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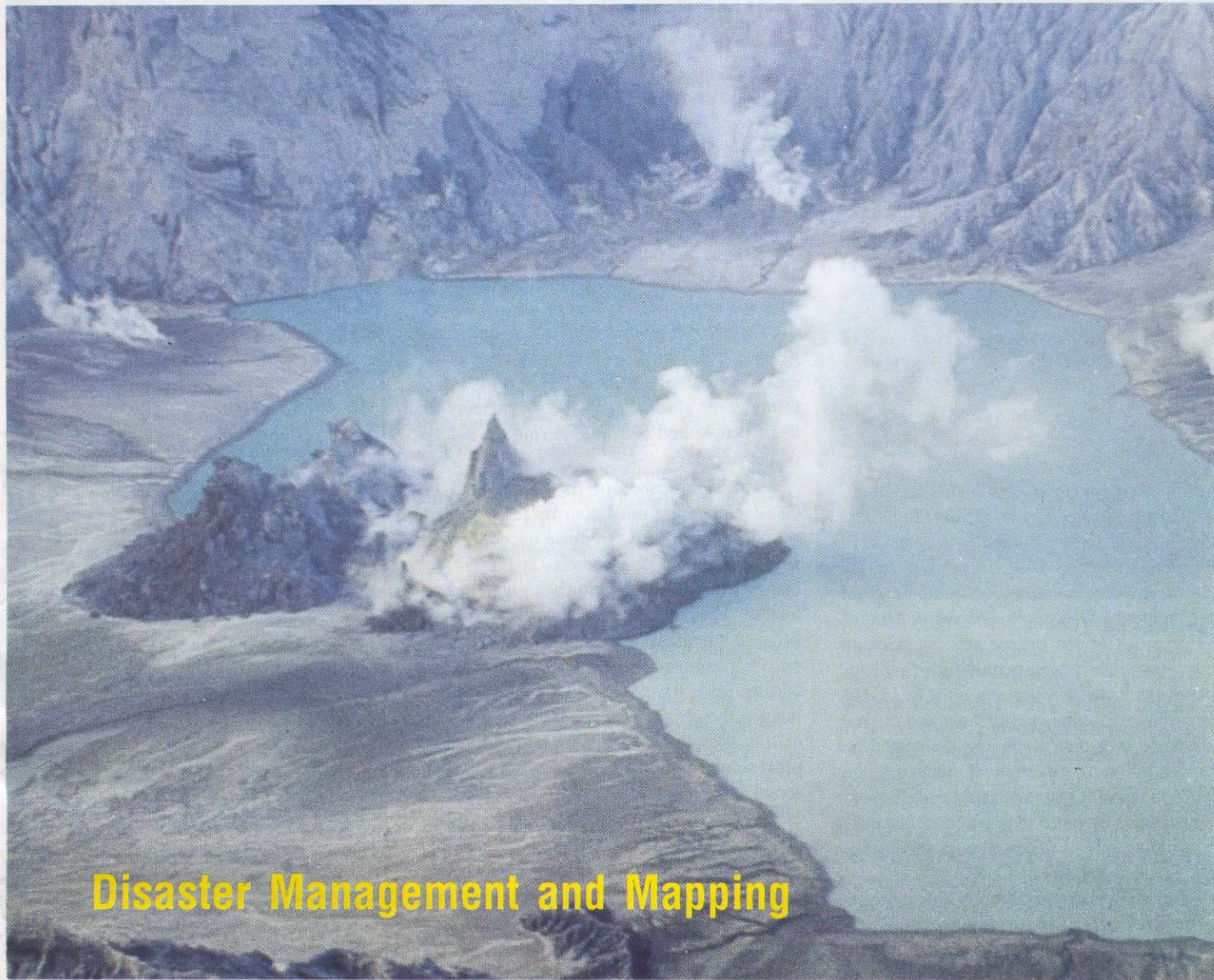
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Disaster Management and Mapping

PHIVOLCS



Editorial

The extent and magnitude of the devastating effects of disasters that have visited the country since the onset of the '90s can partly be traced to the destructive acts of man. Goaded by greed and abject indifference to the environment, man's wanton destruction of forests, as well as the unsustainable exploitation of land, mineral and water resources have aggravated the already damaging effects of natural calamities on lives and property.

On the surface, glaring statistics on the number of deaths, on families rendered homeless, and on damaged infrastructures and agricultural crops demonstrate the ill effects of disasters that have plagued the country during the last decade. The less discerning among us would probably fail to see the real implications of these numbers. These figures indicate nature's revenge, its way of saying "Enough is enough!" to man's plunder and abuse. More significantly, these statistics point to an urgent need for a more comprehensive disaster preparedness, response and rehabilitation program.

Government policy on disaster preparedness and response is clearly embodied in Presidential Decree No. 1566 promulgated in 1978 which established the National Program on Community Disaster Preparedness. Most of the premises of the decree are still relevant today, particularly those pertaining to the major role of the local government units or LGUs. Espousing self reliance, self help and mutual assistance, even then, it squarely delineated the responsibility of government agencies and LGUs in disaster response and rehabilitation. It supersedes by more than ten years the self-determining role of LGUs as contained in the new Local Government Code.

Although the government's disaster management policy is still relevant to the conditions prevailing in the country today, government and private sector involvement is mainly focused on disaster response to save life, protect property, and deal with "immediate danger caused by the disaster." Rescue and relief

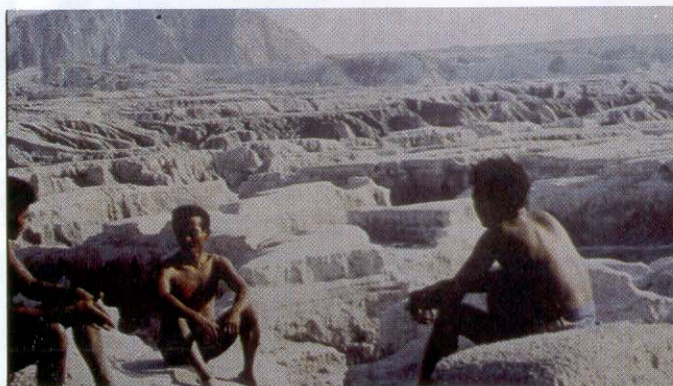
operations, building of lahar sabo dams, the repair of damaged bridges and school-houses and the provision of livelihood projects and employment for the displaced populace are all post-disaster activities, taken only after the damage has already been done.

The concept of disaster management, however, also involves disaster preparedness. This includes the formulation of viable disaster plans and the education and training of people on the dangers of disasters as well as on how to cope with these events.

It is in the formulation of disaster plans where NAMRIA comes in. NAMRIA can lend a hand in mitigating the adverse consequences of disasters by providing relevant and up to date geographic information to decision and policy makers. Its maps, charts and other geographic information products provide vital inputs to these people and help in ensuring the safety of the populace.

The significance of risk assessment in disaster planning must also be realized and seriously considered. Because the concept is still an evolving one, there is at present no comprehensive risk mapping being undertaken locally. The Philippines needs such a risk map because it contains important parameters that will enable government to respond to disaster and mitigate its effects. These parameters include the physical vulnerability of cities to earthquakes, floods, tsunamis, landslides, and other similar natural phenomena, as well as the social and economic aspects of vulnerability. NAMRIA, PAGASA, PHIVOLCS and other agencies must pool their efforts and take the lead in the production of a comprehensive risk map for the country and help save countless lives and properties.

For the fifth issue of the Infomapper, we have focused our energies on disasters. Pains-taking research on several organizations involved in disaster activities, and on dozens of reference materials on this theme has resulted



PHIVOLCS

in a collection of articles on disaster facts, issues, and on disaster management and mapping activities of the public and private sector. It is our hope that through this issue, our readers will in some way be aware of the impact of disasters on our lives and realize that something can be (and is being) done to mitigate their effects on us. ●

In this issue. . .

- Disasters in the Philippines 3
- Trends in Disaster Mapping 4
- Coping with Disasters 6
- NGOs as Government's Partner in Disaster Management 10
- LIS Experience in the Phils. 15

NEW PRODUCTS

Four 1:50,000 scale topographic map sheets of Zamboanga del Norte, five 1:50,000 scale topographic map sheets of Puerto Princesa, two 1:50,000 scale topographic map sheets of Ilocos Norte, one 1:50,000 topographic map sheet of Cagayan Island and one 1:50,000 topographic map sheet of Surigao del Norte have been revised and printed as of August 1993.

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Features

Disasters in the Philippines

by Maria Romina B. dR.-Pe Benito

Webster defines *disaster* as a "calamity" or "any happening that causes great harm or damage."

Through the years, the Philippines has been experiencing a great variety of disasters, from earthquakes to the most recent river tragedy in Bulacan. This phenomenon may easily warrant one to conclude that the country is prone to disasters or a haven for them. Nevertheless, one thing is clear: nature is responsible, even the people themselves.

Nature's Rashness

Through the years, Filipinos have learned to regard natural disasters as ordinary occurrences owing to their too frequent and memorable encounters with them.

Tropical Cyclones

Tropical cyclones are also known by the names *tropical depression*, *tropical storm*, and *typhoon*, depending on the particular weather disturbance's wind velocity. The Philippines' lying in a **typhoon belt*** is said to account for its constant bouts with tropical cyclones. Twenty is the usual number of tropical cyclones which enter the archipelago every year. Damaging effects of tropical cyclones include floods and landslides from heavy rainfall and storm surges or tidal waves.

As a result of destructive tropical cyclones which hit the country in the last ten years, human casualties include 10,305 dead, 9,897 injured, and 2,913 missing. Estimated cost of damage to properties in the period was P 50.5B.

Earthquakes

The Philippines' vulnerability to earthquakes is due to its location between two tectonic plates: the Philippine Sea Plate and the Eurasian Plate. Crustal movements where these plates meet result in the formation of earthquake-generating **faults*** in the archi-



Early shot of Mayon eruption taken at Bgys. Bonga and Mabinit in February 1993

pelago. The common ruinous effects of earthquakes are damages to infrastructures, landslides, fires, and **tsunamis***.

On the average, five earthquakes take place in different areas in the country every day. From 1970 to 1991, the country experienced 159 earthquakes which caused a total of about P12.7B in damages, 5,209 deaths, and injured 12,926 people.

The July 16, 1990 earthquake which struck Luzon can be considered as the most destructive within the last twenty years, causing damages up to P12.5B, and killing 1,302 persons.

Droughts

Commonly occurring in the Philippines during the summer months are prolonged dry periods or droughts. Droughts bring about immense agricultural losses for the country. In the period January-November 1992 alone, total cost of damages was about P 4.1B for 461,776 hectares of affected agricultural land.

Such seasonal dry spells, unfortunately, are aggravated by the El Niño phenomenon which causes the strange occurrence or recurrence in cycles of disturbances in the weather or in the climate. For instance, storms would be present during the summer months or rains would be absent during the wet season. The El Niño phenomenon only serves to worsen the situation of a country like the Philippines whose economic development is already severely affected by droughts.

Volcanic Eruptions

There are about 200 volcanoes in the Philippines. Twenty-one of these are classified as active. The country's volcanoes are found in a **seismic belt*** called the Ring of Fire which is known for its history of volcanic



Coconut plantation at Camalig Albay shortly after the first series of Mayon eruptions



Homes damaged by Mt. Pinatubo volcanic debris

activity and frequently recurring earthquakes caused by plate movements. Among the dangers associated with volcanic eruptions are **lava flows***, **pyroclastic flows***, poisonous gases, earthquakes, tsunamis, landslides, and **lahars***.

Recent volcanic eruptions in the country have been most destructive. Mount Pinatubo, which erupted in June 1991, killed hundreds of people, displaced almost a million people from their homes, caused over P10.6B in total damages, and is also said to have changed weather patterns throughout the world. Mayon Volcano which erupted in February of this year claimed the lives of 80 people and injured nine others, forced the evacuation of thousands of people, and has so far accounted for about P72.7M in damages.

Man's Foolishness

Man is also to blame for certain disasters. He himself causes disasters perhaps by his carelessness, indifference, fatalism, and greed. Common man-made disasters in the

continued on p. 16

* Terms in bold type and marked with asterisks are defined in the Glossary of Terms on page 16.

The Philippines is a disaster-prone country. Considering this fact, it is important that the planning and policy-making aspects of our disaster mitigation system be strengthened to prepare us for such events.

It is within this context that we must realize the importance of maps as vital inputs to physical and landuse planning for disaster management.

Maps for Vulnerability Analysis and Hazard Assessment

According to the United Nations Disaster Relief Organization (UNDRO), maps are important for **vulnerability analysis*** and **hazard assessment***. Through vulnerability analysis, governments can make rational decisions on how the effects of natural disasters can best be mitigated through a system of permanent controls on land development. Assessing the intensity, frequency, and location of hazards, on the other hand, can prepare governments for the adverse effects of disasters.

Maps are necessary for these activities because they provide information on locational criteria needed in disaster mitigation. They provide information on *where* disasters are likely to occur in the absence of data as to exactly *when* these will occur.

Risk maps, which indicate "zones of uniform risk resulting from one or more types of natural hazards" (UNDRO), are products of hazard assessment. They may indicate the location of zones of earthquake risk, wind exposure, areas at risk to floods, storm surge, tsunamis, active volcano sites, avalanche/landslide risk, slope instability, and more.

Base maps at appropriate scales may be used to develop these risk maps. Together with other landuse criteria, risk maps can be used for disaster planning and response activities such as the identification of hazardous areas in existing settlements, determination of appropriate evacuation areas, evaluation of resettlement sites, etc.

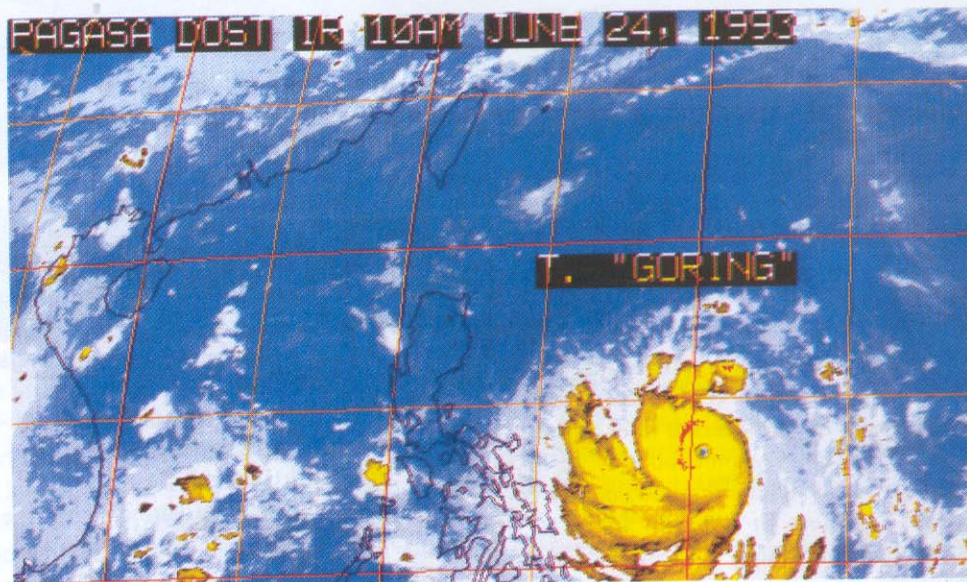
Disaster Mapping in the Philippines

NAMRIA

The agency responsible for mapping the country is the NAMRIA. It produces *base maps* such as topographic maps which contain information on natural and man-made features (mountains, hills, rivers, seas, roads, buildings, and other features) and *thematic maps* which contain information on specific

Trends in Disaster Mapping

by Charmaine Rowena C. Aviquivil



GMS S-VISSR imagery of Typhoon Goring themes or areas of interest (landuse, land cover, land condition, etc.).

Base maps are used as a reference for disaster planning and decision making, for determining the location of particular geographic or man-made features, or for demarcating a danger or safety radius from a central point. They are also used as a base for risk or hazard maps and as a reference for determining rehabilitation/resettlement sites for disaster victims. Thematic maps such as land use maps can be used for zoning purposes and as a basis for steering population and development away from hazardous areas, while land cover maps are useful for comparative studies prior to and after disasters.

NAMRIA has found itself involved in more and more disaster-related mapping activities since 1990. For the 1990 killer quake, it has undertaken together with Intera Technologies Ltd. of Canada and other local agencies the Synthetic Aperture Radar (SAR) Survey of Northern Luzon which assessed earthquake damage and mapped potential **geologic hazard*** zones.

For the 1991 Mt. Pinatubo eruption, NAMRIA has conducted ground control survey of the Mt. Pinatubo area using Global Positioning System which expedited the production of new maps of the affected areas; topographic surveys of road systems and hydrographic surveys of rivers and coastal areas around Mt. Pinatubo which helped in

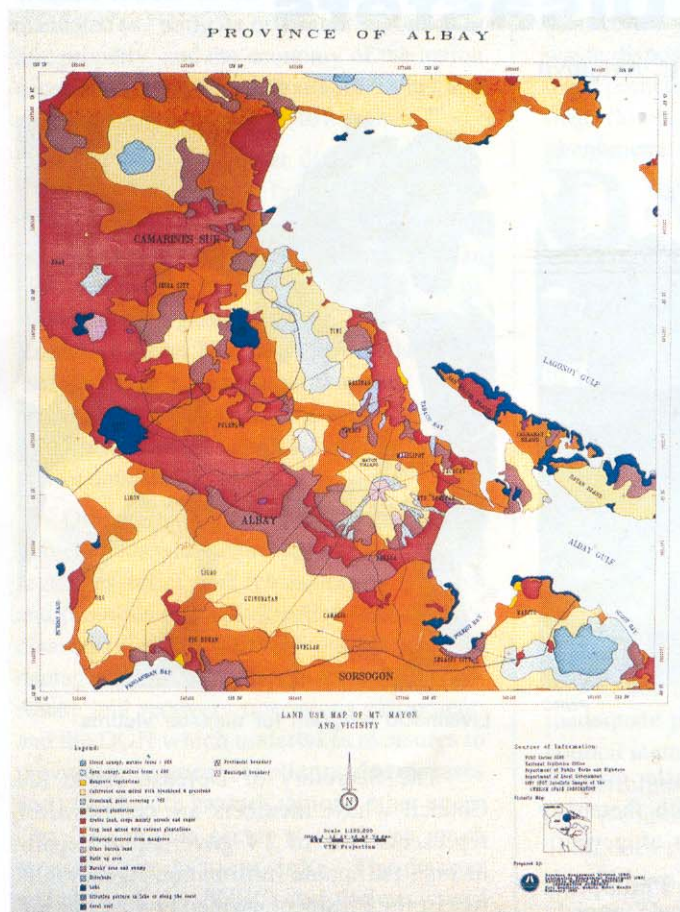
estimating the extent of dredging and the amount of clearing needed; aerial photography within a 40-km. radius of Mt. Pinatubo to determine extent and location of lahar deposits; and analysis and interpretation of pre- and post-eruption SPOT and MOS-1 satellite data of Mt. Pinatubo. It has also produced and disseminated free copies of 1:100,000 scale Mudflow Hazard Maps covering Mt. Pinatubo and Vicinity with data coming from PHIVOLCS and produced a 1:300,000 digitized mudflow hazard map of the Mt. Pinatubo area and vicinity using GIS.

Ongoing disaster-related projects of the agency include: the Mt. Pinatubo Base Mapping project which aims to produce 1:10,000 topographic maps of the area; and high altitude photography of Mayon Volcano and vicinity for photogrammetric purposes.

Another current activity is the joint NAMRIA-NDCC project entitled Survey, GIS Applications, and Digital Analysis for Mayon and Taal Volcanoes and Vicinities Disaster Management and Monitoring. Radar and other multispectral data are being used to monitor and map areas severely affected by the Mayon eruption and those which could be affected by future eruptions of Taal. It is also expected to provide geographic information needed for disaster preparedness and management.

PAGASA

The name PAGASA is almost always synonymous with weather forecasting. A basic



Digitized land use map of Mt. Mayon and vicinity



SAR data of earthquake-stricken areas in Dagupan weather forecaster's tool is the *weather map*, which "depicts the distribution patterns of atmospheric pressure, wind, temperature, and humidity at the different levels of the atmosphere" (PAGASA, 1992). The two types of weather maps are: 1.) the surface map, made four times daily at six-hour intervals, which

delineates distribution patterns of rain or other forms of precipitation and cloudiness; and 2.) the upper-air map, made twice daily at 12-hour intervals.

Weather maps are made through observing land, sea, and upper air conditions such as atmospheric pressure, wind direction and speed, temperature, humidity, clouds, precipitation, visibility and other factors through **barometers***, **rain gauges**, **anemometers***, **radio-sondes***, and other devices on land-based, coastal, and upper air weather stations. Weather radars and meteorological satellites such as the NOAA satellite system and Geostationary Meteorological Satellite (GMS) are also used for observing cloud formations and coverage.

These weather observations are then coded and sent to designated collection centers for further transmission to the central forecasting

station where these are decoded and plotted in symbols or numbers on weather charts over different areas. These constitute the weather maps which are then analyzed to locate high and low pressure areas, tropical cyclones, and other phenomena. Current weather data (weather maps and satellite pictures) are compared with previous 24-72 hour data to determine development and movement of weather systems affecting the country. Estimates as to the direction and rate of movement are then formulated and extrapolated into the immediate future, and are disseminated to tri-media. These become the weather forecasts we see on print and on TV, or hear over the radio.

Other PAGASA maps include climate maps which show the four types of rainfall distribution in the Philippines, maps showing typical wind flow pattern per month, a map of Philippine coastal areas inundated by storm surges from 1897 to 1984, and others. Other disaster-related activities of PAGASA include lectures on natural hazards, formation of a Special Tropical Cyclone Reconnaissance, Investigation, and Damage Evaluation (STRIDE) team, and

research studies on Typhoon Damage Model and Risk Mapping.

PHIVOLCS

PHIVOLCS produces two types of maps for disaster mitigation. These are: (1) *volcanic hazard maps* for pyroclastic flows, lava flows, airfall ash, and lahars; and (2) *maps for earthquake-related phenomena* such as faults, shear zones, landslides, and other effects attributable to earthquakes. Volcanic hazard maps show the extent and probable paths or areas which might be affected by eruptions and other volcanic activities. In active fault mapping, the main trace or shear maps are shown together with other seismic effects such as landslides and may be superimposed on base maps showing topography, boundaries, road networks, and other features. There are also fault maps which contain data on known seismic effects showing the contours of magnitude and intensity.

These maps are used to ensure public safety during volcanic activity, earthquakes and related events and also for hazard mitigation, landuse zoning, and educational/instructional uses.

PHIVOLCS has already completed volcanic hazard maps for Mayon, Bulusan, Taal, Canlaon, Hibok-Hibok, and Pinatubo volcanoes. These are updated through regular geological and monitoring surveys. Mapping of earthquake-related effects was undertaken for areas in Luzon affected by the 1990 earthquake. Active fault mapping was also done for the Marikina Valley Fault system and the Philippine Fault Segment from Butuan-Surigao to Davao. Lastly, seismic hazard zonation mapping of the entire country has already been completed.

Disaster Maps Instruments for Saving Lives and Property

Disaster maps are vital for many applications apart from disaster management. These maps also serve as inputs to national development planning and policy making.

Admittedly, the cost of mapping the entire country may be very expensive. But this is a mere pittance compared with the immeasurable value of lives and property that might be saved with the help of hazard and other maps in the event of disasters. Considering the increasing number of lives and property lost with each disaster, the government must realize the necessity of disaster mapping and make it a priority. ●

continued on p. 16

Coping with Disasters

by Charmaine Rowena C. Aviquivil



Phil. National Red Cross team at work



Livelihood program for disaster victims PNRC

It is perhaps ironic that during the decade 1990-2000, which the United Nations has declared as the International Decade for Disaster Reduction, several major catastrophes hit the Philippines one after another. The June 1990 earthquake, the Mindanao drought, super typhoon Ruping, the destructive Mt. Pinatubo eruption in 1991, the Ormoc floods, the Mt. Mayon eruption early this year, and more recently, Typhoon Goring are just the tail-enders of a disaster-riddled century for the Philippines. In fact, our country has the dubious "distinction" of holding the record for being No. 1 on the list of the world's most disaster-prone countries. From 1900-1991, a total of 701 disasters, or an average of eight disasters a year, have occurred locally, beating India, which came in a "poor" second with only 369 incidents¹.

The Philippines - A Disaster-Prone Country

Disasters are almost a way of life in these islands, since our geographical location makes us especially prone to calamities. Our country is located within the typhoon belt and the Pacific Ring of Fire, and has an extensive coastline. These make us vulnerable to typhoons, earthquakes, volcanic eruptions, tsunamis, floods, and storm surges.

Our physical vulnerability to disasters makes it almost futile to think of ways by which these could be prevented. It is more

realistic to set up effective disaster management mechanisms to cope with the many disasters which plague us year after year.

Disaster Management in the Philippines

Brief History

The deprivations of World War II saw the founding of the first organized disaster groups in the country such as the *Civilian Emergency Preparation Board* created in 1940 which inventoried food, hospitals, medicines, and other vital items; and the *Civilian Emergency Administration* created in 1941 which was a superbody overseeing all preparations for emergency. The *National Civil Defense Administration* which was founded in 1954 rendered basic services such as rescue, evacuation, and emergency welfare. By 1968, all government agencies were being asked to organize their own disaster response groups.

The NDCC

In 1978, Presidential Decree No. 1566 created the *National Disaster Coordinating Council* to strengthen the Philippine disaster control capability and to establish the national program on community disaster preparedness. It is mandated to: prepare a National Disaster and Calamities Preparedness Plan; organize Disaster Coordinating Councils (DCCs) down to barangay level; and develop self-reliance in disaster management among local government units.

The Secretary of Defense chairs the Council whose members are composed of representatives of 14 government departments², Philippine Information Agency, Office of the President, Armed Forces, and the Philippine National Red Cross (PNRC) as the only private sector representative. The Office of Civil Defense serves as the operations center and secretariat of the NDCC.

The NDCC's plans and programs are embodied in a document called the *Calamities and Disaster Preparedness Plan*, which was originally drafted in 1970 (way before the Council was established) and which the Council has amended in 1988. This serves as a blueprint of the government's disaster preparedness, relief and rehabilitation work. The plan's primary objectives are to: save lives, prevent needless suffering, protect property, and minimize damages during disasters and calamities. It provides for a concerted and coordinated disaster control effort from the national down to the barangay levels through the various levels of DCCs. It also states the tasks of each NDCC member agency.

Other Government Agencies

The DOST is also heavily involved in disaster activities through two of its agencies, the PAGASA and PHIVOLCS. PAGASA was established by Presidential Decree No. 78 on 8 December 1972 taking over the former

¹ These figures were based on a study of the Center for Research on the Epidemiology of Disasters (CRED) in Brussels, Belgium.

Weather Bureau as the government agency mandated to "mitigate or reduce the losses to life, property, and the economy of the nation occasioned by typhoons, floods, droughts, and other destructive weather disturbances."

PHIVOLCS, another disaster monitoring agency, has virtually become a household name since the Pinatubo eruptions. It started out as the Commission on Volcanology in 1951 and was eventually restructured into its present day organization in 1982 through Executive Order No. 784. Its mandate is to "safeguard lives and property against volcanic eruption, earthquake, and related **geotectonic phenomena*** such as faulting, tsunamis or landslides."

Other government bodies actively involved in disaster efforts are: DSWD which organizes relief and rehabilitation services and provides immediate relief assistance to disaster victims; DPWH which restores damaged public infrastructures and provides rescue and recovery operations equipment; and the DOH which undertakes measures to prevent the occurrence and spread of diseases and other health hazards, among other agencies. The private sector is also very much around when disasters strike. The disaster activities of the PNRC and various civic/NGO groups such as the Citizen's Disaster Response Center (CDRC) have complemented government efforts in **disaster management, preparedness, response, and mitigation***

Disaster Issues

What makes the Philippines even more vulnerable are man-made causes such as poor economic and social structures, inadequate social services, and rampant environmental destruction.

There are other countries which are similarly vulnerable to many disasters. For rich nations, the effects of such disasters are hardly felt, since they can afford to set up facilities (e.g. earthquake proof buildings, dams, etc.) which will prepare them for the worst possible disaster scenario. Compare this with Bangladesh, India, or the Philippines which can hardly stand a chance against nature's destructive whims. Poor Filipino families can hardly cope with similar events because they do not have the means to arm themselves against such calamities. The insufficiency of basic social services such as adequate housing and health care facilities makes Filipinos even more ill-equipped to face disasters.

Man's wanton destruction of his environment through illegal logging and improper waste disposal has aggravated the situation to the point that ordinary rains can now cause flash floods and pollutants trigger red tide phenomena which last for weeks.

Despite the fact that our disaster monitoring agencies are doing their best, they are not spared from public criticism. PAGASA is often criticized for inaccurate forecasts, while PHIVOLCS has experienced its share of flak when it failed to predict the recent Mayon eruption. Although PAGASA and PHIVOLCS have modern facilities, even these cannot compare with the disaster forecasting/monitoring technologies in other countries. Often, modern equipment are acquired, but as they become rapidly obsolete, they cannot be upgraded or replaced immediately due to lack of funds.

People have also found fault with the NDCC for many reasons, among them its inadequate plans, the impermanence of its council members, and its perceived lackluster performance during the Pinatubo disaster. We must understand, however, that PD 1566 does not give the NDCC the clout it should have since it has no executory provisions. Thus, it is merely advisory in nature. Nor does it provide for an operations budget which prevents it from performing other activities such as the conduct of policy studies on disaster management.

Despite the Plan and a host of laws which are supposed to protect people from disasters, the lack of implementation makes these regulations next to useless. We have



Denudation of forests can trigger or aggravate disasters as experienced in the Ormoc tragedy



Improper disposal of urban waste is another culprit which can cause disaster such as floods

a National Building Code which requires structural designs that can withstand intensity 8 quakes; DPWH standard specifications for public infrastructures; and land use and zoning regulations which provide for the proper utilization of land. But these are not appreciated, much less strictly followed, as evidenced by the poor drainage systems, clogging of major waterways, lack of dikes, unstable bridges, building of industrial plants in residential areas, and more.

Possible Solutions

There is hard work ahead for those who want to improve Philippine disaster efforts. On the government side, a review of existing disaster policies, laws, and programs must be done to ensure that these are still applicable today. Existing construction, environment, land use and other policies must be strictly implemented. A comprehensive risk assessment study which deals not only with hazards and physical vulnerability, but also with the social and economic aspects of vulnerability must be undertaken. Physical and social structures must be improved to prepare families for disasters. Modern communication and transportation facilities must always be made available during emergencies.

Disaster monitoring agencies must have modern, upgraded facilities. Networks/linkages among these agencies and with the NDCC must be strengthened for more efficient warning systems and quicker response time.

The NDCC must be strengthened. Its structure, powers, and functions must be studied so as to find out areas for improvement, particularly on funding and executory powers. Its Plan must also be improved to make it more responsive, proactive, and long-term.

continued on p. 9

* Departments of National Defense; Public Works and Highways; Transportation and Communication; Social Welfare and Development; Agriculture; Education, Culture and Sports; Finance; Labor and Employment; Justice; Trade and Industry; Local Government; Health; Environment and Natural Resources; and Budget and Management.

Photo Essay

Flood Risk Assessment of Major Population Centers Using GIS

by Celeste E. Barile

People will always remember the Ormoc City floods which claimed the lives of over 8,000 residents on November 5, 1991. What may have caused it? Was it "Using", the 17th typhoon to hit the Philippines during that year, or can it be directly traced to man-made activities?

According to the Haribon Foundation of Green-Forum Philippines, Ormoc City is one of 12 provinces in the country considered as "high-risk" areas due to forest degradation and soil erosion. Facts point to man-made activities such as over-exploitation of forest resources and over-logging as probable causes of the rapid depletion of forest cover which in turn brought about the Ormoc disaster.

The occurrence of the Ormoc floods is an ominous sign that similar disasters

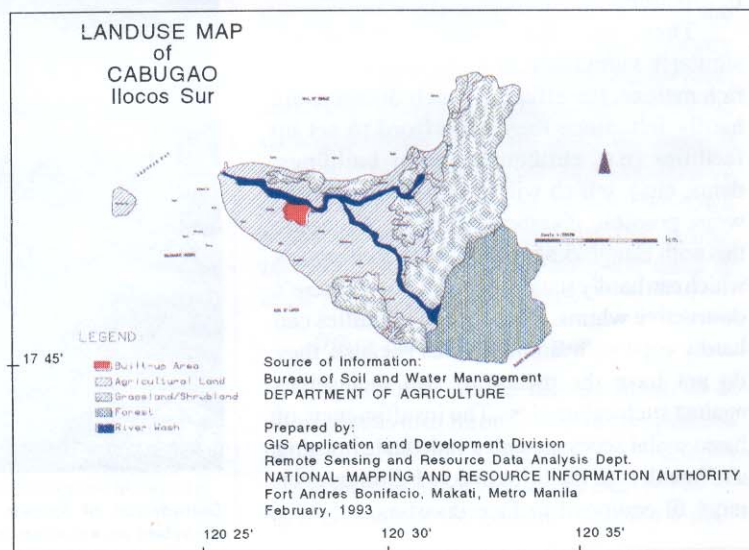
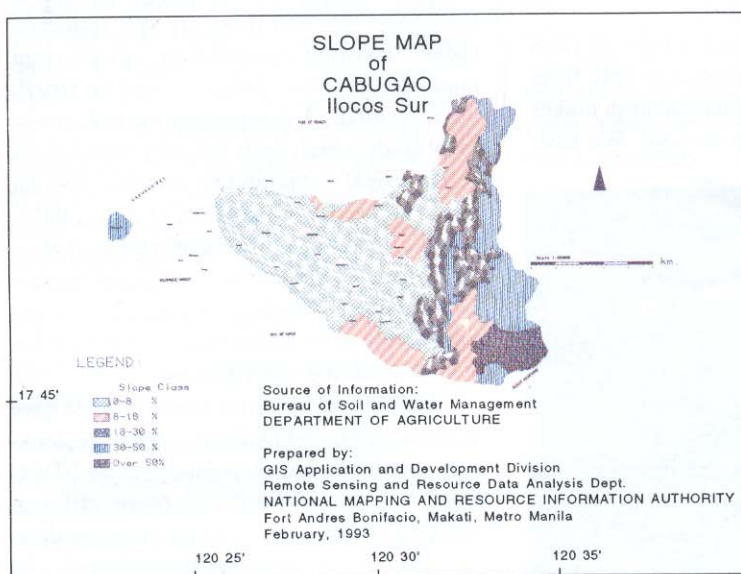
may happen if the current trend continues. An assessment of population centers in high-risk provinces is necessary to determine the varying degrees of flooding potential. Such an assessment can help in minimizing the ill effects of floods in these high-risk area.

NAMRIA is currently implementing a project on Flood Risk Assessment of Major Population Centers using GIS to evaluate conditions that predispose populated areas to flooding. GIS technology, which is capable of handling data processing and mapping requirements for integrated and overlay analysis was used to generate important baseline information for this study. The selected study area is Cabugao, Ilocos Sur.

The project results will hopefully serve as basis for more in-depth studies by other government agencies and private sector groups involved in the prevention and control of natural disasters.

The following digitized maps were generated for this project:

- Watershed boundary map
- Elevation map
- Soil map
- Slope map
- Landuse map
- Climatic map
- Drainage pattern map
- Settlement map
- Road map



WATERSHED BOUNDARY MAP of CABUGAO Ilocos Sur



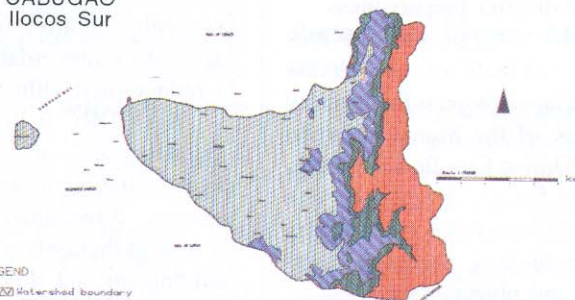
LEGEND:

- Watershed boundary
- Main Road
- Trails
- Main River
- Stream
- Intermittent Stream/Creek
- Settlements

Source of Information:
Topographic Map Scale 1:50000

Prepared by:
GIS Application and Development Division
Remote Sensing and Resource Data Analysis Dept.
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY
Fort Andres Bonifacio, Makati, Metro Manila
February, 1993

ELEVATION MAP of CABUGAO Ilocos Sur



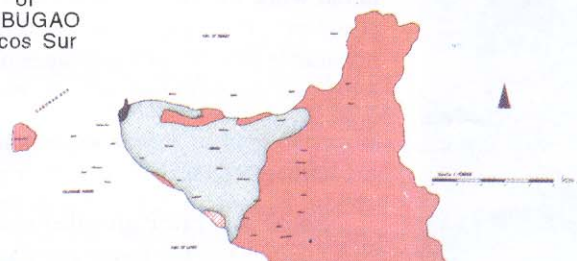
LEGEND

- Watershed boundary
- Elevation (meter)
- 8-100
- 100-200
- 200-300
- 300 above

SOURCE OF INFORMATION:
Topographic Map Scale 1:50000

Prepared by:
GIS Application and Development Division
Remote Sensing and Resource Data Analysis Dept.
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY
Fort Andres Bonifacio, Makati, Metro Manila

SOIL MAP of CABUGAO Ilocos Sur



LEGEND

- Beach Sand
- Bantay Loan
- Bantay Clay
- San Manuel Clay Loan

Source of Information:
Bureau of Soil and Water Management
DEPARTMENT OF AGRICULTURE

Prepared by:
GIS Application and Development Division
Remote Sensing and Resource Data Analysis Dept.
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY
Fort Andres Bonifacio, Makati, Metro Manila
February, 1993

from p. 7

Coping with. . .

Government must continue to encourage private volunteer groups, students, and NGOs involved in disaster efforts. These groups can complement government disaster actions and can help in making the distribution of relief goods faster and more efficient.

Together with NGOs and other concerned groups, government can focus on development-oriented disaster management programs which will not merely be crisis management or disaster response activities. A development-oriented program focuses on self-reliance and involvement. Disaster victims are not merely passive recipients of aid or dole-outs, but are active partners in disaster planning and response. Reorientation towards such a program will also refocus attention on poverty, environmental degradation, and other problems which make the Philippines even weaker in times of disaster, as well as on man-made disasters and the increasing number of **internal refugees***.

Sunshine After Rain

It is said that after even the heaviest rains, the sun is bound to come out. Yes, our disaster woes pile up year after year, but the ever-resilient Filipino never fails to rise again in the midst of such adversity. With enough support from the private citizenry, and with the joint efforts of government, NGOs, and other volunteer groups, there may still be hope for thousands of Filipino families facing yet another bout of calamities, natural or man-made, in the years to come. ●

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NGOs as Government's Partner in Disaster Management

by Maria Romina B. dR.-Pe Benito

Year in and year out, Filipinos have to contend with a spate of destructive calamities, natural or man-made.

The government is generally acknowledged by the people as their major source of help during disasters. It tries its best to respond to all calamities quickly and in an organized and coordinated manner.

Considering however its limited resources, the government cannot cope with disasters all by itself. It needs the assistance of the private sector for disaster management.

Disaster management refers to the activities done before, during, and after a calamity so as to minimize its effects. Programs and efforts for disaster management are geared towards making the country capable of an organized, quick, and effective response to calamities.

As past experiences show, the Non-Governmental Organizations (NGOs) have already proven their worth as dependable allies of the government in disaster management.

NGOs

Private groups such as NGOs have long been in existence in the country. NGOs are generally known to be non-profit, non-political, and organized primarily for service to humanity. They are also known to do their work quietly, without fanfare. Majority of existing NGOs were not organized or formed by the government. They may or may not also be functioning independently of it, especially in terms of receiving assistance, monetary or otherwise. Funding for NGOs are usually donations from local or foreign private groups. There are health NGOs and environmental NGOs; those in education; those involved in efforts for Philippine development; and figuring prominently especially in recent years, NGOs involved in disaster work.

The Philippine National Red Cross

Perhaps the best-known NGO associated with national emergency situations is the Philippine National Red Cross (PNRC).

The PNRC, since its inauguration as an autonomous Red Cross society in 1947, has been concerned with providing substantial and immediate health and welfare services to

victims of calamities. Red Cross volunteers are ready to respond to any emergency, whether it is a fire, flood, earthquake, volcanic eruption, or even a military rebellion.

During calamities, the PNRC helps the government in providing for the most pressing needs of victims such as food, clothing, and medical services. The PNRC's Blood Bank and its emergency blood donation programs have saved many lives especially during the 1989 coup attempt and the 1990 earthquake. Aside from providing relief services, the PNRC has rescue teams, so far numbering 15, which are always ready to respond to any kind of emergency.

Activities of Red Cross volunteers during less feverish times include conducting a yearly nationwide blood donation campaign for its Blood Bank and conducting for volunteers the necessary training sessions on such courses as basic first aid procedures, water safety, and disaster preparedness.

Majority of the present activities of the 85 Red Cross chapters are livelihood projects for calamity victims, like those of the Mount Pinatubo eruption and the Ormoc City floods, both in 1991. Local and foreign donors help the PNRC in sustaining such projects, examples of which are dressmaking, vegetable farming, and poultry and piggery raising.



Common site at evacuation centers CDRC

Citizens' Disaster Response Center

Another leading NGO very much involved in disaster work is the Citizens' Disaster Response Center (CDRC). The CDRC is a non-partisan organization established in 1984 which provides the necessary relief and rehabilitation services to victims of natural and human-made disasters. Such disasters are among the concerns being addressed by the CDRC. On natural disasters, however, the organization merely complements government efforts in providing relief and rehabilitation services.

As a humanitarian organization, the CDRC does not just dole out assistance to disaster victims. Through the years, the organization has concentrated its efforts in the development of disaster management programs to help bring disaster victims back to their pre-disaster situation. CDRC assistance is directed towards improvement of the economic condition of certain communities exposed to unavoidable calamities in order to reduce their vulnerability.

The CDRC believes in the importance of getting people involved in the planning and implementation of projects for disaster management. It recognizes the people's capability to help themselves and the importance of building up and making the most of such capability.

For the year 1992, a total of 58,501 families or 310,056 individuals were beneficiaries of CDRC's relief and rehabilitation services. Together with its different regional affiliates nationwide, presently numbering 17, the CDRC is continuing with its humanitarian work for victims of various types of disasters. It is able to do so through the invaluable support and assistance of various local and international private groups and individuals.

Other NGOs

AKAP and PBSP are other examples of NGO partners of the government in disaster management.

AKAP

Alay sa Kapatid [Offering for a Brother] or AKAP (the acronym means "embrace") is an all-nun organization which provides



Long queue for relief goods distributed by CDRC



Resettlement areas for displaced people

CDRC

relief and rehabilitation services for victims of natural disasters. AKAP is based in Baguio City where it was established in 1990, four days after the July 16 killer earthquake. Aside from setting up livelihood projects for the victims, the welfare organization after only ten months of operation was able to come up with other noteworthy accomplishments like the setting up of communal irrigation systems and the construction of foot bridges and trails, tire paths, and a cemented pathway. AKAP is at present helping needy residents not only of Baguio City but also those in other areas by means, for example, of providing them with employment or alternative livelihood opportunities. The organization also conducts classes on family life, good citizenship, and values for the social and moral upliftment of disaster victims. The non-political organization is being assisted in its funding needs by the government.

PBSP

The Philippine Business for Social Progress or PBSP is a donor organization which for more than 20 years has been a major source of help during national emergencies. The PBSP is a foundation composed of more than a hundred member companies which offers financial assistance for the implementation of social development projects. The cash and relief donations of other donor organizations and countries are also coursed through the PBSP. For example, the PBSP and a partner NGO served as the Dutch government's implementing arm in the project for the construction of 102 structures

such as bunkhouses and deep wells for the Mt. Pinatubo evacuees in barangay Pio in Porac, Pampanga. The donations were turned over to the evacuees just early this year.

Partners for Disaster Management

There may be many other NGOs involved in disaster work which were not cited in this article. Hopefully, the organizations brought to the reader's attention would suffice to show that through their respective roles and accomplishments, such private entities are capable of a formidable partnership with the government for disaster management.

Following the ravages recently left by Typhoon Goring, Filipinos would again be experiencing some kind of lull. We have only to see it in the papers. Anything about disasters would eventually lose its prominence in the news to give way to current, more pressing matters.

However, until the next disaster comes along, God forbid, the government and especially the Filipino people can at least be assured of one thing. The NGOs shall again be counted on as the government's ally in helping the people cope with or respond in the best possible way to any disaster, any time it happens. Whether it is during a period of national calamity or a period of normalcy, those affected cannot afford to be selective. They are ready and willing to receive any form of assistance from any entity with the time and concern for them. ●



Assistance from foreign donors

CDRC

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Info Technology Strategic Plan for NAMRIA prepared

A ten-month study for an Information Technology Strategic Plan (ITSP) for NAMRIA is currently being conducted by MacDonald Dettwiler Technologies Ltd. (MDA) experts with financial support from the Canadian International Development Agency (CIDA).

The ITSP aims to: identify possible consolidations, simplifications, and rationalization of NAMRIA's current hardware, software, and systems architecture; define a target information technology (IT) environment in terms of products/services and data models, architecture, applications and subject databases; come up with a report which will help NAMRIA on IT investments; and assist in obtaining financing to upgrade and enhance program delivery and services through IT.

The ITSP for NAMRIA is an information systems concept plan which will help ensure that NAMRIA is optimizing the information technologies available to it; identify possible interfaces between equipment and technology and among the technologies existing at NAMRIA's different departments; realize benefits through collaboration; develop a framework within which IT decisions can be made; and achieve a national land and resource information infrastructure system.

Geodata, a local consultant firm which specializes in Geographic Information System (GIS), provides technical assistance in the development of a product support plan for the equipment, hardware, and software; development of the concept (especially on

continued on p. 14

PRS '92 for surveying, mapping

The first order geodetic control network consisting of 330 stations recently established by the NAMRIA throughout the country will be adopted by geodetic engineers and surveyors as the standard reference for all surveying and mapping activities in the country. This is pursuant to Executive Order No. 45 which was signed by President Fidel V. Ramos on 5 January 1993.

The new network known as Philippine Reference System 1992 (PRS 92) upgraded the old triangulation network. The old network was established primarily to provide controls for hydrographic surveying and charting and was classed second order. The new network was initially densified with 101 second-order stations and 36 third order stations.

PRS 92 was established using the Global Positioning System (GPS) a state-of-the-art technology that is an all weather, high precision global satellite positioning system which uses the same principle as Electronic Distance Meter (EDM) while the computation procedure is analogous to the resection techniques of surveying. The geodetic control network will support the integrated surveying and mapping programs of the government for sustainable management and development of the environment and natural resources, and for infrastructure activities. ●

GIS project for Muntinlupa

The Municipal Government of Muntinlupa headed by Mayor Ignacio R. Bunye recently approved the conduct of technology transfer of the Tax Mapping and Zoning Information System by NAMRIA's Information Management Department (IMD).

This GIS application project aims to provide Muntinlupa municipality with thematic maps which will serve as reference materials for development planning.

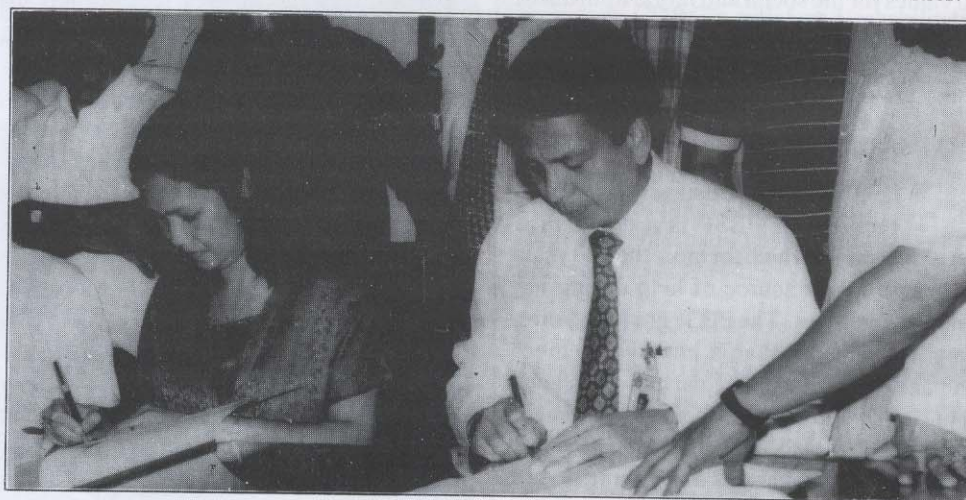
A resolution by the Muntinlupa Sangguniang Bayan regarding the funding of the project as well as the Memorandum of Agreement (MOA) have been approved. The MOA signing between NAMRIA and the Muntinlupa municipal government took place on 13 September 1993.

Prior to this project, Mayor Bunye together with some municipal officials visited NAMRIA on 17 June 1993 to familiarize themselves with the agency's products and services.

The visit included a tour of NAMRIA remote sensing, photogrammetric and printing facilities and a briefing on GIS technology used in map production; on databases

being maintained and systems produced by IMD; and on specific NAMRIA services such as hydrographic, geodetic, geophysical and photolaboratory services.

It was during the visit that Mayor Bunye expressed interest in tying up with NAMRIA for the production of GIS maps of Muntinlupa. ●



Dir. Linda S.D. Papa and Mayor Ignacio R. Bunye sign the Memorandum of Agreement (MOA) to formalize the transfer of technology of the Tax Mapping and Zoning Information System to the municipality of Muntinlupa. Witnessing the signing of the MOA are members of the Muntinlupa Municipal Council

NAMRIA undertakes Phil. crustal motion project

The NAMRIA in cooperation with the University of South Australia, Lamont Doherty Geological Observatory of Columbia University, and the University of NAVSTAR Consortium (UNAVCO) is undertaking the monitoring of crustal earth movement along the Philippine seismic zone using the Global Positioning System (GPS).

The cooperative venture called the Philippine Crustal Motion Project (PICMP) is an initial undertaking of a long-term monitoring program which aims to provide the local and international scientific community with data vital to the studies on future earthquake predictions and geophysical researches. The project is initially funded by the United States National Science Foundation and the University of South Australia.

The PICMP initial observation program consists of a three-day training of GPS operators and two major observation phases. Phase I of the project involves establishing high-precision fiducial framework in strategic locations in the country by the survey teams from the Coast and Geodetic Survey

Department (CGSD) of NAMRIA. The framework will strengthen and improve the accuracy of the existing framework for long-term crustal motion studies throughout the country.

GPS stations in Pasuquin, Ilocos Norte; Tuguegarao, Cagayan; Makati, Metro Manila; Aguilar, Pangasinan; Tiwi, Albay; Mogpog, Marinduque; Iloilo City; Tacloban Leyte; Puerto Princesa, Palawan; Kidapawan, North Cotabato; and Zamboanga City will be observed to get the horizontal and vertical positions and elevation of these areas.

Phase II of the project will concentrate its observation in Luzon within the affected areas of the 1990 earthquake.

Priority areas for observation were identified with the assistance of PHIVOLCS.

This project is of enormous interest to the international scientific community as scientists attempt to unravel the mysteries of the mechanisms which cause earthquakes and volcanic eruptions. It is also aimed at developing new approaches for natural hazard mitigation. ●

NAMRIA joins Kalayaan expedition

The NAMRIA participated in the Joint National Inter-Agency Scientific Expedition held on 25 April - 9 May 1993 at the Kalayaan Group of Islands with the conduct of hydrographic, oceanographic and geodetic surveys.

The Joint National Scientific Expedition was one of the proposed projects of the UP-MSI in a National Workshop on Oceanographic Research & Development conducted last March.

The objectives and scope of the national scientific expedition, among others, are to organize a computerized database of the marine resources and environment for the Kalayaan Islands; undertake extensive resource mapping of the areas; provide taxonomic guides, inventory and increase museum sample collections for this region; and enhance the understanding of the physico-chemical marine environment through various numerical models.

Hydrographic, oceanographic and geodetic surveys were conducted by the CGSD team of NAMRIA to determine the current pattern and bottom topography of the surrounding waters in conjunction with the resource assessment surveys of the Kalayaan Islands.

Data generated from the oceanographic survey will be added to the marine data bank of the NAMRIA National Oceanographic Data Center (NODC). Hydrographic data gathered will be used in updating chart and bottom topography and will serve as input to the General Bathymetric Chart of the Ocean (GEBCO) of the International Hydrographic Organization (IHO), and for the International Bathymetric Chart of the Western Pacific under the International Oceanographic Commission (IOC), WESTPAC. Geodetic data will be used in updating the positions of the islands' reef, shoal, and lighthouse on the chart; checking the position of the Doppler station; defining the archipelagic baseline; and mapping. Data on the position of the sunken wreck at the Investigator shoal were also taken as additional information for aids to navigation.

NAMRIA participants were Ltjg. Herbert Catapang, Ltjg. Rene Eclarino and SN2 Diosdado Pahilga.

Other participating agencies were the Institute of Marine Fisheries and Oceanology at UPV (UPV-IMFO), UPMSI, BFAR, Department of Foreign Affairs (DFA), DENR, MGB, DOST, Department of National Defense (DND), PCAMRD and PAGASA. ●

Magnetic survey equipment acquired

The NAMRIA Magnetic Observatory at the National Bureau of Prisons in Muntinlupa will be operationalized by the last quarter of this year with the reconstruction of the Variation Building and the installation of a newly acquired set of magnetic instruments.

The observatory stopped its operation on 4 May 1988 after a fire burned down the Variation Building. The reconstruction of the Variation Building is nearly complete and other buildings are under minor repairs.

The magnetic instruments which were acquired from the Japanese government through the Japan International Cooperation Agency (JICA) are the following: three-axes magnetometer* (Model MB-162); flux gate magnetometer (Model MAG-01H); Overhauser magnetometer (Model GMS-11); portable proton magnetometer (Model M-200); and 5. proton magnetometer (Model 5711ADR).

The NAMRIA Magnetic Observatory was chosen by the Solar-Terrestrial Environment Laboratory of Nagoya University in Japan through its International Scientific Solar Terrestrial Energy Program (STEP) as one of the sites for the conduct of geomagnetic observation along the 210° magnetic meridian (MM)* network project. ●

Nat'l oceanographic R & D workshop

The NAMRIA together with the University of the Philippines Marine Science Institute (UPMSI), Bureau of Fisheries and Aquatic Resources (BFAR), Mines & GeoSciences Bureau (MGB), Mindanao State University (MSU), PAGASA and UP Visayas (UPV) participated in the National Workshop on Oceanographic Research and Development (R & D). Initiated by the Philippine Council for Aquatic and Marine Research and Development (PCAMRD), the workshop was held at the UPMSI in Diliman, Quezon City on 17-18 March 1993.

The workshop aimed to assess the country's present capabilities in oceanographic research and development and to come out with a National Program for Oceanographic R & D.

continued on p. 14

INCEDE team visits NAMRIA

Scientists from the International Center for Disaster Mitigation Engineering (INCEDE) met with NAMRIA officials on 17 August 1993 to explore the possibility of conducting a cooperative research and study on disaster phenomena particularly on water-related disaster and mitigation techniques using remote sensing and GIS technologies.

The team was headed by Dr. Tsuneo Katayama, professor and INCEDE Director. With him were Dr. Anura Srikantha Herath, associate professor; Dr. Kimiro Meguro, research associate; and Dr. Mohammad Abul Hossain, foreign visiting professor.

After a briefing on NAMRIA's functions, activities, capabilities, services and outputs by Deputy Administrator Ricardo T. Biña, the visitors toured the National Remote Sensing Center and the MRD facilities. They then proceeded to pay a courtesy call on Administrator Jose G. Solis.

The INCEDE was established in April 1991 in the Institute of Industrial Science (IIS), University of Tokyo. The Center is one of Japan's contributions to the United Nations'.

The INCEDE identified NAMRIA, UP and PAGASA as the three organizations who could participate in this joint undertaking. The goals and objectives of the project will greatly depend on the available information and data to be gathered from the local counterparts in the Asia Pacific Region.●

Mapping staff attend trainings

Eight photogrammetrists of the NAMRIA Mapping and Reprography Department (MRD) recently attended trainings on various computer operations to prepare for the full utilization of the ZEISS PLANICOMP P2 for Digital Mapping.

The Autocad Course Release II conducted by the International CAD Institute, a training school recognized by AUTODESK, Inc., USA (the developers of AUTOCAD Softwares) was held last year at the Magnac Office, Makati. It was attended by Engrs. Audey Soriano, Anita Medrano, Joel Baros, Nick Parayno and Noel Obusan.

The training provided the participants with advanced knowledge in cost effective tools of combining interactive graphics with powerful design and analogue programs. Modules tackled during the course included complete implementation of imperial and metric units, north and south azi-

muth* reference and grad capabilities.

Another group of photogrammetrists also took the Program Logic Formulation (PLF) course last October and November 1992 at the National Computer Institute. The PLF course is a prerequisite to C-language programming which will also be taken by the staff to prepare them for the new computer system acquired recently by NAMRIA. The NAMRIA participants were Engrs. Anita Medrano, Cleo Galicia and Audey Soriano.

MRD acquired the ZEISS Planicomp P2 and 5 Multi-terminals NEC/Multi Sync 5D with corresponding Epson LQ-1170 printers last year. This ZEISS equipment was upgraded to facilitate digital mapping in a PC-based AUTOCAD environment.●

IATFGI created

An Inter-Agency Task Force on Geographic Information (IATFGI) that will promote and coordinate the efficient development, management and utilization of geographic information in the country was created on 15 April 1993 thru National Statistical Coordination Board (NSCB) Memorandum Order No. 01-93. Recent advances in geographic information technology have caught the interest of the national and local government planners and as a result many government agencies and local government units are trying to build up their capabilities in the generation of geographic information.

The creation of the IATFGI was initiated to establish standards that will ensure compatibility of geographic information systems (GIS), facilitate data exchange, and avoid duplication of efforts such as the conduct of similar projects covering the same area by these various agencies.

The Task Force has already undertaken the establishment of sectoral TWGs after a series of consultative meetings among core agencies. The TWGs are: (1) TWG for Agriculture, Environment and Natural Resources Sector; (2) TWG for Lands and Survey Sector; (3) TWG for Infrastructure and Utilities Sector; (4) TWG for Socio-Economic Sector; and (5) TWG for Research, Training and Technology Sector.

The IATFGI is chaired by the NAMRIA with NSCB as the Co-Chairman. Member agencies are: Housing and Land Use Regulatory Board (HLURB), National Statistics Office (NSO), National Computer Center (NCC), Department of Public Works and Highways (DPWH), Department of Science and Technology (DOST), Bureau of Soils and Water Management (BSWM), and National Economic and Development Authority (NEDA).●

from p. 12

Info Technology. . .

the organizational and infrastructure level) for a national mapping and resource information infrastructure system; and development of a NAMRIA business model, among others.

The MDA consultants have already completed most of the expected outputs of this project which include the following: a Corporate Needs Assessment Report, Services and Information Models, and a Technical and Applications Architecture. These documents describe NAMRIA in terms of the services it is expected to provide to its clients over the next five years; identify the key information resources used to provide these services and describe how these are used; and propose a set of application systems to support these information and their different uses, among others.

An Implementation Plan and set of recommendations were also presented by the MDA experts to NAMRIA top management officials comprising the ITSP Executive Committee (ExeCom). The ExeCom unanimously approved the Plan and its recommendations, including the implementation of a series of three projects starting with Project 1. This initial project will establish some of the Corporate Databases and extend the NRSC Local Area Network to cover the entire NAMRIA Fort Bonifacio office using existing agency resources.

Also involved in the ITSP study are the IMD Core Team composed of Dir. Linda SD. Papa as Project Manager, Assistant Project Manager ADir. Wilma Capistrano, and staff from the various IMD divisions; and the Technical Working Group composed of technical staff from all NAMRIA departments.●

from p. 13

National oceanographic. . .

An outline of the National Oceanographic Program for 1993 - 1998 was drafted after the workshop. The Program identified researchable areas such as ocean/water circulation, environmental phenomena and coastal resources.

Deputy Administrator Ricardo T. Biña; Paquito Miralles, Chief of the CGSD Oceanography Division; and Dennis Bringas, also from the CGSD, were NAMRIA's representatives to the workshop.●

Technical Paper

LIS Experience in the Philippines¹

by Jose G. Solis and John S. Fabic

I. Background

The Philippines' **Land Information Management (LIM)*** is in critical need of improvement. However, as in many other developing countries, LIM in the country has not been prioritized since its outputs are less immediate and tangible.

Land information systems (LIS)* technology may help improve the country's LIM but its development and use are considerably affected by the factors of rapid population growth and deficiency in resources and expertise.

Land Information Systems are computerized land-based information systems. Some of their major aims are the improvement of the management of survey records, facilitation of the checking of survey computations, enhancement of billing and payment capabilities, and the providing of resource information tools.

The country's attempts at undertaking LIM through implementation of LIS technology have met with various issues and concerns.

II. Issues and Concerns

A. Policy and Institutional

A great amount of land resource information can be presently obtained from several agencies/offices doing land resource inventory. The kind of information they produce is usually determined by their respective jurisdictional needs and mandates or the land-related problems they are to address.

Examples of such agencies/offices are the following:

1. Land Management Division, Bureau of Lands
2. Land Registration Commission
3. Registries of Deeds
4. Municipality/City Assessor's Office
5. Municipality/City Treasurer's Office
6. Provincial Assessor's Office
7. Regional Trial Courts
8. Forest Management Bureau
9. Housing and Land Use Regulatory Board
10. National Mapping and Resource Information Authority

B. Land Information Management Technology

For more effective LIM in the country, what should be established is an integrated LIS covering all sectors and able to link with existing information systems in agencies concerned with land resource planning and management. However, its design and implementation should be approached with a great deal of caution and preparedness. A possible wiser option eventually, especially for developing countries, is the adoption of an incremental or step-wise approach to LIS development. LIS development begins with small-scale implementation, gradually building up through the years as resources are made more available and the direction of the adopting organization's information needs becomes more sharply defined.

The system to be established should also be simple and inexpensive to facilitate repetition at the local levels. However, even if putting up a complete LIS requires

very high investments, costs can be distributed with the incremental approach through time and while returns from the system's initial phases are being enjoyed.

Another advantage of the incremental approach is its ability to penetrate and adopt itself into the organization. It can shift to the latest state-of-the-art technology until the organization is brought along the desired change.

The following are examples of government efforts to use LIS in the Philippines:

1. Natural Resource Management and Development Project (NRM DP) is a project for the development of Geographic Information Systems (GIS) in the Philippines. Its land administration component could bring an incremental approach to LIS.

2. GIS for Municipal Planning and Management is a GIS project for providing a tool for generating statistics for planning and management at the municipal level. Its application areas are Street Information System, Tax Mapping Information System, Building Permit Monitoring System, Business Establishment Monitoring System, and Zoning Information System. With Makati as the pilot area, the project is envisioned to be repeated in other municipalities in the country.

3. NAMRIA has itself developed some LIS like the Inventory of Land Survey Records, Verification of Survey Returns, and Public Land Application System.

For the private sector, several survey companies/contractors in the Philippines have actually taken the initiative to develop their own computer-based application systems to support their cadastral survey operations. Such systems facilitate computation and generation of parcel-based data. The systems of some private contractors have in fact been made commercially available. A concerted syndication between the private and government sectors of efforts for cadastral information management will definitely help the country in the establishment of successful land information systems.

C. Education and Training

There is so far no local institution for learning offering any LIS course in its pure form at any level. However, education in remote sensing is a possible rich source of both information and techniques for any LIS or GIS undertaking in the Philippines. Postgraduate studies in Remote Sensing are currently being offered by the Training Center for Applied Geodesy and Photogrammetry (TCAGP) at the University of the Philippines (UP).

The developed countries and international organizations are also providing many officials and technical personnel with opportunities for exposure to LIS through technical assistance and scholarships.

The academic sector is expected to respond in the future to the projected growing demand for LIS specialists.

III. Plan of Action

A. National Cooperation and Coordination

Owing to the proliferation of activities by various government and private agencies in the generation and

utilization of land/geographic information, the setting up of a coordinative body to control such activities has become necessary. Initial efforts for the establishment of the coordinative body has come from NAMRIA.

B. Digital Mapping Technology

Making headway in NAMRIA is a move to introduce digital mapping technology which will present favorable support to any LIS development in the country by providing a fast and efficient method of updating and revising maps.

C. Remote Sensing Technology

The wide range of information offered by the outputs of remote sensing technology can be tapped or extended further as helpful inputs to any LIS program. Such state-of-the-art information technology is availed of by the Philippines through the currently operational Remote Sensing Center based in NAMRIA.

D. GIS for Provincial Planning

NAMRIA has been pursuing the development of LIS and GIS projects, especially for implementation at the provincial level, to enhance capability of local officials in resource use, land use, and environmental planning.

Several GIS projects have so far been initiated by the agency. Two of these are the Environment and Natural Resources Provincial Planning System and the GIS for Ecological Profiling.

IV. Conclusion/Future Outlook

Considering the steady increase in number of LIS activities, facilities, technical manpower, and users in the country, the government should take the initiative to shape the LIS program. It must issue policies and guidelines to ensure the country's ability to make the most of the application of an LIS technology.

NAMRIA's efforts for the adoption of an LIS technology in the Philippines figure prominently in its helping the country improve its land information management by means of implementation of several incremental computer-based land information systems. The agency may also be the future center for both GIS and remote sensing in the country. ●

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¹ Excerpts from a paper presented for the Regional Training Workshop on Urban Land Information Systems in Kuala Lumpur and Singapore on 22-25 June 1992 by NAMRIA Administrator Jose G. Solis.

from p. 3

Disasters. . .

Philippines include fires and civil disturbances brought about by military operations, mostly in the countryside.

It has also been often learned that nature is not entirely responsible for deaths during natural disasters. For instance, during the great flood which occurred in Ormoc City in November 1991, illegal loggers in Leyte were widely suspected to have been the major culprits, even if there was unusual rainfall of 148.2 millimeters that fateful day.

A Compromise

The situation is this: we Filipinos have no choice but to live with the constant threat of disasters, either from nature or ourselves. What can we do?

With the reality of the inevitable occurrence of disasters in our country, especially the likes of typhoons, earthquakes, droughts, and

volcanic eruptions, the best we can do is to be ready, to try to be survivors rather than just resigned victims. We should also learn to care enough for ourselves, others, our environment, all of our country's wealth. These are not easy to accomplish but it seems as if there is no other choice. There is the next disaster to consider. ●

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from p. 5

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Glossary

Anemometer - an instrument for measuring wind speed and force.

Azimuth - distance clockwise in degrees from the north point or, in the southern hemisphere, the south point.

Barometer - a device for measuring atmospheric pressure.

Compass roses - a circle graduated in degrees clockwise from 0 (north) to 360° printed on a nautical chart for use as a protractor. These are also placed at other convenient locations to facilitate measurements of directions and may be oriented to the true or magnetic north.

Disaster management - activities done before, during, and after a calamity so as to minimize its effects. These are geared towards making the country capable of an organized, quick, and effective response to calamities, reducing the vulnerability of people to disasters, and increasing their capacity to withstand and cope with these events.

Disaster mitigation - measures to reduce the effects of disaster-causing phenomena.

Disaster preparedness - measures which enable governments, organizations, communities, and individuals to respond rapidly and effectively to disaster situations. It includes the formulation of viable disaster plans, maintenance of resources, and training of personnel.

Disaster response - measures taken immediately prior to and following disasters directed towards saving lives and property and dealing with the immediate damage caused by the disaster.

Fault - a surface or zone of rock fracture along which displacements from a few centimeters to a few kilometers in scale had occurred or can occur again.

Geologic hazards - earth processes occurring as irregular events whose direct interaction with the material environment is capable of causing significant

negative impact on man's well-being.

Geomorphology - study of the earth's form and structure.

Geotectonic phenomena - geological processes of tectonic origin.

Hazard assessment - assessment of the intensity, frequency, and location of natural hazards.

Internal refugees - individuals, families, and communities displaced from their habitual residence and sources of livelihood by incidents arising from armed conflict.

Lahars - rapidly flowing mixtures of volcanic materials and water.

Land Information Management (LIM) - the managing of information about land.

Land Information System (LIS) - a system for acquiring, processing, storing, and distributing information about land.

Lava flows - flowing molten rocks from a volcano's vent or fissure.

Lineaments - a very linear natural feature or element discernible from maps, aerial photos, satellite imageries, or field observations.

Magnetic Meridian (MM) - refers to a line of horizontal magnetic force of the earth. It is the vertical plane in which a freely suspended, symmetrically magnetized needle, influenced by no transient, artificial, magnetic disturbance, will come to rest.

Magnetometer - an instrument for measuring the intensity and/or direction of the earth's magnetic field.

Pyroclastic flow - a turbulent, flowing mass of ejected fragmental volcanic materials mixed with hot gases and moving downslope at high speed.

Radiosonde - a balloon-borne instrument used for the simultaneous measurement and transmission of meteorological data such as pressure, temperature, and relative humidity.

Seismic belt - an elongated earthquake zone which includes the Circum-Pacific, Mediterranean, Trans-Atlantic, Mid-Atlantic, and Mid-Indian belts.

Seismograph - a sensitive instrument that records earthquakes.

Tiltmeter - a device used to detect the direction of ground deformation.

Tsunamis - giant ocean waves produced when a submarine quake dislocates seabed rock segments, causing seawater above them to form huge waves moving outward on the surface at 300-500 kph and travel over great distances. They may also be called seismic sea waves.

Typhoon belt - area near the equator (from 10°N to 10°S) where most tropical cyclones occur.

Vulnerability analysis - refers to a method of risk identification and evaluation and is expressed as the product of natural hazard risk and damage probability (Vulnerability or Disaster Risk = Natural Hazard Risk x Damage Probability).

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