

*The Study on Comprehensive Disaster Prevention
around Mayon Volcano*

SUPPORTING REPORT (2)

(Part II: Feasibility Study)

XXI: O&M PLANNING

**SUPPORTING REPORT (2) - XXI
O&M PLANNING**

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SUPPORTING REPORT (2) – XXI

O&M PLANNING

1. BASIC CONCEPT

(1) Purpose of Operation and Maintenance

The cost imposed on economies by poorly maintained infrastructure facilities is not well documented but are large.

Good operation and maintenance (O&M) can extend the useful lives of facilities. This affects the performance of facilities, and hence expands the resources available for investment in other infrastructures.

Root causes for poor O&M were usually lack of attention towards O&M due to low ownership of the project, which lead to lack of funds, shortages of managers qualified to organize O&M, shortages of skilled staff and training, and shortages of spare parts and equipment.

Purpose of O&M is to contribute to sustainable development.

(2) Scope of Works for Operation and Maintenance

Operation and maintenance (O&M) refers to all activities needed to run the facilities and system, except for construction of new facilities. Operation includes the planning and control of facilities and system.

Maintenance may be preventive or reactive. Preventive maintenance consists of the systematic routine actions needed to keep facilities and system in good condition. It includes minor repairs and replacement as dictated by the routine examination. Reactive maintenance normally occurs as a result of reported malfunctioning or breakdown of facilities and system.

Preventive or routine maintenance should be carried out continuously according to pre-established schedules, according to rational considerations such as the manufacturer's recommendations for servicing the equipment. Once agreed upon, these schedules need to be kept to and the results recorded.

Reactive maintenance is needed where past routine maintenance has been insufficient, as well as after accidents and where facilities are aging. All interventions need to be analyzed and the causes of malfunction or breakage recorded, so as to guide future procurement decisions and help in deciding whether part or all of facilities should be upgraded or replaced.

(3) Organization and Staffing for Operation and Maintenance

It is essential that those organizations that are involved in project planning and implementation are responsible for O&M as well.

2. OPERATION AND MAINTENANCE

2.1 Basic Concept

It is necessary to have O&M plan before commencing construction/installation of equipment in order to achieve sustainable disaster prevention capacity. Thus implementing organization for each project is required to provide an operations and maintenance plan before any disbursement begins. An annual review of O&M activities and needs will be carried out by PMO.

2.2 Operation and Maintenance of Priority Projects

(1) Yawa River System Sabo Project

1) Scope of Works

Scope of works for O&M of sand pocket are assumed as follows:

- Maintenance dredging to remove deposit
- Regular river survey including deposition in sand pocket
- Monitoring river deposit mining
- Regular inspection of sabo structure
- Longitudinal profiling and Cross – sectioning survey

2) Dredging capacity

Dredging work by backhoe and dump truck is contemplated considering the physical properties and the conditions of the sites.

- | | |
|--------------------------|---|
| (Excavation) | - Bulldozer 22t with ripper and Backhoe |
| (Excavation and hauling) | - Bulldozer and Backhoe |
| (Hauling) | - Backhoe |

Adopted Equipment: Backhoe (Bucket Capacity 1.2m³)

Work capability of Backhoe for Dredging work is as follows:

(Source: Japanese Construction and Equipment Handbook)

Earthwork Volume (Back Hoe) = $(3600 \cdot q \cdot K \cdot f \cdot E) / C_m$ (m^3/h)

q : Loading Volume/1 cycle (m^3) $q = 0.98 \cdot q_o = 1.18m^3$

q_o : Nominal Bucket Capacity $1.2m^3$

K : A coefficient of Bucket 0.98

F : Bulking Factor 1

E : Production Efficiency 0.6 (Normal Condition)

C_m: Cycle Time 30 sec

Earthwork Volume : $(3600 \times 1.18 \times 0.98 \times 1 \times 0.6) / 30 = 83.3$ ($m^3/h/car$)

(Conveyance) - Dump truck

Adopted Equipment: Dump truck (11t)

E : Production Efficiency 0.9

(Normal Condition in case of Dump truck)

Transportation distance: Round way (3 - 4km)

(Maintenance of spoil bank yard) Bulldozer 11t

Possible Dredging Volume per Round (Pawa-Burabod)

Equipment	Number	Dredging Capacity
Back Hoe $1.2m^3$	1	$83.3m^3/h$
Dump Truck 11t	6	$14.4m^3/h \times 6 = 86.4m^3/h$
Dredging Capacity/Party		$83.3m^3/h$

Possible Dredging Volume per Round (Anoling, Budiao)

Equipment	Number	Dredging Capacity
Back Hoe $1.2m^3$	1	$83.3m^3/h$
Dump Truck 11t	3	$32.0m^3/h \times 3 = 96.0m^3/h$
Dredging Capacity/Party		$83.3m^3/h$

As a result of the above, a work party in the Pawa-Burabod river and the Anoling, Budiao river consists of the following equipment.

The Pawa-burabod river: Back Hoe 1, Dump Truck 6 and bulldozer 1

The Anoling and Budiao river: Back Hoe 1, Dump Truck 3 and bulldozer 1

In case of working 8 hours a day, a work party which is composed of backhoe and dump truck is required the following total number of working days.

Work Volume of Dredging Work

Work Volume	Number of Party	Dredging Capacity (m ³ /h)	Dredging Volume (m ³)	Total Number of Days (days/year)
Pawa-Burabod	1 (1 BH, 6 DT)	83.7 (83.3 × 1)	13,200	21
Anoling, Budiao	1 (1 BH, 3 DT)	83.7 (83.3 × 1)	146,600	220
Total	1 (2 BH, 9 DT)	167.4	159,800	241

BH: Back Hoe

DT: Dump Track

3) Organization and Staffing

Required Manpower is estimated as follows:

Required Number of Staff and Cost

Personnel	Pawa-Burabod Sand Pocket	Anoling, Budiao Sand Pocket	Labor Cost (peso/day)
Site Supervisor	1	1	400
Administrator	1	1	300
Back hoe operator	1	1	350
Bulldozer operator or Pay Loader operator	2	1	350
Dump track driver	6	3	300
Guard	2	1	250
Total	13	8	

4) Implementation of the Maintenance Works

The necessary maintenance works almost double the present dredging work done by DPWH and the present capacity of DPWH might not be sufficient to accommodate the works. The implementation is rather irregular and sporadic depending on debris runoff and is preferable to be completed within short period. In the light of this, it is recommended that the implementation be carried out under contract basis rather than the force account basis.

The estimated required budget for the maintenance works are 21,228 thousand pesos a year. The required budget comprises administration 954, regular maintenance 6,719 and dredging 21,228 thousand pesos.

(2) Legazpi City Urban Drainage Project

Please refer to XIV- p.29~p.31 “Hydrology, Hydraulics/River Planning”.

(3) Forecasting and Warning System Strengthening and Evacuation Project

1) Target system of OMR

- The proposed system comprises the following systems;
- Monitoring and forecasting system
- Warning system
- Evacuation system

The proposed monitoring and forecasting system comprises the following systems for the target hazards to be monitored;

- Eruption monitoring system
- Typhoon monitoring system
- Mud and debris flow monitoring system
- Flood monitoring system

Existing system is adopted as it is with regard to the typhoon monitoring and the prevailing OMR is supposed to be appropriate. And no additional input is necessary for the system.

An inter agency disaster information system is proposed as the core warning system in addition to the prevailing warning disseminating system. VHF radio telephone are provided to enforce the communication between MDCC and BDCC.

Capacity up of the existing evacuation center is proposed and emergency shelter and the provision of a livestock sanctuary is proposed.

2) Scope of Works

Works requisite to the OMR incurred by the new proposals or proposal of alterations are as follow;

Eruption monitoring

OMR for 3 telemetered seismograph and 1 repeater station , data processing unit,
1 supervisory control and monitoring equipment,

GPS and deformation assessment system, elaboration and calibration of the assessment software

Mud and debris Flow monitoring

OMR for 41 telemetered rainfall gauging stations, 2 repeater stations and 1 System supervisory control and monitoring equipment, data processing unit and elaboration and calibration of the assessment software

Flood monitoring

OMR of 6 telemeterd water level gauging Systemstations and 1 tidal gauging station, 1 supervisory control and data processing unit and calibration and elaboration of the assessment soft ware

Warning system

OMR of inter agency disaster information network (IADIN) and VHF radio and elaboration of database for server

Evacuation system

OMR of evacuation center, shelter and livestock sanctuary

3) Responsible agencies

The agency responsible for the OMR of each system is assumed on the basis of the present practice and the covering discipline as follows:

Eruption monitoring	PHIVOLCS
Mud and debris	DPWH
Flood	DPWH
IADIN	OCD
VHF	LGU
Evacuation center	DECS
Shelter	LGU
Livestock sanctuary	LGU

4) Necessary input for the OMR

Necessary input are manpower, material, spare parts and miscellaneous expenditures.

The manpower inputs for each system are estimated as below:

System	Manager	Engineer	Administrator	Technician	Labor
Eruption Monitoring	1	1	1	1	1
Mud and Debris and Flood	1	3	1	4	4
Inter Agency Disaster Network	1	-	1	1	-
VHF Radio System	-	-	-	1	-
Evacuation Center	-	-	-	5	5
Shelter and Livestock Sanctuary	-	-	1	3	4

The necessary work force is assumed including part time input.

Material input and spare parts requirement including miscellaneous expenditure are estimated to be as follows:

Monitoring system	9% of installation cost
Warning system	9% of installation cost
Evacuation center	0.1% of construction cost

5) OMR cost

The estimated OMR costs are as follows:

Forecasting and Warning system	28.7 million pesos
Evacuation, shelter and L. sanctuary	1.0 million pesos

(4) Resettlement Site Development Project

1) Scope of Works

Maintenance and repair works of the public facilities in the resettlement site will be carried out according to the following procedure and rules:

- Repair inspection of the public facilities within the site;
- Reporting on the trouble and preparation of an inventory of the facilities to be rehabilitated;
- Identification of the authority in charge (depending on the kinds of facilities and works needed, and their degrees in trouble); and
- Implementation of the maintenance and/or repair works

The responsibilities for the respective maintenance and repair works will be made as follows:

- Roads and pathways (LGUs/Resettlement Committee concerned);
- Water Supply system (Local Water Districts);
- Drainage System (LGUs/Resettlement Committee concerned);
- Electric power supply system (ALECO);
- Public buildings
 - a. School (DECS);
 - b. Chapel (Resettlement Committee/Community);
 - c. Public Hall (Resettlement Committee/Community);
 - d. Health and day care center (LGU/Resettlement Committee);
 - e. Productivity center (Resettlement Committee/Cooperative);
 - f. Multi-purpose warehouse (Resettlement Committee/Cooperative);
 - g. Park and open space (Resettlement Committee/Community)

Regarding the O&M cost for the Resettlement Sites, majority of the people interviewed in “People’s intention survey” answered that they were willing to pay 60 pesos monthly. There are approximately 1,600 households to be dwelled in Banquerohan and Anislag Resettlement Sites.

If this O&M charge of 60 pesos a month is realized, cost recovery from user charge is realized for the Resettlement Sites.

2.3 Total Budget for Operation and Maintenance

Total annual budget required for O&M of Priority Projects is 52.0 million pesos.

Summary of organization responsible for O&M activities, required number of staff and cost is given below.

Priority Project	Agency	Required Staff	Annual O&M Cost (million PHP)
Yawa River System Sabo	DPWH	21	21.2
Legazpi City Urban Drainage	DPWH	27	3.2
Forecasting & Warning System Strengthening	DPWH	13	12.4
	PHIVOLCS	5	4.0
	OCD	3	6.5
	LGUs	19	3.0
	Sub-total	40	25.9
Evacuation System Strengthening	DECS	-	0.9
	LGUs	-	0.1
Resettlement Site Development	Legazpi City	-	0.4
	Daraga	-	0.3
Total	-		52.0

For Evacuation System Strengthening and Resettlement Site Development Projects, no permanent staff for is envisaged. Maintenance work will be made on call basis as set in the O&M plan, though regular inspection by appointed staff is required.

The breakdown of annual O&M cost is shown in Chapter XXIV Cost Estimate. Summary of Annual O&M cost by organization is given below.

Summary of Annual O&M Cost for Priority Projects by Organization

(Unit: Million PHP)

Project	DPWH	PHIVOLCS	OCD	Legazpi	Daraga	LGUs	DECS	Total
Yawa River System Sabo	21.2							21.2
Legazpi City Urban Drainage	3.2							3.2
Forecasting and Warning System Strengthening	12.4	4.0	6.5	0.3	0.3	2.4		25.9
Evacuation System Strengthening				0.01	0.01	0.05	0.9	1.0
Resettlement Site Development				0.4	0.3			0.7
Total	36.8	4.0	6.5	0.7	0.6	2.4	0.9	52.0

*LGUs refer to Municipalities of Camalig, Guinobatan, Ligao, Malilipot, Sto. Domingo and Tabaco