Armoring	PP																																			
	CP	②							①	①					①	①	①																		②	①
	OP			②													②	②																②	②	

Environmental Elements:
 I Natural and Biological Environment
 II Environmental Hazards
 III Resource Conservation and Use

Project Phases:
 PP: Pre-construction Phase
 CP: Construction Phase
 OP: Operations Phase

Environmental Impact Score:
 ③ Significant positive impact
 ② Moderate positive impact
 ① Negligible positive impact
 U Unclear

Environmental Impact Score:
 ③ Significant negative impact
 ② Moderate negative impact
 ① Negligible negative impact
 U Unclear

Classifications:
 VII Historic Resources
 VIII Visual Resources
 IX Economic Environment

Table 4.11.3 Environmental Impact Matrix for IEE of Possible Non-Structural Measures for Disaster Prevention and Livelihood (Preliminary Assessment)

Environmental Element	Class I				Class II			Class III			Class IV		Class V						Class VI	Class VII	Class VIII	Class IX											
	Surface Water Quality	Groundwater	Soil	Geology/Geological Hazards	Climate	Wildlife Habitat	Ecology of Fishes	Natural Vegetation	Hazardous Substances	Solid Wastes	Water Resources	Agricultural Production	Timber Production	Mining and energy resources	Air quality	Noise	Community facilities and services	Infrastructure	Transportation	Community Population	Resettlement	Income	Ethnic Distribution	Lifestyle	Accessibility	Activities	Historical Sites and Structures	Archaeological sites	Natural landscape	Cultural Landscape	Dislocation of Industries	Employment	Local Economy
Relocation of people from 6-km PDZ			②	③							①	①				②				②		②	③							②			
Resettlement Area	①		②	②	①	①	②		①	①							①				①						②			②		③	
Development	①			②	①	①			①	①							①	②										②		②		②	
Establishment of Evacuation Centers	①		①	②		①			①	①							①												①		①		
Construction of Evacuation Routes	①		①			①	②		①	①							①	②	③	①											②	②	
Mineral Water Development	①			②		①																									②	②	
Pili Nut Plantation in Mayon slopes	①		①	②		①	①			①																					②	②	
Reforestation	①																															②	②

Environmental Elements:
 I Natural and Biological Environment
 II Environmental Hazards
 III Resource Conservation and Use

IV Air Quality and Noise Environment
 V Community facilities/Services & Structures
 VI Open Space and Recreation

VII Historic Resources
 VIII Visual Resources
 IX Economic Environment

Environmental Impact Score:
 A+ Significant positive impact
 B+ Moderate positive impact
 C+ Negligible positive impact

A- Significant negative impact
 B- Moderate negative impact
 C- Negligible negative impact
 U Unclear

Project Phases: PP: Pre-construction Phase CP: Construction Phase OP: Operations Phase

Table 8.1.1 Land Use in The Protected Areas Of The Yawa River Sabo System (1/2)

LOCATION	TOTAL PROTECTED AREA IN HECTARES		AGRICULTURAL LANDS (AREAS IN HECTARES)														IDLE LAND (mostly Sand & Gravel)	TOTAL AREA	
			PALAY		COCO LAND	CORN & LEGUMES	BANANA & FRUITS	VEGETABLES & ROOT CROPS	MIX. CROPS	INDUSTRIAL CROPS		OTHERS		AGRI. LAND	%				
			NIRL	IRL						ABACA	PILI	BUSH	FOREST						
CITY OF LEGAZPI																			
1 ARIMBAY	75.00	2.50	33.00	22.41	4.37	6.37	2.75	6.43								64.33	85.77		
2 BAGONG ABRE	135.24	4.84	94.40	28.12	6.99			6.76								134.12	99.17		
3 BONGA	228.00	1.00	25.09	13.09	8.25	1.63	8.35	31.59	5.00			61.00	85.53			217.30	95.31		
4 BUYUAN	17.00	0.29	3.98	2.05		0.29		10.69								17.00	100.00		
5 DITA	51.09	21.37	13.50	13.50	4.50	6.00	4.50	17.75				4.50	2.02			48.37	94.68		
6 MABINIT	41.50	0.48	8.05	8.31	0.50			41.11					9.50			41.11	99.05		
7 MATANAG	67.00	6.56	7.44	18.11	7.75	0.50	3.00	23.58					11.50			65.19	97.29		
8 PAWA	184.76	44.04	36.99	12.00	1.76	1.20	9.99	88.94								181.47	98.22		
9 SAN JOAQUIN	54.67	32.61	16.60	3.50	1.00			52.71								52.71	96.41		
10 TAMAAYAN	28.00	25.72	1.50	0.50				27.72								27.72	99.00		
SUBTOTAL	882.26	95.36	247.60	146.57	32.50	21.19	16.65	185.73	5.00			65.50	108.55			849.31	96.26		
MUN. OF DARAGA																			
1 ALCALA	189.26	39.19	80.50	2.00	1.00	1.00		123.02								123.02	72.68		
2 BANADERO	224.34	55.98	50.00	100.50	0.50			218.26								218.26	97.29		
3 BUDIAO	183.30	0.44	78.43	59.00	7.00			179.13					9.00			179.13	97.73		
4 BUSAY	103.94	30.00	37.00	4.50	0.50			101.28								101.28	97.44		
5 KILICAO	160.49	10.00	95.33	7.25	0.25	1.00		116.93								116.93	72.86		
6 MALABOG	54.11	16.43	16.57	13.60	7.10	0.50		52.83								52.83	97.63		
7 MATNOG	141.32	17.30	109.70	0.90	1.00			138.24				5.00				138.24	97.82		
8 MHSI	334.50		231.67	0.75	0.90			333.25				59.23	10.50			333.25	99.63		
9 SALVACION	130.00	18.00	16.00	1.00	1.00			93.03				64.23	19.50			93.03	71.56		
SUBTOTAL	1,501.27	152.04	393.13	544.22	9.10	7.40		1,355.96								1,355.96	90.32		
MUN. OF CAMALIG																			
1 CABANGAN	89.98	0.80	0.53	54.29	0.37	0.78		56.12								56.12	62.37		
2 SUMLANG	65.52	7.48	51.83	10.38	2.38			59.31								59.31	90.52		
SUBTOTAL	155.50	0.80	8.01	106.12	2.75	0.78		115.43								115.43	74.23		
TOTAL (%)*	2,539.03	248.21	648.73	796.91	41.60	19.61	28.59	369.07	15.38			129.73	128.05			2,320.70	91.40		
		10.70	27.95	34.34	1.79	0.84	1.23	15.90	0.66			5.59	5.52			100.00			

Source: CPDO/MPDO, Assessors Office in City of Legazpi, Daraga and Camalig, JICA Study Team

(%)* : Agricultural Crops / Total Area of Agricultural Land, Rural Land Area / Total Area

..... : Included in Coco Land and Paddy as the intercropping.

Table 8.1.1 Land Use in The Protected Areas Of The Yawa River Sabo System (2/2)

LOCATION	RURAL (BUILT-UP AREA) LAND (AREAS IN HECTARES)										NATIONAL ROAD			BARANGAY ROAD			RAILROAD		TOTAL AREA ROADWAYS IN Ha.	%		
	RESIDENTIAL		COMMERCIAL		INDUSTRIAL		EDUCATIONAL		RELIGIOUS		INSTITUTIONAL		TOTAL AREA RURAL LAND		LENGTH IN Km.	AREA IN Ha.	LENGTH IN Km.	AREA IN Ha.			LENGTH IN Km.	AREA IN Ha.
	No.	AREA	No.	AREA	No.	AREA	No.	AREA	No.	AREA	No.	AREA	%									
CITY OF LEGAZPI																						
1	ARIMBAY	435	2.18	5	6.27			4	1.02	1	0.50			9.97	13.29	1.20	0.70			0.70	0.93	
2	BAGONG ABRE	192	0.96	4			4	0.16					1.12	0.83							0.00	
3	BONGA	162	9.90		0.16				1	0.04			10.10	4.43		1.00	0.60			0.60	0.26	
4	BUYUAN												0.00	0.00							0.00	
5	DITA	202	1.01				3	1.32	1	0.03			2.36	4.62		0.65	0.36			0.36	0.70	
6	IMABINIT	25	0.13										0.13	0.30		0.45	0.27			0.27	0.65	
7	MATANAG	245	1.23				3	0.12	1	0.05			1.40	2.08		0.70	0.42			0.42	0.63	
8	PAWA	77	0.94				3	1.02	1	0.02			1.98	1.07		3.10	1.32			1.32	0.71	
9	SAN JOAQUIN	317	1.59				1	0.01	1	0.04			1.64	2.99		0.55	0.33			0.33	0.60	
10	TAMAAYAN	26	0.04										0.04	0.14		0.40	0.24			0.24	0.86	
	SUBTOTAL	1681	17.96	9	6.43		18	3.65	6	0.68			28.72	3.25	1.20	0.70	6.85	3.54		4.24	0.48	
MUN. OF DARAGA																						
1	ALCALA	201	43.41		1.66		6	0.33			1	0.01	45.40	26.82			1.40	0.84		0.84	0.50	
2	BANADERO	159	4.32	1	0.05		5	0.02	1	0.01	1	0.04	5.42	2.42		1.10	0.66			0.66	0.29	
3	BUDIAO	36	0.11		1.25		1	0.64	2	1.01	1	0.02	3.03	1.65		1.9	1.14			1.14	0.62	
4	BUSAY	28	0.66		1.04	1	0.19	1	0.02			0.75	2.66	2.56							0.00	
5	KILICAO	167	12.86	1	3.41	15	22.83		0.97	2	0.01	3	0.08	41.16	25.65		4.00	2.40		2.40	1.50	
6	MALABOG	37	0.11		0.09								0.20	0.38		0.50	0.30		0.80	0.48	2.00	
7	MATNOG	97	0.68		0.89		1	0.01			3	0.01	1.59	1.12			2.50		1.50	1.50	1.06	
8	MISI	23	0.75				1	0.50					1.25	0.37							0.00	
9	SALVACION	107	4.88	3	10.67		1	0.00			78	15.73	34.27	26.36		1.50	0.90		3.00	1.80	2.08	
	SUBTOTAL	855	67.76	5	19.07	16	23.02	16	2.48	5	1.03	87	16.63	134.99	8.99	2.00	1.20	12.80	8.82	0.40	10.32	0.69
MUN. OF CAMALIG																						
1	CABANGAN	71	20.55								17	10.33	30.88	34.32		1.70	1.00		2.20	1.32	2.98	
2	SUMLANG	14	5.61										5.61	8.57						1.00	0.60	
	SUBTOTAL	85	26.16								17	10.33	36.49	23.47		1.00	2.20		2.20	1.32	3.58	
	TOTAL (%)*	2621	111.87	14	25.50	16	23.02	34	6.13	11	1.71	104	26.96	200.20	7.88	2.90	21.85	13.68	2.50	18.14	0.71	
			4.41	1.00	0.91	0.24	0.07															

Source: CPDO/MPDO, Assessors Office in City of Legazpi, Daraga and Camalig, JICA Study Team
 (%)* : Agricultural Crops / Total Area of Agricultural Land, Rural Land Area / Total Area
 : Included in Coco Land and Paddy as the intercropping.

Table 8.3.1 Losses of Free Space, Topography and Fading

Span	D (km)	SI (dB)	TI (dB)	FI (dB)	Total (dB)
S5 — R3	6.8	101.1	8.5	4.4	114.0
P14 — R3	6.8	101.1	8.5	4.4	114.0
R3 — LH	11.3	105.5	0.0	5.3	110.8
S6 — LH	10.1	104.5	0.0	5.0	109.5
S7 — R1	7.0	101.3	0.0	4.4	105.7
R1 — LH	17.5	109.3	4.5	6.5	120.3
P6 — DP	10.9	105.1	0.0	5.2	110.3
P8 — DP	4.8	98.0	0.0	4.0	102.0
P9 — DP	4.4	97.3	0.0	3.9	101.2
W1 — DP	4.4	97.3	0.0	3.9	101.2
P10 — R1	7.0	101.3	0.0	4.4	105.7
R1 — DP	20.3	110.4	5.2	7.1	122.7
P11 — R1	3.0	93.9	0.0	3.6	97.5
W2 — R1	3.0	93.9	0.0	3.6	97.5
P12 — R1	9.6	104.0	0.0	4.9	108.9
P13 — R2	8.1	102.6	0.0	4.6	107.2
W6 — R2	8.1	102.6	0.0	4.6	107.2
R2 — R1	11.4	105.5	0.0	5.3	110.8
R3 — DP	10.2	104.6	0.0	5.0	109.6
W3 — R1	1.8	89.5	0.0	3.4	92.9
W4 — R1	5.8	99.7	0.0	4.2	103.9
W5 — R2	9.4	103.9	0.0	4.9	108.8
T1 — DP	1.5	87.9	0.0	3.3	91.2

Note

D : Span length (km)

SI = $20 \log f + 20 \log D + 32.4$

TI = Chart

FI = $0.2 D + 3.0$

Table 8.3.2 Minimum X and Necessary Power

Span	Total Loss (dB)	Min. X	Necessary Power (W)
S5 – R3	114.0	27.4	1
S6 – LH	109.5	22.9	1
S7 – R1	105.7	19.1	1
P6 – DP	110.3	23.7	1
P8 – DP	102.0	15.4	1
P9 – DP	101.2	14.6	1
P10 – R1	105.7	19.1	1
P11 – R1	97.5	10.9	1
P12 – R1	108.9	22.3	1
P13 – R2	107.2	20.6	1
P14 – R3	114.0	27.4	1
W1 – DP	101.2	14.6	1
W2 – R1	97.5	10.9	1
W3 – R1	92.9	6.3	1
W4 – R1	103.9	17.3	1
W5 – R2	108.8	22.2	1
W6 – R2	107.2	20.6	1
T1 – DP	91.2	4.6	1
R1 – LH	120.3	33.7	3
R3 – LH	110.8	24.2	1
R1 – DP	122.7	36.1	5
R2 – R1	110.8	24.2	1
R3 – DP	109.6	23.0	1

Note

$$X \geq \text{Total Loss} - 86.6$$

$$\text{Output} = 10 \log W + 30 \text{ (dB)}$$

$$W = 1 : 30.0 \quad W = 4 : 36.0$$

$$2 : 33.0 \quad 5 : 37.0$$

$$3 : 34.8$$

Table 8.3.3 Allocation of Wave

Span 1	Wave	Span 2	Wave	Span 3	Wave	Existing
S1 – LHill	a	—	—	—	—	*
S2 – LHill	Cable	—	—	—	—	*
S3 – LHill	b	—	—	—	—	*
S4 – R1	c	R1 – LHill	d	—	—	*
S5 – R3	(o)	R3 – LHill	e	—	—	—
S6 – LHill	(c)	—	—	—	—	—
S7 – R1	(e)	R1 – LHill	f	—	—	—
P1 – DPWH	g	—	—	—	—	*
P2 – DPWH	h	—	—	—	—	*
P3 – DPWH	i	—	—	—	—	*
P4 – DPWH	j	—	—	—	—	*
P5 – R1	k	R1 – DPWH	l	—	—	*
P6 – DPWH	(w)	—	—	—	—	—
P7 – DPWH	Cable	—	—	—	—	—
P8 – DPWH	m	—	—	—	—	—
P9 – DPWH	n	—	—	—	—	—
P10 – R1	(a)	R1 – DPWH	o	—	—	—
P11 – R1	(b)	R1 – DPWH	p	—	—	—
P12 – R1	(h)	R1 – DPWH	q	—	—	—
P13 – R2	(p)	R2 – R1	(j)	R1 – DPWH	S	—
P14 – R3	(s)	R3 – DPWH	(k)	—	—	—
W1 – DPWH	r	—	—	—	—	—
W2 – R1	(g)	R1 – DPWH	t	—	—	—
W3 – R1	(e)	R1 – DPWH	u	—	—	—
W4 – R1	(a)	R1 – DPWH	v	R1 – DPWH	X	—
W5 – R2	(a)	R2 – R1	(n)	R1 – DPWH	Y	—
W6 – R2	(p)	R2 – R1	(r)	—	—	—
T1 – DPWH	w	—	—	—	—	—

Note

* : Existing

Table 8.5.1 Profile of the Banquerohan Resettlement Site and Anislag Resettlement Plan (as of October 1999)

Name	(1) Banquerohan Resettlement Site	(2) Anislag Resettlement Plan
1. Location	Banquerohan, Legazpi City	Anislag, Daraga
2. Distance from crater (km)	25 km	15 km
3. Distance from former residence (km)	20 km	8 km
4. Land area (ha)	Phase I : 18.93 ha (Phase II Plan : 27.07ha)	21.35 ha (Phase I: 12.57ha, Phase II: 8.78ha)
5. No. of houses	Phase I : 600 (Phase II Plan : 460)	Planning for 635
6. Home lot size (m ²)	Phase I : 90 - 298m ² (Phase II : 90 - 290 m ²)	100m ² (10m x 10m)
7. House size (m ²)	Phase I : 20 m ² (4m x 5 m)	10.5m ² (3.0m x 3.5m)
8. Establishment (year)	Phase I : 1994	Construction started on May 1998 and to be completed in 1999.
9. Total Investment Amount (Million Pesos)	Phase I: 38.9 / Phase II: 8.0	19.4 Millions Pesos
10. Beneficiaries	Victims of Mayon Volcano eruption	Victims of Mayon Volcano eruption and typhoon Rosing, and those living in danger areas
11. Actual no. of houses awarded	504	80 houses are under construction.
12. Estimated no. of household living in the resettlement	174	None
13. Profile of the beneficiaries	Farmers, laborers & employees (Coconut, vegetables such tomato, cucumber, squash, pechay, beans and rootcrops such as cassava)	Farmers and laborers (coconut, paddy rice and vegetables)
14. Name of former Barangay	Arimbay, Bagong Abre, Bigaa, Bonga, Boyoan, Mabinit, Matanag, Padang	Budiao(all HH), Banadero(21/300), Busay(91/300), Banag(69/400), Binitayan(128/1,000), Kimangtong and Tagas(100/1,000)
15. Project Administration	LGU-Legazpi City	LGU-Daraga
16. Land development	LGU-Legazpi City, NDCC, NHA	LGU-Daraga, NHA
17. Construction of houses	LGU-Legazpi City, NDCC(P20M), NHA	NHA, Donation from NGOs
18. NDCC Calamity Fund	None	9.57 Millions Pesos
19. Water supply	18 deep wells	28 units shallow wells
20. Other Facilities	Administration building, training hall, chapel, multi-purpose hall, recreational park, integrated family life resource center, ALECO power line	Concrete road, drainage system, individual septic tank, power lines by ALECO
21. Other remarks	Some resettlers acquired farm lots in nearby sites. Some temporarily farm on Phase II lots. Other livelihood means are abaca weaving, trading and so on. Few are engaged in fishing.	Adjacent to the resettlement area, construction of houses for government employes is planned. Irrigation system is available nearby.
22. Issues	Various technical and financial assistance were given but still resettlers face livelihood problems. Illegal squatting of non beneficiaries, insufficient potable water supply, lack of sanitary facilities (toilets), no farmlots for them and abandonment of some units by beneficiaries.	Technical assistance in livelihood generation is needed by acquiring farmlands and/or generating job opportunities.
23. Land Acquisition	Purchased by LGU	Purchased by LGU
24. Type of constructed house	Mayon model type II & III	Core shelter type
25. Livelihood assistance	National DSWD-Self Employment Assistance (SEA) "Kaunlaran" Program	None

Sources: Data from the City and Municipal authorities concerned and Results of the Area Development Potential Survey conducted in October 1999 by JICA Study Team .

Table 14.6.1
OFFICE OF CIVIL DEFENSE
REGIONAL DISASTER MANAGEMENT CENTER
 Camp General Simeon A. Ola
 Legazpi City

MUD AND DEBRIS FLOW BULLETIN

Bulletin No. _____
 Time & Date issued _____

MONITORED PARAMETERS	OBSERVATION ON RAINGAUGE STAN NO.				
	No. 1 Site A	No. 2 Site B	No. 3 Site C	No. 4 Site D	No. 5 Site E
OBSERVATION TIME					
Accumulated Effective Rainfall (mm)					
Total Rainfall Intensity (mm/h)					
Rain Intensity for the past 60 minutes					
Area at Risk	Maninila, Masarawag, Tandarora, San Rafael, Maipon, all of Guinobatan, Baligang, Basag, Nasisi, allof Ligao	Mabinit, Pawa, Bonga, Bogtong, all of Legazpi City, Budiao, Bañadero, Busay, Culliat, Bañag, Bagumbayan, Malobago, Tagas, Matnog, all of Daraga	Buyuan, Bigaa, Padang, all of Legazpi City	Sta. Mesirecordia, Fidel Surtida, Lidong, San Isidro, all of Sto. Domingo	San Vicente, Mariroc and Buang, all of Tabaco.
Alert Status	Level _____	Level _____	Level _____	Level _____	Level _____