infomapper

A Publication on Surveys, Mapping and Resource Information Technology

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VISION

"A highly professionalized, technologically advanced, globally competitive, and environment and natural resource-caring agency"

MISSION

"To generate reliable, up-to-date, geospatial information and related services using state-of-the-art technology for sustainable growth and development"

The year 1987 saw the birth of the National Mapping and Resource Information Authority or NAMRIA.

An attached agency of the Department of Environment and Natural Resources, NAMRIA is the merger of the functions of the Bureau of Coast and Geodetic Survey, the Land Classification Teams of the Bureau of Forest Development, the Natural Resources Management Center, and the National Cartography Authority.

As the country's central mapping agency, NAMRIA is responsible for providing the public with mapmaking services and is the repository and distribution facility of geospatial information. It undertakes integrated surveys, mapping, charting and oceanography, land classification, remote sensing, resource information management, and research and development.

In this special issue of the *Infomapper*, featured are the highlights of NAMRIA's 25 years of surveying and mapping for national development.

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Editorial

AT THE CROSSROADS: NAMRIA @ 25

The past 25 years saw NAMRIA transform from a mere aggregation of four technical groups, each with its own distinct set of expertise, traditions, and norms, into a cohesive team at the nexus of the most significant events in the nation's life. Unity was borne of many shared successes (and yes, some missteps) achieved through vigorous efforts at dialogue and engagement with its stakeholders.

The agency's major achievements include the implementation of the Philippine Reference System of 1992 Project; the enactment of Republic Act Number 9522 (Archipelagic Baselines Law), which is owed to a large extent to NAMRIA's advocacy and technical support to Congress and the executive leadership; the extensive hydrographic survey of the exclusive economic zone; and the successful completion of the Extended Continental Shelf Project for the Benham Rise Region.

Yet, problems of data obsolescence and inaccuracy persist. Increasingly, immense gaps in geospatial information (GI) are recognized and are sorely felt. This is especially true with regard to resource management, comprehensive land use planning, disaster risk reduction and management, and climate change adaptation, all of which are more and more demanding both historical and up-to-date high-resolution data.

Current NAMRIA efforts aim to provide a responsive geospatial information infrastructure. These initiatives include the issuance of Administrative Order (AO) No. 16 directing coordination among government agencies with respect to mapping activities; the proposed Unified Mapping Project (UMP) to provide high-resolution topographic base maps for the whole country; and the ongoing Philippine Geoportal Project to provide the facility for GI sharing. Complementing these technical initiatives are internal reforms like the ongoing pursuit of the International Standardization Organization 9001:2008 certification.

Related projects of other agencies, such as the Department of Agriculture's high-resolution mapping project and the Department of Science and Technology's DREAM-Light Detection and Ranging (LiDAR), are symptomatic of the severe information gaps but should all be welcome contributions to the solution. They also clearly indicate the need for stronger coordination to better allocate limited resources, which is precisely the goal of AO 16.

Thus, NAMRIA as the central mapping agency has to further step up its collaborative efforts. To do this, it has to look closer at its programs vis-à-vis its very broad mandates and the diverse GI needs of the country; determine who is taking care of specific GI products and services; and seek agreement with its stakeholders on how to best address the gaps. A quick attempt at such an exercise immediately brings up much more than enough to keep NAMRIA extremely busy towards its golden year.

NAMRIA has to scale up its programs on hydrographic and oceanographic survey and nautical charting. Nautical charts, aside from being legal requirements for maritime navigation, are the base maps of the seas, analogous to the topographic base maps for land. As the management of coastal, ocean, and freshwater resources gain sophistication in the country, the requirements for accurate base maps of our waters will approach the widely expressed (acutely felt) need for large-scale topographic maps. Extensive shallow and clear waters may be surveyed faster and with lower cost using LiDAR and similar technologies that may emerge. But charting the vast waters beyond LiDAR range will likely remain time-consuming and expensive as they would still be the exclusive domain of wet sonars, with no feasible airborne remote sensing (RS) techniques in sight. For both shallow and deep waters, remotely operated vehicles and autonomous underwater vehicles may offer potential gains in operational efficiency and data resolution.

A stronger oceanographic observation program should be able to provide the baseline data for the sustainable use of water resources, including the assessment and harnessing of renewable energy from tides, waves, current, and thermal differences. RS greatly increases data collection efficiency, but in-situ observations will remain resource intensive. Very strong collaboration will be needed to establish a comprehensive maritime database and the analytical tools to understand ocean and coastal dynamics and how these are affected by human activities.

With the full implementation of AO 16, UMP, and the Geoportal Project, the key challenges will be maintaining the GI infrastructure and institutional arrangements, updating of the fundamental datasets, sourcing and building up the thematic layers, and implementing sharing and access protocols and development of business applications to empower users to take full advantage of these GI assets. New and more efficient technologies will continue to speed up mapping processes, but at the same time, they will create demand for new map products and services. Technological advances and increasing urban sprawl will also continually shrink the figurative "last mile" (more aptly "square mile") where the market for mapping services is not large enough to justify private investment and where public provision is thus necessary. NAMRIA then will have to be very agile, abreast with, and better yet, a key driver of technological innovations, attuned and adaptive to the evolving expectations of its clientele. The agency should also be ever on the lookout for synergies with the private sector, recognizing areas where the latter may better assume some of the agency's traditional roles while enhancing its skills at advocacy to continue obtaining the support that will enable it to best serve its unique and critical niche.•

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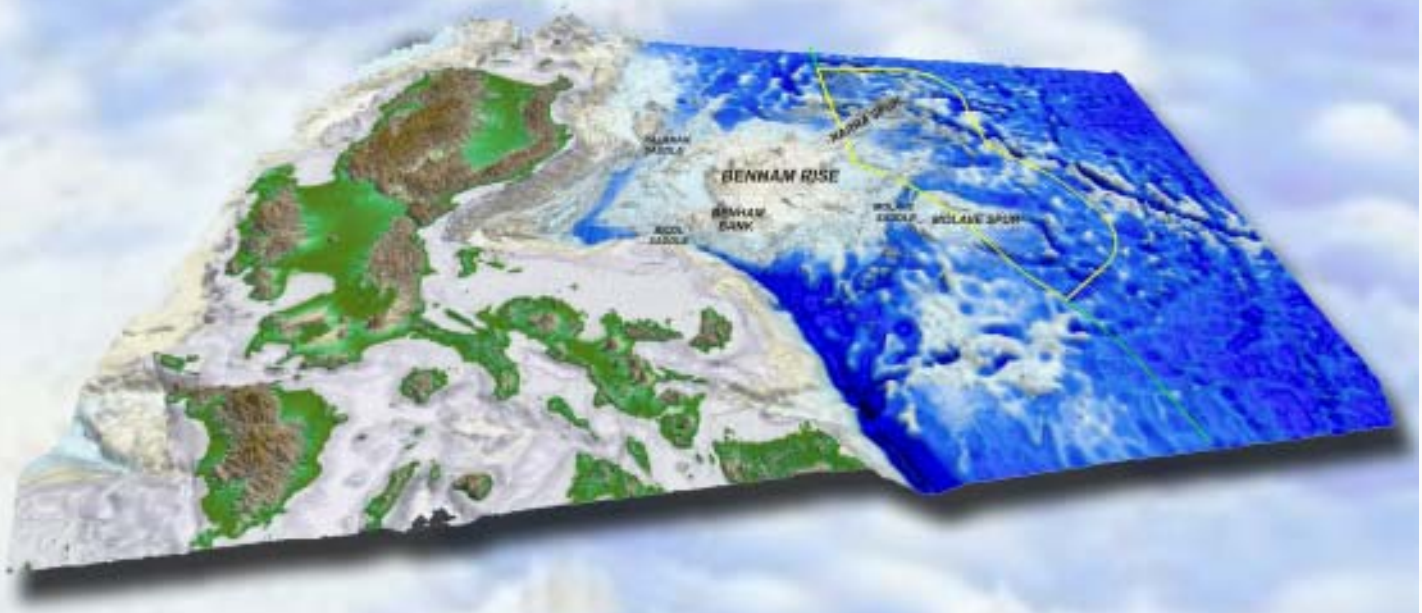
The Philippine Extended Continental Shelf in the Benham Rise Region



On April 12, 2012, the Commission on the Limits of the Continental Shelf (CLCS) of the United Nations adopted in full the Republic of the Philippines' Submission for an extended continental shelf (ECS) in the Benham Rise Region. The outer limits of the ECS, as established on the basis of the CLCS recommendations, are defined by 226 points, covering a seabed area of 135,506 square kilometers.

Benham Rise is a shallow bathymetric feature, east of Luzon, that towers above the adjacent deep ocean floor. The shallowest part, which is Benham Bank, is less than 50 meters deep.

The main body of Benham Rise is like a plateau with its broad crest and steep slopes toward the deep ocean floor of the West Philippine Basin. It has a blocky outline with its southwest corner impinging on the eastern side of the Luzon landmass creating an indentation.

Benham Rise is craggy and has a rough surface fabric with downsloping flow structures to the valleys and adjacent ocean floor. It is morphologically connected to the Luzon margin through the Bicol Saddle and the Palanan Saddle. The Bicol Saddle is the shallowest part of the morphological connection between Luzon and the southern margin of Benham Rise, while the Palanan Saddle is the shallowest part of the connection between Luzon and the western margin of Benham Rise.

It has two prominent spurs: Narra Spur in the northeast and Molave Spur in the southeast. The Narra Spur is a complex feature, narrowing to less than 20 km wide and connected to the main body of the Rise through the Narra Saddle. Molave Spur is an arrowhead-shaped plateau, extending almost 200 km east of the main body of Benham Rise. It is connected to the main body of the Rise through the Molave Saddle.

The morphological and geological analyses establish that Benham Rise is a natural prolongation of the landmass of Luzon that is distinct from the adjacent deep ocean floor. The connection between Benham Rise and Luzon is evident from its morphology particularly through the Bicol and Palanan Saddles. It is also evident from its geology, which shows that Benham Rise is accreted to Luzon. The geology also reveals the full extent of Benham Rise as a geological unit that is different in nature and character from the adjacent deep ocean floor. The extent of this large igneous province reaches well beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured. With the morphological and geological evidence complementing each other, the Test of Appurtenance is satisfied and the Philippines is therefore entitled to delineate the outer limit of its continental shelf beyond 200 nautical miles.•

Deputy Administrator Efren P. Carandang and Norieda M. Queypo

Benham Rise: How the Shelf was Won

The Commission on the Limits of the Continental Shelf (CLCS)'s recognition of Philippine jurisdiction over the Benham Rise Region is the Philippines' first successful validation of a claim in accord with the 1982 Law of the Sea Convention. It is the first major expansion of the Philippines' maritime boundaries since the late 1970s when it declared its EEZ (exclusive economic zone). This happy outcome is a tribute to a quiet and diligent work and collaboration by a team of public servants, scientists and legal experts who pursued the claim for over a decade.

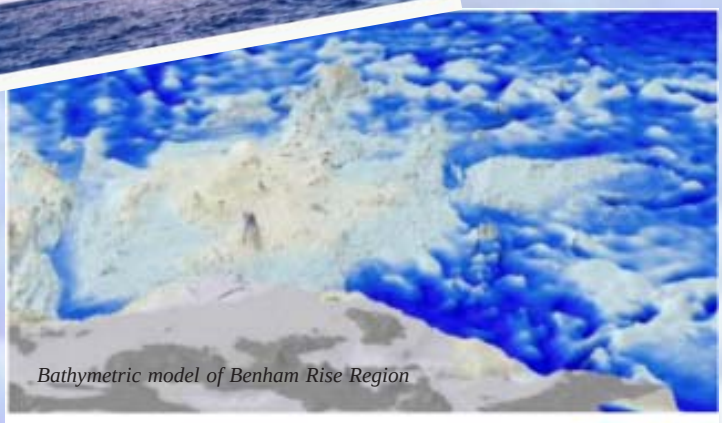
The story of the Philippine claim to Benham Rise began with a workshop in 2001 to assist the DFA and the DENR's National Mapping and Resource Information Authority (NAMRIA) with regard to the implementation of the Law of the Sea. Ms. Suzette Suarez of the UP Institute of International Legal Studies (UP-IILS) organized the workshop to discuss the requirements for claiming extended continental shelf (ECS) areas for the Philippines. Dr. Teodoro Santos of the UP National Institute for Geological Sciences (UP-NIGS) identified and proposed Benham Rise, then a relatively unknown area of the Pacific Ocean east of Luzon, as a possible ECS area in addition to areas west of Palawan. This resulted in an inter-agency Memorandum of Agreement among key government agencies and the academe to work together to make the ECS claims. Under then-Administrator Diony Ventura, the NAMRIA set itself to the task of conducting the extensive hydrographic surveys required as a basis for the claim. They commissioned a desktop feasibility study by the Norwegian firm Blom-ASA with Norwegian assistance. Afterwards, the NAMRIA's Coast and Geodetic Surveys Department sent its two survey ships, the Presbitero and Ventura, on several cruises to the Pacific to map the seabed beyond 200 nautical miles away and more than 5000 meters deep.

NAMRIA survey vessel BRP Hydrographer Presbitero

In 2007, the cabinet-level Commission on Maritime and Ocean Affairs created a Technical Working Group to prepare the Philippines' formal claims or "Submissions," to be filed with the CLCS in the United Nations. NAMRIA inaugurated the Philippine ECS Project under then-Director Efren Carandang. Its first task was to recruit scientific expertise, to which Dr. Santos and the UP-NIGS quickly responded. Ms. Nancy Aguda and Jenny Anne Barretto, both young geologists of UP-NIGS, together with Engr. Dennis Bringas of NAMRIA, undertook much of the very tedious technical analysis, supported by a team of cartographers, hydrographers, and IT-specialists detailed from other NAMRIA offices. Many experts from the UP-NIGS such as Dr. Mario Aurelio and Dr. Mahar Lagmay were also called in. Additional data were gathered from both local and international institutions, and NAMRIA procured the latest in computer hardware and software to process them. Participants from the DOJ, DOE, PCG, NSC, and other relevant agencies also joined discussions on policy issues about the claim. The team then produced draft submissions with advice from the National Oceanography Centre (NOC) based in Southampton, UK.

At the time, there was very little first-hand information about the actual intricacies of writing and supporting ECS submissions with the CLCS. NAMRIA contacted UP Law Prof. Jay Batongbacal, who was still taking up his doctorate in Canada, to join the project even while abroad, participating in the project's second major workshop via Skype. Prof. Batongbacal then met with Comm. Galo Carrera of Mexico, a CLCS Commissioner and colleague who had given maritime boundary workshops in the Philippines back in the 1990s. Over a cup of coffee in Halifax, Nova Scotia, Comm. Carrera agreed to assist the Philippines in preparing and finalizing the Submissions.

For help on the technical aspects, NAMRIA engaged the GNS, New Zealand's equivalent of the UP-NIGS and PhiVolcs. New Zealand had just announced its success in securing approval of the New Zealand ECS claim. The GNS team provided the Philippine team with information and advice on their actual experiences in making their claim, as well as enhanced their knowledge and capabilities in analysing and interpreting the data.



Bathymetric model of Benham Rise Region

The team then decided to make the submission for Benham Rise first. With the new project participants, a completely different version of the Submission emerged from the previous drafts. Comm. Carrera facilitated an exchange of views between the Philippine ECS Project team and their counterparts in Mexico, who had also successfully completed their own ECS submission. He also visited the Philippines to work directly with the Project team in marathon technical workshops. All previous work was reviewed, re-analyzed, and sometimes rejected, in order to produce the new Submission. Mr. Rolando Peña of UP-NIGS served as technical editor. Thousands of pages of raw data and documents had to be collated, digitally reproduced, and professionally packaged by the NAMRIA's IT Group led by Deputy Administrator Linda Papa, and integrated into

The ECS Team at the UN Headquarters in New York with Sen. Loren Legarda, CLCS Commissioners Galo Carrera and Lawrence Awosika, and Philippine Ambassador to the UN Libran Cabactulan

customised browser software for the exclusive use of the CLCS. Their hard work resulted in boxes of documents that filled half of the NAMRIA's service van, and which were later delivered to New York.

Meanwhile, there was movement in the legislature on the proposed amendment of the Philippine archipelagic baselines law, which was an important prelude to the making of a Submission to the CLCS. NAMRIA undertook the Global Positioning System (GPS) surveys of the proposed basepoints, and prepared several baseline configurations for Congress to consider. The ECS team closely monitored the developments in the legislature, and was relieved when the new baselines law was passed in March 2009.

The Philippines made its submission on April 8, 2009, a month before the original deadline. On August 15, 2009, the ECS team made its first formal presentation to the CLCS en banc. Then-Ambassador Hilario Davide introduced the delegation led by Amb. Minerva Falcon, who delivered the overview and summary of the claim and its basis. The initial meeting ended on a very optimistic note, and the Commissioners and their staff (many of whom turned out to be Filipino expatriates) warmly congratulated the team for a very clear and straightforward presentation that even laymen understood.

The team thought that the Philippines would have to wait until the year 2014 before the CLCS could begin consideration of the Submission. They were thus completely surprised when in January 2011, there was a notification that a CLCS Subcommission, chaired by Lawrence F. Awosika of Nigeria, had began the validation of the claim, and that it had already sent technical questions. For some reason the Philippines had jumped the line! The ECS team members were quickly convened to respond to technical issues raised in the

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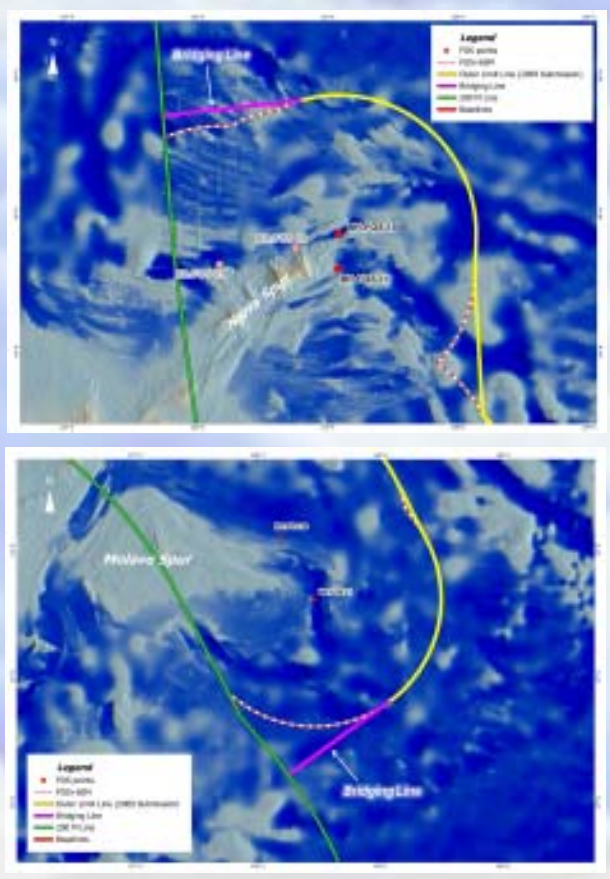
Ray Wood and Atty. Elana Geddis of GNS-Science with the ECS Technical Working Group in a marathon technical workshop.



Maps of the expanded northern and southern portions of the ECS comprising a larger area than the Philippines had at first claimed.

notification, and the following August, they returned to the CLCS led by NAMRIA Administrator Peter Tiangco. Computers, printers, and office supplies in tow, most team members arrived in New York just a day before Hurricane Irene which prevented the other members from the DFA from joining. As the city recovered, the meeting proceeded, joined by members of the Permanent Mission of the Republic of the Philippines to the United Nations and Sen. Loren Legarda. Dr. Lagmay of the UP-NIGS delivered the technical presentation as the rest of the team closely observed the reactions of the Subcommission.

Although the Subcommission accepted the answers of the delegation to almost all the technical issues, they not agree on basis for the location of the southern border of the ECS area. The Subcommission was inclined towards a substantially decreased ECS area. The delegation requested another meeting at which to provide additional data and analysis, which took place the following December 2011. It turned out to be the busiest and most challenging of all the meetings. Despite daily discussions, the Subcommission was not swayed from its position. The stalemate jeopardized the resolution of the Submission. However, upon the delegation's request for guidance, the Subcommission pointed out that it was possible to draw the border using another method adopted by the CLCS.

The new method actually increased the area of the claim; so the team enthusiastically spent a sleepless night excitedly drawing up new scenarios and borders with everything from computers to kitchenware. Into the early morning, the geologists, hydrographers and cartographers drew up maps and figures, while the lawyers prepared the necessary diplomatic script. On the last meeting held several hours later, the Subcommission agreed with the Philippines' new proposed boundaries.

The team members thought that their work was finished, so in March 2012, only a three-man delegation composed of NAMRIA Administrator Tiangco, now-Deputy Administrator Carandang, and now-Dr. Batongbacal attended the final meeting with the Subcommission to confirm that their report to the CLCS en banc reflected the previous meetings' agreements. But another surprise was sprung: the delegation determined just before the actual meeting that it was still possible to again expand the claimed area, this time at the northern border. They woke up the technical staff in Manila to recompute the borders and produce new maps and coordinates in only three hours. The effort was successful, with the Subcommission accepting the change. The delegation left with a new map and technical description of the Benham Rise Region comprising a larger area than the Philippines had at first claimed.

On 12 April 2012, the small delegation returned and accompanied the Permanent Mission of the Republic of the Philippines to the United Nations in making its final presentation to the CLCS en banc, before its final deliberation on the Philippine submission. Amb. Libran Cabactulan delivered the final pitch, speaking of the Philippines' adherence to international law, and thanking the Commission for the fruitful collaboration in determining the outer limits of our ECS in the Benham Rise Region. He made this presentation to the full Commission, which by this time was chaired by Comm. Carrera. Since he had previously assisted the Philippines, Comm. Carrera could not help our cause in the deliberations, and as Chairman he was bound by rules of confidentiality. The day after the meeting, as the delegation met him to bid a friendly farewell, he warned that nothing was fixed yet, and that he would notify the Philippines of the results in the following weeks. But he congratulated the delegation for a good final presentation and a job well done, and then parted by saying, with a smile, "I think we should be thankful for the very good weather." Now we know why.•

UP College of Law Assistant Professor Jay L. Batongbacal and NAMRIA Deputy Administrator Efren P. Carandang

Institutions That Contributed To The Benham Rise Submission

- The Commission on Maritime and Ocean Affairs (CMOA);
- The Department of Environment and Natural Resources (DENR), through the National Mapping and Resource Information Authority (NAMRIA), and the Mines and Geosciences Bureau (MGB)
- The Department of Foreign Affairs (DFA)
- The Department of Justice (DOJ)
- The Department of Energy (DOE) and the Philippine National Oil Company Exploration Corporation (PNOC-EC)
- The National Security Council (NSC)
- The Philippine Coast Guard (PCG)
- The University of the Philippines (UP) through the National Institute of Geological Sciences (NIGS) and the Institute of International Legal Studies (IILS)
- The Norwegian Agency for Development (NORAD)
- The Institute of Geological and Nuclear Sciences of New Zealand (GNS-Science)
- Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)
- Japan International Cooperation Agency (JICA)

PRS92

Think Philippine surveying and mapping, think NAMRIA and the Philippine Reference System of 1992 (PRS92). The establishment of PRS92 as an accurate and homogeneous national network of geodetic control points has had such a long, long history and is truly a defining undertaking of the agency.

The first geodetic control network in the Philippines was put up from 1901 to 1946 by the Americans through the United States Coast and Geodetic Survey, the forerunner of the Bureau of Coast and Geodetic Survey (BCGS). The BCGS was one of the agencies that merged under Executive Order number 192 to create NAMRIA in 1987.

NAMRIA conducted the geodetic survey which led to the upgrading of the old national geodetic network into PRS92. This was under the Geodetic Survey Component of the Philippines-Australia Natural Resources Management and Development Project implemented by DENR from 1989 to 1992. The year "1992" was the date when the initial upgrading of the network was finished. In 1993, by virtue of Executive Order number 45, PRS92 was made the standard reference for all mapping and surveying activities in the Philippines. Having a standard minimizes gaps, overlaps, and other inconsistencies of various surveys and maps.

The work continues to date for the full adoption of PRS92. The DENR through NAMRIA is involved in geodetic network development which aims to develop and maintain the system. Upgrading the country's horizontal and vertical control network ensures the reliability, completeness, and accuracy of PRS92 as a geodetic reference network. Activities include establishment and upgrading of geodetic control points, interisland benchmark connections, establishment of active geodetic stations, leveling and gravity surveys, and installation and upgrading of tide stations. PRS92 is a fundamental component of the country's spatial data infrastructure.•

Establishment and upgrading of geodetic control points

Gravity surveys

Interisland benchmark connections

Installation and upgrading of tide stations

Geodetic control points

Information, education, and communication on PRS92

PRESERVING THE HISTORIC STATION BALANACAN

One notable undertaking of NAMRIA to generate awareness among the various stakeholders and their support to the Adopt-a-*Mojon* program of the PRS92 Project is the preservation and development of the Station BALANACAN. NAMRIA spearheaded interagency initiatives to ensure the protection and usefulness of the historic geodetic station, which continues to play a significant role in the surveying and mapping of the Philippines.

The Station BALANACAN (Latitude 13° 33' 41".000 North, Longitude 121° 52' 03".000 East) is the datum origin of the Luzon Datum of 1911 and the PRS92. It was established in 1906 by the United States Coast and Geodetic Survey in Marinduque Island with Clarke Spheroid of 1866 as reference ellipsoid. It had for its azimuth mark the Station BALTASAR (azimuth: 9° 12'37".00) located in the western Tres Reyes Group of Islands also in Marinduque.

NAMRIA worked in partnership with the National Historical Commission of the Philippines, the DENR, the Provincial Government of Marinduque, and other stakeholders in carrying the preservation initiatives, namely, the (1) National Recognition of the Station BALANACAN, Luzon Datum Origin through a National Historical Marker; (2) Issuance of a Presidential Proclamation reserving a parcel of land of the public domain as the site for the Luzon Datum Origin National Historical Landmark, ecotourism development, and for other purposes; and (3) Development of the Luzon Datum Origin National Historical Landmark Site.

Through the collaborative efforts, the Station BALANACAN secured the recognition it greatly deserves. A national historical marker was installed at the Station and was unveiled in August last year in time for the centenary year of the establishment of the Luzon Datum. His Excellency President Benigno S. Aquino III moreover issued Presidential Proclamation No. 243, series of 2011 which withdraws from sale, lease, or settlement and reserves a certain parcel of land of the public domain containing an area of 281,817 square meters located in the Municipality of Mogpog as *Luzon Datum Origin National Historical Landmark, Ecotourism Sites, and For Other Purposes*. The Station BALANACAN is also being developed as a domestic tourism site in order to ensure stewardship for its maintenance and protection.

NAMRIA continuous to work towards the full preservation of the Station BALANACAN which hopefully will remain for centuries to come in order to witness the unfolding of more chapters in the history of surveying and mapping in the Philippines. The participation and support of the local government units, nongovernmental and people's organizations, and the general public is encouraged to maintain the national edifice.•

TOPOGRAPHIC BASE MAPPING

As the central mapping agency of the Philippine government, NAMRIA produces and maintains topographic base maps at various scales. Maps are important support tools in environmental management, development planning, disaster risk reduction management, climate change mitigation, comprehensive land use planning, and many other activities.

A topographic base map is where fundamental geographic features are shown. It depicts basic information, such as natural and man-made features, as well as elevation, to which additional specialized data can be superimposed.

One project that certainly stands out for greatly contributing to NAMRIA's topographic base mapping capability, is the Republic of the Philippines-Federal Republic of Germany (RP-FRG) National Cartography Center Project. The implementation period spanned the period of transformation of the National Cartography, Photogrammetry, and Remote Sensing Center (NCPRSC) into NAMRIA. The NCPRSC, the then central mapping agency of the government was renamed in April 1981 as the National Cartography Authority, one of the agencies that merged to create NAMRIA on 10 June 1987 by virtue of Executive Order 192, the Reorganization Act of the DENR.

NAMRIA periodically updates existing topographic base maps to ensure their accuracy and availability to different users. The maps are updated through the use of the latest satellite imageries and aerial photographs. The entire country is covered by 672 map sheets at 1:50,000 scale. The new 1:50,000 series is called the Philippine National Topographic Map Series. In the 1990s, NAMRIA started utilizing digital map production technology. The agency automated its cartographic process wherein analog maps were converted into digital form and cartographic enhancement and color separation were done on computer-based desktop systems. In 2000, digital photogrammetric workstations were acquired to enhance mapping capabilities. With this system, digital maps can now be produced directly from the scanned aerial photographs at a much faster rate than using the conventional plotters.

Significant mapping projects of NAMRIA were then implemented using modern technology. The Philippines-Australia Land Administration and Management Project (LAMP) was implemented to provide services for the geographic control survey and digital orthophoto mapping for DENR. Started in 2001 and completed in 2003, the LAMP aimed to alleviate poverty and enhance economic growth by improving the security of land tenure and fostering efficient land markets in rural and urban areas, through the development of an efficient land titling system.

In 2006, a development study project was also implemented through the assistance of the Japan International Cooperation Agency (JICA) entitled "The Study for Mapping Policy and Topographic Mapping for Integrated National Development Plan in the Republic of the Philippines". The pilot project covered the Pampanga River Basin up north to the Agno River Basin. To bring socioeconomic and peace development in Mindanao, JICA is also implementing the Topographic Base Mapping Project for Peace and Development in Mindanao. The project will generate a total of 227 updated topographic base maps at 1:50,000 scale and covering the whole region. The three-year project (2010-2013) aims to update the vintage 1:50,000 scale topographic maps of Mindanao. The grant-in-aid project is so far the biggest project for the Philippines by the Japan International Cooperation Agency (JICA) in terms of cost and area coverage.

Another important undertaking of NAMRIA which is in the works is the Unified Mapping Project. The country's topographic map series will be updated and at a more detailed 1:10,000 scale for an estimated 50 per cent of the whole country. The project would not only improve business processes but could also potentially reduce the loss of lives when used for disaster management and geohazard mapping.

Recently, the application of the LiDAR technology was used for the first time in the country to map Metro Manila and parts of Cavite, Rizal, Laguna and Bulacan. The outputs are digital elevation model, digital surface model, and imagery of the area coverage. The grant project from the Australian Agency for International Development will migrate into other areas of application, such as: socio-economic planning, land-use and resource allocation planning, environmental management, national security administration, road network planning, and traffic management. Map outputs will be distributed to local government units to help them invest on necessary infrastructure and prepare for natural disasters.

NAMRIA continues to produce and update topographic base maps of various scales to serve the needs of the DENR and its line bureaus, other government and private institutions, the scientific community, the academe, and the general public in numerous development planning activities.•

Enhanced topographic map of Kalibo

HYDROGRAPHIC AND OCEANOGRAPHIC SURVEYS

NAMRIA is the national hydrographic office and the focal agency for the International Hydrographic Organization. As such, the Agency conducts hydrographic and oceanographic surveys to gather marine geographic information and is responsible for the delineation of the country's various maritime zones. The information are essential in the production of nautical charts; for the revision/updating of paper nautical charts, electronic navigational charts, bathymetric charts, tide and current tables, maritime publications; and for scientific study and research.

Acquisition of Survey Vessels BRP PRESBITERO and BRP VENTURA

Resource exploration in the depths of the sea is as economically potential as that on the land. Cognizant of the social and long-term benefits from these explorations, the Philippine government acquired platforms necessary for surveying and delineating the country's archipelagic waters, territorial sea, exclusive economic zone (EEZ), and continental shelf.

In 1998, NAMRIA procured two identical survey vessels through a soft loan from the Government of Spain. These two multidisciplinary vessels were named *Barko ng Republika ng Pilipinas (BRP) Hydrographer Presbitero* and *BRP Hydrographer Ventura* after the names of the former Directors of the then Bureau of Coast and Geodetic Survey. Both vessels were designed and built by Factorias Vulcano based in Vigo, Spain.

Each vessel has a length of 53.5 meters, breadth of 12 meters, and a gross tonnage of 1,179 tons. Both vessels are powered by diesel engines and have a maximum speed of 13 knots. For navigation and surveying, the ships are equipped with modern navigational systems, Global Positioning System, multibeam sonar, sub-bottom profiler, gravimeter, magnetometer, current profiler and oceanographic sensors as well as a nine-meter survey launch and a skiff boat.

Since the arrival and commissioning of *BRP Presbitero* and *BRP Ventura* in 1998 and 1999, respectively, these survey vessels were able to carry out hydrographic, oceanographic, and geophysical surveys in the shallowest and the deepest part of the Philippine seafloor.

Among the accomplishments of the two vessels were the hydrographic surveys of the Philippine EEZ, territorial sea, archipelagic waters and ports and harbors; collaborative marine scientific research with local and international agencies and data acquisition in the Benham Rise and Kalayaan Island Group regions in support of the country's claim to an extended continental shelf which provides an opportunity to establish its rights on the seabed beyond the 200 nautical miles limit of the EEZ.• ***Ens. Jonathan T. Pason***

Survey launch of BRP Hydrographer Presbitero

BRP Hydrographer Presbitero and BRP Hydrographer Presbitero moored at their home port in Subic Bay

Survey of Philippine Archipelagic Basepoints and Maritime Zones

The country's internal/archipelagic waters, territorial sea, and the Exclusive Economic Zone (EEZ) are maritime zones that define the extent over which the Philippines has the right to exercise its sovereignty and exclusive right to utilize its marine resources, respectively. The delineation of the said maritime zones requires a baseline with which the 12 nautical miles extent for the territorial sea and the 200 nautical miles limit for the EEZ shall be reckoned.

The Philippines enacted baseline legislation in 1961 drawing straight baselines from which its territorial sea is determined prior to the country's ratification of the United Nations Convention on the Law of the Sea (UNCLOS) on 08 May 1984. The legislation provided that all waters within the baselines are considered inland or internal waters of the country and that all the waters from the baselines to the international treaty limits comprise the territorial sea of the Philippines.

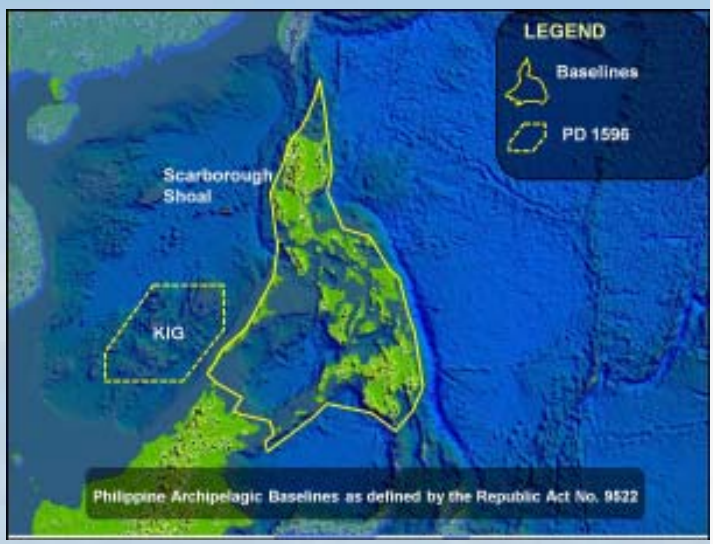
To harmonize the country's baseline system with the provisions of the UNCLOS, it has implemented the provisions of Part IV of the Convention to define its status as an archipelagic State. Consequently, the Philippines has applied the provisions of Article 47 of UNCLOS to establish its archipelagic baselines.

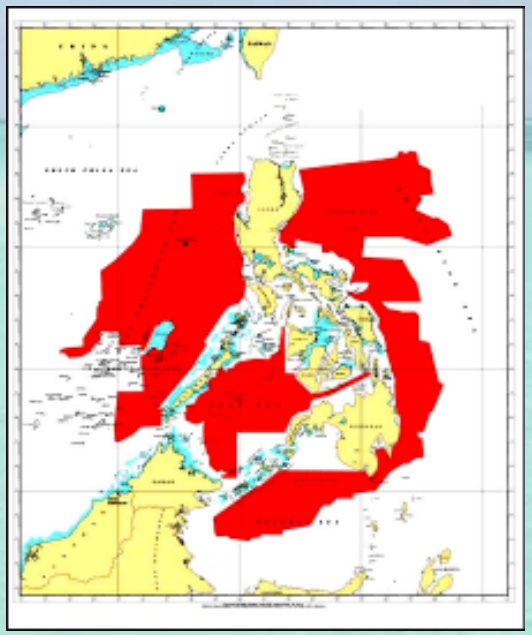
From 1992 to 2006, a survey campaign was conducted by NAMRIA utilizing the Global Positioning System (GPS) to determine the geodetic coordinates of the potential basepoints of baselines around the archipelago. The locations of the basepoints or the outermost points of the farthest island at low tide were initially identified using NAMRIA topographic maps and nautical charts. These selected basepoints were identified in the locality and the GPS relative positioning method was employed to tie the basepoints to the Philippine geodetic control network.

Preliminary processed positions in the World Geodetic System of 1984 (WGS84) were then refined by network adjustment software. The final geodetic coordinates of each basepoint were initially plotted on maps and charts at an appropriate scale to ensure position accuracy. There were instances that a basepoint needed to be adjusted or optimized by means of remote sensing techniques. Distances between basepoints were also calculated to ensure compliance with the provisions of Article 47 that the length of the baselines shall not exceed 125 nautical miles and that the number of baselines between 100 and 125 nautical miles in length shall not exceed three percent of the total number of baselines.

Out of the surveyed basepoints throughout the archipelago, four baselines options/systems were derived for consideration in the enactment of baselines law. The Philippine government has chosen the baselines option enclosing the main archipelago and that the Kalayaan Island Group and Bajo de Masinloc (Scarborough Shoal) under the provisions of Article 121 of the UNCLOS for the "Regime of Islands." This is embodied in Republic Act No. 9522 defining the archipelagic baselines of the Philippines consistent with UNCLOS.

In parallel, a series of hydrographic surveys starting in 1999 was conducted within the country's maritime zones, namely the archipelagic waters, territorial sea, and EEZ, using NAMRIA's survey vessels, BRP Hydrographer Presbitero and BRP Hydrographer Ventura. The areas beyond the EEZ where the country could possibly claim for an extended continental shelf were likewise surveyed to ensure that scientific evidences are available for the preparation of the claim. The multibeam echo sounder systems of both ships were employed in the said surveys which are complemented by the cooperative hydrographic surveys with the Naval Oceanographic Office (NAVOCEANO) of the United States of America and the Philippine Navy.





Status of the Philippine territorial waters hydrographic survey using the multibeam system

The timely passage of the baselines law played a key role in the submission of the outer limits of the continental shelf in the Benham Rise region to the United Nations Commission on the Limits of the Continental Shelf (CLCS) on 08 April 2009. Moreover, RA 9522 serves as reference for the proposed bill defining the Philippine maritime zones. Given the magnitude of collected bathymetric data using the latest technology, the accurate charting of the maritime zones is now feasible.• ***Cdr. Herbert L. Catapang and Ens. Jonathan T. Pason***

Joint Hydrographic Surveys with US Naval Oceanographic Office

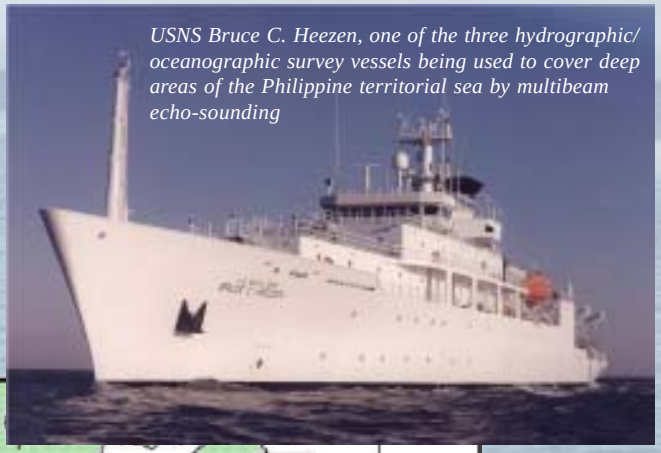
The Philippines, being an archipelagic country, has several sea-lanes that are vital to trade and commerce. To ensure safe navigation along these important sea-lanes, it is imperative to have accurate nautical charts derived from the modern system of hydrographic data acquisition. Most of the available charts were produced using the data from conventional method of hydrographic surveying where the water depth data are limited to the survey ship's track lines.

In April 2006, the Department of Environment and Natural Resources, through NAMRIA, signed a Memorandum of Understanding with the US Naval Oceanographic Office (NAVOCEANO) for the conduct of joint hydrographic surveys on Philippine waters. A Terms of Reference, which was signed in 2009, placed the cooperative hydrographic surveys under the oversight of the Philippines-United States Security Engagement Board Interagency Committee.

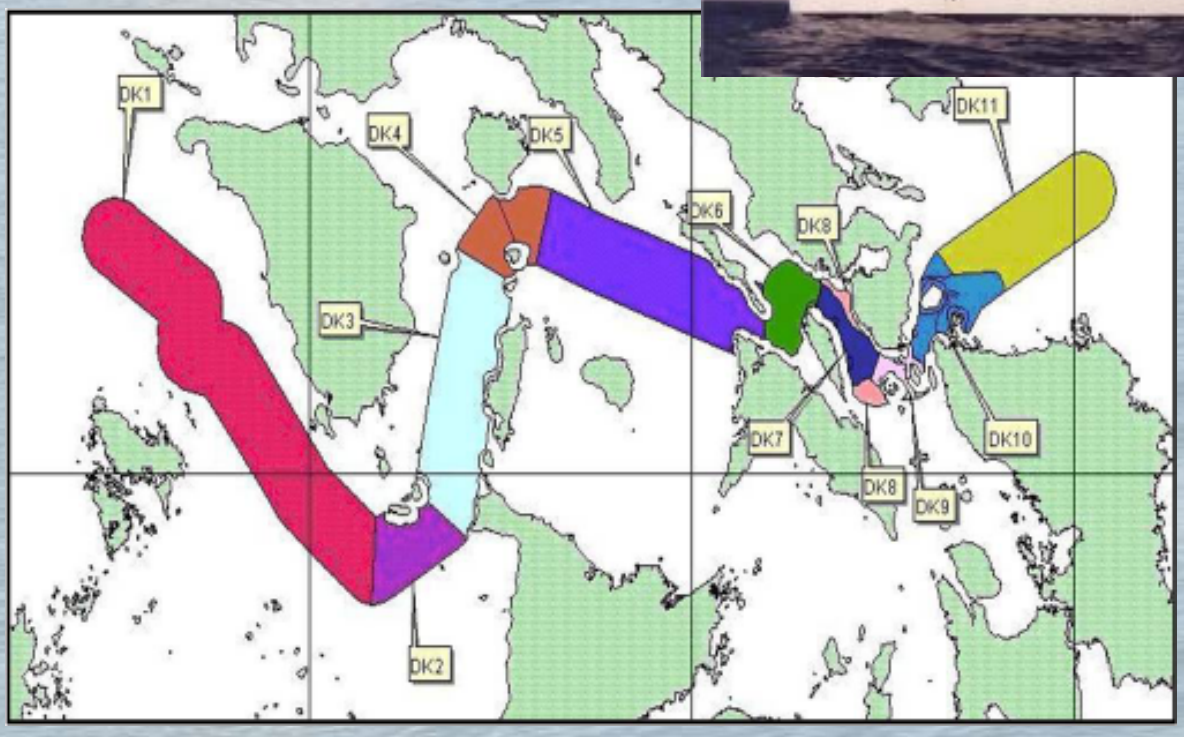
The surveys are conducted aboard US Navy hydrographic/ oceanographic survey ships and launches as well as the US Navy's airborne LiDAR survey platform known as the Compact Hydrographic Airborne Rapid Total Survey System (CHARTS). In general, the extent of the surveys covers the transit sea-lanes within the country's territorial sea, approach to harbors in selected bays, and key harbors. The USNS John McDonnell, USNS Bruce C. Heezen and USNS Bowditch are the three survey vessels utilized in conducting hydrographic surveys in offshore/deep areas. Hydrographic surveys on shallow areas are conducted by survey launches while the airborne LiDAR is used over areas that are too shallow for survey launches.

The cooperative hydrographic survey with NAVOCEANO serves as an opportunity for the Philippine hydrographers to be exposed to the latest technologies and techniques in hydrographic surveying. Representatives from NAMRIA and Ocean and Littoral Affairs Group of the Philippine Navy join the hydrographic surveys aboard the survey vessels, launches, and airborne LiDAR platform.

Since the start of the collaboration with NAVOCEANO, the surveys covered about 80,000 square kilometers all throughout the country. Bathymetric data were gathered in essential areas such as the Balintang and Babuyan Channels, Mindoro Strait to San Bernardino Strait, Verde Island Passage, Balabac Strait, Subic Bay, and Manila Bay. These data are being used in updating or producing new NAMRIA nautical charts and for other purposes. Having up-to-date nautical publications will not only complement the proposed bill on the designation of the Philippine archipelagic sea-lanes but it will likewise conform with the Safety of Life at Sea (SOLAS) requirement.• ***Cdr. Herbert L. Catapang and Ens. Aaron Andro V. Ching***



USNS Bruce C. Heezen, one of the three hydrographic/ oceanographic survey vessels being used to cover deep areas of the Philippine territorial sea by multibeam echo-sounding



Hydrographic survey segmentation along the transit lane from Mindoro Strait to San Bernardino Strait

Inner Space Speciation Project: A Marine Scientific Research in the Deep Waters of Celebes Sea

The ISSP expedition team

In January 2007, the United States of America through the US Embassy in Manila filed an application for consent to the Department of Foreign Affairs (DFA) to conduct the Inner Space Speciation Project (ISSP) within the maritime jurisdiction of the country. The ISSP is a marine scientific research and expedition aimed at increasing the understanding of the rich biological composition and the nature of the unexplored waters in the heart of the coral triangle in Southeast Asia, the Celebes Sea. The Celebes Sea is known as the center of the most biologically diverse area of the world's ocean.

Six months after the application, the Philippine government through the DFA granted its consent to the said marine scientific research in accordance with Article 245 of the United Nations Convention on the Law of the Sea and subject to the strict adherence to the terms and conditions set forth in the Grant of Consent.


The ROV used in the marine scientific research

The members of the expedition team included representatives from the Silliman University, the University of the Philippines Marine Science Institute, the Mindanao State University, the National Museum of the Philippines, the National Fisheries Research and Development Institute, the Philippine Coast Guard, the Philippine Navy, the World Wildlife Fund-Philippines, the Embassy of the United States in Manila, the Woods Hole Oceanographic Institution, the National Geographic Society, the Deep Sea Systems International, the Scripps Institution of Oceanography, the New England Aquarium, the University of California Los Angeles, and the University of Alaska. The US National Oceanographic and Atmospheric Administration funded the scientific research. The BRP Hydrographer Presbitero served as the platform of the ISSP.

The team of US scientists and their Filipino counterparts utilized special equipment to penetrate the different water layers and the sea bottom, one of which was the remotely operated vehicle (ROV) that can dive to about 3,000 meters deep. While the ROV took photographs and footages and collected specimens, the NAMRIA commissioned officers and enlisted personnel manoeuvred the ship in the correct speed and heading to counteract the effect of the wind and surface current and to ensure that the ship is in the right position to protect the safety of the ROV cable and other equipment used during the operation.

The different samples taken during the 10-day expedition were analyzed jointly by the US and Filipino scientists. The results of the study were made available to the Philippine government and other conservation organizations and were published in scientific papers, websites, and magazines to aid in the conservation and protection of the rich biodiversity of the Celebes Sea and to be part of the census of marine life.• ***Cdr. Rosalino C. delos Reyes***


Former US Ambassador to the Philippines Kirstie Kenney welcomes the scientists and crew in Manila South Harbor after the expedition.

DEVELOPMENT OF ENC IN THE PHILIPPINES

Electronic Navigational Chart or *ENC* became a buzzword in the early eighties among hydrographic offices especially in Europe and North America and was one of the hottest topics in meetings and conferences during that time. Several hydrographic offices in Europe joined forces with private institutions and continued their research and sea trials to evaluate the complexity of the electronic chart system. In 1984, the International Hydrographic Organization (IHO) established a committee on the exchange of digital data which was instrumental in the development of the S-57 standard or the Transfer Standard for Digital Hydrographic Data. This standard serves as the basic reference in the compilation and production of ENC. The potential of using ENC in providing safe and reliable information for safety of navigation was seen as a big leap from the conventional way of navigating the smooth and rough waters of the seas using paper charts or navigational charts, although varying degrees of complexities and difficulties were also anticipated.

In the middle part of the 1990s, NAMRIA saw the need to explore the possibility of seeking assistance from the Japanese government, through the Japan International Cooperation Agency (JICA), for the development of ENC in the country. In response to the request made, JICA dispatched in 1997 a long-term expert under the expert dispatch scheme to assist the agency in the transfer of technology in the preparation of digital chart data to be used in the development of ENCs. A major breakthrough happened in the year 2000 when JICA and NAMRIA forged a Memorandum of Understanding signalling the start of a three-year grant-in-aid project aimed at modernizing the nautical charting activities in the Philippines. The project was geared towards the development and eventual production of ENC in various scales covering some parts of the country. During the project implementation period, JICA dispatched several short- and long-term Japanese experts, provided hardware and software and put up capability-building programs.

The gestation period of converting the datum of the old nautical charts from Luzon Datum to the ENC-required World Geodetic System of 1984 (WGS84) datum was a major concern during that time considering the difference in the magnitude and direction of the shifts between the two datums. Global Positioning System (GPS) observation was carried out in different places to test and analyze the results and come up with satellite-derived positions for use in the adjustment of charted positions of the affected nautical charts. During the ENC development stage, minor concerns became part of the process like software bugs and equipment breakdown. Nevertheless, with the support provided by JICA and the NAMRIA management and the enthusiasm of the staff involved in the project, the migration from paper chart to digital to ENC was eventually realized. Accuracy test run of the newly-compiled ENC for Manila South Harbor was conducted aboard a car using a GPS and a laptop computer installed with a software that could read and display the ENC in real time while the car was cruising along Roxas Boulevard in Manila. Two commissioned officers also boarded a commercial vessel from Manila to Cebu then to Zamboanga City using the same setup and tested the newly-compiled small-scale ENCs of Northern Luzon, Central Visayas, and Mindanao for accuracy and reliability in actual navigation.

With the introduction of the new technology, awareness seminars and actual demonstrations for various stakeholders were conducted in Manila, Subic, Batangas, and Cebu. The introduction of the ENC technology was well received by seminar participants. The only setback at that time was the cost of the hardware like the Electronic Chart Display Information System (ECDIS), a machine which is to be installed in the bridge as part of the ship's navigation system and specifically designed to load, read, and manipulate the system ENC for use in real-time navigation. Finally, the first official copies of the Philippine ENCs covering Manila Harbor (1:10,000), Manila to Cavite (1;30,000), and Northern Luzon (1:800,000) was made available to the public on 10 December 2003.

Six months before the three-year project ended and after the launching of the ENCs, JICA dispatched an Evaluation Mission Team from Japan and assessed the accomplishments, status, and progress of the project as outlined in the project design matrix. The Evaluation Mission Team was satisfied with the project implementation and accomplishments and together with their NAMRIA counterparts recommended the extension of the project for another two years which was then approved by JICA.

Through the years, the popularity of and the demand for the ENC and ECDIS in the local and international community have increased. Many navigators will agree that compared to using paper charts during navigation, the introduction of ENC and ECDIS could be considered as one of the major innovations in marine navigation after the introduction of the radar many years before. Availing itself of ENC technology brought NAMRIA even closer to global competitiveness.•

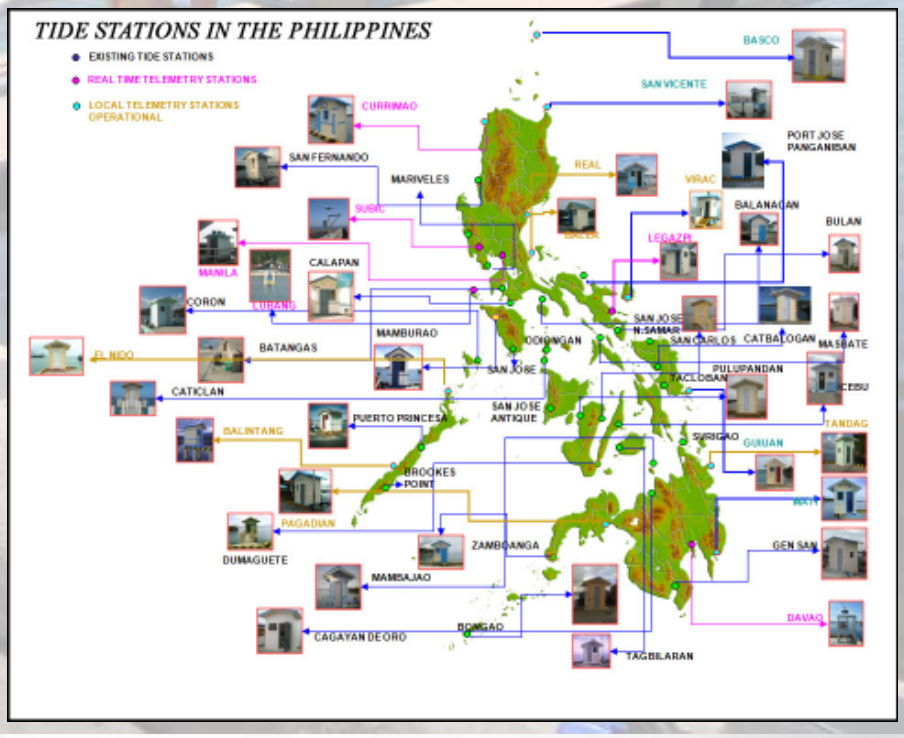
Cdr. Rosalino C. delos Reyes

PHILIPPINE TIDE STATIONS

A tide station is established to provide a record of accurate water-level measurements on a regular and uninterrupted basis over long periods of time while maintaining a stable elevation reference. NAMRIA has a long history of tide observations to measure the regular fluctuation of tides, and to predict its change over time. Safety of navigation is the primary purpose of tide observation. Tidal data, however, is also used to support all other marine-related activities, including economic development, security and defense, scientific research, and environmental protection.

The beginning of tide observations in the Philippines began in the pre-war era of 1901 with the establishment of the Manila Field Station by the former United States Coast and Geodetic Survey (USC&GS). The data gathered are mainly kept in the archives of the former USC&GS, now known as NOAA. Tide observations continued to be performed in different locations in the country with the establishment of additional tide stations in Iloilo City, Panay, and Cebu City in 1903. It was the onset of the Second World War which temporarily disrupted the continuous monitoring of tides in the country.

In 1946, the Manila Primary Tide Station was again put into operation. Then there was the construction of tide stations in Cebu, Davao, Legazpi, and Jolo in 1947. Further expansion followed with the establishment of the San Fernando Primary Tide Station in La Union in the same year. In 1952, one of the forerunner agencies of NAMRIA, the former Bureau of Coast and Geodetic Survey (BCGS), acquired a tide-predicting machine from Liverpool, England, that was used to generate 32 tidal components utilized for the prediction of tides. The first Tide and Current Tables for the Philippines prepared under Filipino leadership was published in 1953 with the printing of the manuscripts done in Washington D.C. USA. In 1969, computer-aided tidal predictions (IBM 360/06) replaced the use of the 32-component predicting machine. These developments greatly improved and hastened the tedious mathematical computations applied during tide predictions. By 1972, additional computers such as the FACOM 230/20 were used for all predictions including manuscript preparation.



In 1986, a regional cooperative program was conceived between the Association of Southeast Asian Nations (ASEAN) countries and Australia. This was "The *Tides and Tidal Phenomena Project*" under Phase I of the ASEAN-Australia Economic Cooperation Program (AAECP). The former BCGS which eventually became part of NAMRIA in 1987, started to install a digital type of tide gauge with analogue-to-digital converter models and pressure sensor type gauges in the project sites. The project established new tide stations in Surigao City, San Jose in Occidental Mindoro, Port Irene in Cagayan, and Puerto Princesa in Palawan. The old primary tide station in Jolo was upgraded and was equipped with a digital tide gauge. Phase II of the AAECP, called the "*Regional Ocean Dynamics Project*", commenced in 1990. Three of the tide stations established during Phase I of the Project, namely, Surigao, Port Irene, and San Jose were reclassified as Primary Tide Stations after exhibiting good quality of data derived from analysis and displaying accurate predictions.

Puerto Princesa became a primary tide station in 1994. The Jolo Tide Station was dismantled in 1996 due to security reasons and was transferred to Zamboanga City in 2002. In 2001, the tide station in Real, Quezon became a primary tide station. In both phases of the project, NAMRIA personnel were trained in instrumentation, calibration, data processing and analysis, and undertook a post-graduate level course on the theory and practice of hydro dynamics modeling.

The many reasons for measuring sea-level range from the immediate operational requirement of ship navigation to long-term predictions of global sea-level change because of climate variations. Technicians, engineers, and scientists may have different requirements for accuracy and availability of the measurements, but they are all concerned with the same parameter, the average level of the sea surface relative to a fixed datum.

Charting and navigation in harbors require immediate information on sea level, whereas the harbor design depends on the statistics of sea-level variations, measured over several years. Tidal prediction to facilitate ship movements depends on careful analysis of a long period of data, preferably at least a year. Coastal defenses against flooding are designed on the basis of long-term statistics. Datum definitions for both hydrographic charts and land surveys are based on analysis of long periods of sea level. Over long periods, planning for coastal zone management depends on long-term estimates of local sea-level change. On a regional scale, sea-level measurements are required with minimum delay to give warnings of coastal flooding and other sea-level related hazards.

NAMRIA is consistently upgrading its tide stations by acquiring modern and technologically advanced sea-level monitoring equipment to meet the needs of its clients. Capacity building for NAMRIA oceanographers is actively pursued. NAMRIA's sea-level data and products have been used extensively in local, regional, and global settings. The aim of NAMRIA, in this regard, is to continuously provide quality sea-level data using world-class technology and to ensure a sustained ocean resources awareness campaign for all.•

Norelius G. Baloran

DELINEATION OF MUNICIPAL WATERS

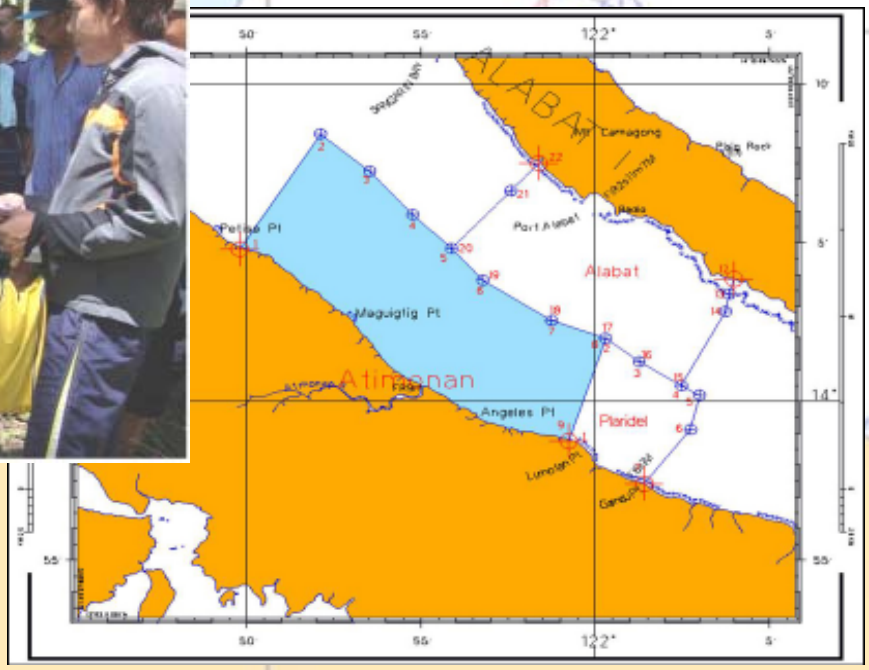
The Philippine Fisheries Code was enacted in 1998 to protect the rights of municipal fisherfolk to the preferential use of the municipal waters. The law tasked NAMRIA to provide technical assistance to municipalities and cities without offshore island/s in the delineation of the municipal waters following the guidelines set by the Department of Agriculture.

After more than a decade, NAMRIA continues to collaborate with local government units (LGUs). As of May 2012, the Agency has certified 275 out of 927 municipal water boundaries and a total of 796 coastal municipalities and cities had their coastal terminal points validated. Aside from issuing certified technical descriptions, NAMRIA provides training to enhance the technical capabilities of the LGUs in managing their municipal waters. In fact, some LGUs have already prepared a sea-use zoning plan that enables them to strategize the use of their marine resources.

LGUs with certified municipal water boundary have the legal capacity to protect its marine resources which results in the increase of fish yields for the benefit of marginal fisherfolk. As more LGUs are realizing the benefits of delineating their municipal waters, NAMRIA is all the more committed to provide technical assistance in this aspect.• ***Ens. Aaron Andro V. Ching***

Conduct of the third batch of GPS training for the Province of Negros Occidental in November 2011

Field validation of tbe coastal terminal point of the boundary between the Municipalities of Cagwait and Bayabas, Surigao del Sur in 2009



Delineated and certified municipal waters of Atimonan, Quezon

LAND CLASSIFICATION

The function of NAMRIA on land classification surveys covers public domain lands, forestland surveys and mapping, and remote sensing data application in updating land use or land cover information.

Forestland Boundary Assesment and Delineation

The 1987 Philippine Constitution provides that lands of the public domain are classified as agricultural, forest or timber, mineral lands, and national parks. It also mandates, "the Congress shall as soon as possible, determine by law the specific limits of forestlands and national parks, marking clearly their boundaries on the ground. Thereafter, such forestlands and national parks shall be conserved and may not be increased or diminished, except by law." The enactment of the law setting the final boundaries of forestlands addresses the national requirements on conservation, equity, and development.

To provide Congress with the needed technical, scientific and institutional support, the Department of Environment and Natural Resources (DENR) launched the Delineation and Establishment of Boundaries of Permanent Forestlands as its CY 2000 Banner Program. DENR Administrative Order (DAO) No. 2000-24 dated March 9, 2000 prescribed implementation procedures. However, the DAO lacked the detailed provisions on field verification and land use assessment which should provide essential information on the enactment or legislation of the final limits of forestlands.

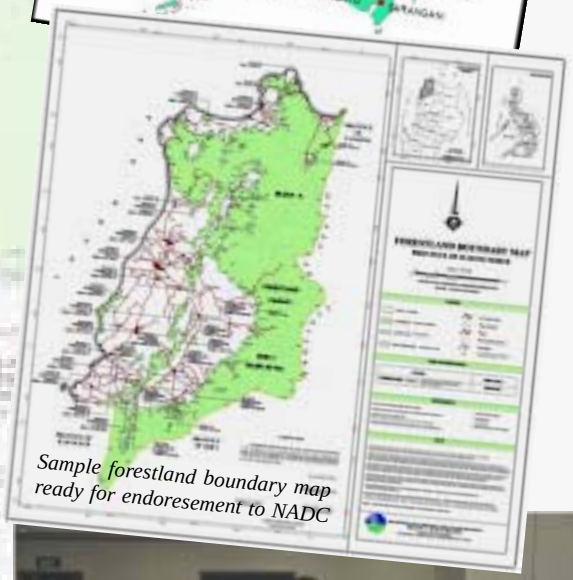
When DENR relaunched the project in 2008, it promulgated and issued DAO No. 2008-24 on December 8, 2008 providing for the guidelines on assessment and delineation of boundaries between forestlands, agricultural lands and national parks and serves as the current implementation guideline for the project. Based on the guidelines, boundaries between forestlands and agricultural lands (alienable and disposable) depicted on land classification (LC) maps are assessed. A one-kilometer strip of land along the LC line, 500 meters on the forestland side, and 500 meters on the alienable and disposable (A&D) side, are assessed with the aim of determining the validity of the existing LC line. In the process, portions of the *forestlands* assessed as 'non-conforming' (those that do not serve the legal classification or purposes for which these were established like forestlands utilized for agricultural, built-up or settlements) and meet the primary criteria prescribed in PD 705, shall be delineated/excised and proposed for conversion to A&D. Conversely, those classified as A&D lands which are not yet the subject of private acquisition or concession, and assessed and determined to be better needed for conservation purposes based on their biophysical attributes, are delineated and proposed for reversion to forestlands. In both instances, new LC lines are established to form part of the final limits of forestlands proposed for legislation. The delineated forestland boundary lines/corners are temporarily marked with 2-inch diameter x 3.33 feet long PVC pipe reinforced with concrete. After the legislation of the specific boundaries for each province, DENR and LGUs shall establish the permanent boundary monuments and delimit the boundary of forestlands and agricultural lands in accordance with standard reference system of surveys

The DENR Regional Offices through their Regional Assessment and Delineation Teams (RADTs) have completed assessment and delineation of approximately 75,000 kilometers of forestland boundaries in 75 provinces and 2-cities of the country (excluding ARMM). NAMRIA is a key player in the project as it provided and continues to provide the critical LC line base maps, technical assistance and evaluation/review of map outputs and final mapping.

The final forestland boundary maps and corresponding House Bills of 38 provinces and two cities are ready for transmittal to the National Assessment and Delineation Committee for final review and eventual submission by the DENR Secretary to Congress for legislative action.•

Jesus L. Gerardo, Violeta A. Quiliza, and Estela C. Gumabon

Provinces and cities with final maps and draft bills



Sample forestland boundary map ready for endoresement to NADC

NAMRIA technical working group members during a workshop in Tagaytay

Generation of Data on Upland/Forestland Population

Recent and reliable information on forestland/upland population and their geographic distribution is an important component in the overall data requirements for effective forest management. The data serve as basic input in framing social forestry policies, delivery of social services, and disaster risk management. Within a broader context, the information is critical in resolving problems and concomitant issues associated with forest protection and conservation, and in planning social and economic programs aimed at making forest dwellers valuable partners in sustainable forest management initiatives.

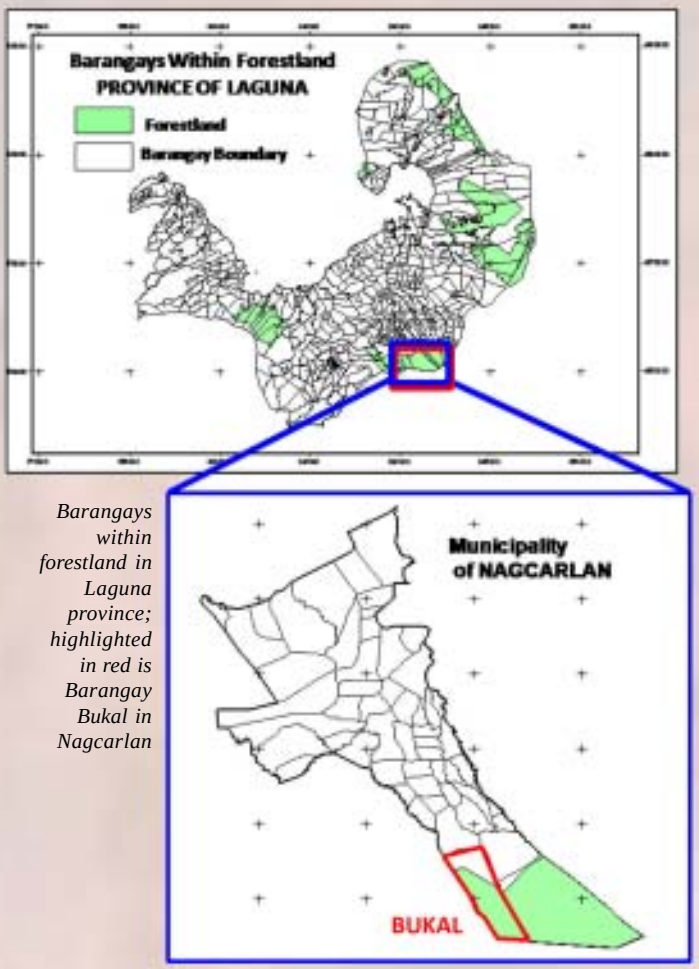
Forestland/upland refers to lands of the public domain which have been the subject of present system of land classification and determined as needed for forest purposes based on criteria pertaining to terrain (18% and above slope), vegetation and presence of geohazards, among others. According to the Philippine Forest Statistics (2009), around 15,805,325 hectares or 52.7 percent of the country's total land area is classified as forestland.

Based on the National Statistics Office (NSO) CY 2000 figures as cited by World Agroforestry Center (2011), upland population is estimated to be about 24 million, mostly belonging to the poor and disadvantaged sector in the Philippines society. An earlier estimate of around 17.8 million for CY1988 was provided by the Philippine Institute of Development Studies quoting result of the study made by Cruz, et al. (1986).

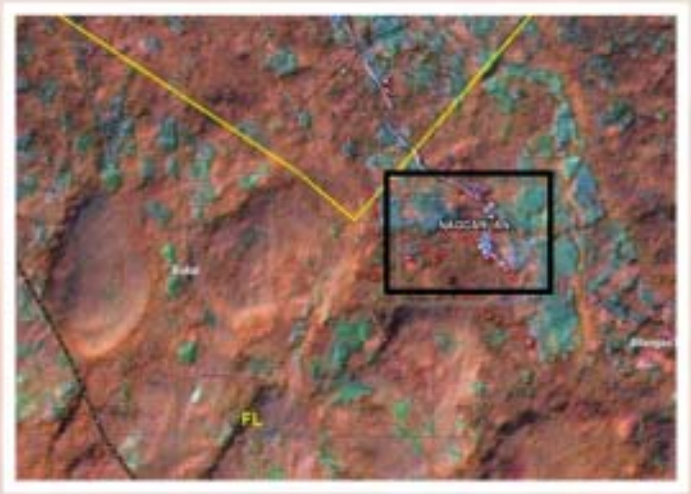
Realizing the urgent need to have an up-to-date and reliable data on forestland population and distribution for national and local levels, FMB and NAMRIA jointly prepared a proposal for the project ***Generation of Data on Upland/Forestland Population.*** Approved and implemented through a MOA with NAMRIA, the project will utilize high-resolution satellite imageries complemented by ground validation and consultation workshops with barangay officials.

The major activities include image acquisition and processing, replotting of LC maps, data gathering, validation of barangay boundaries, base map preparation, identification of target barangays, coordination with LGUs and DENR regional offices, consultation workshops and field validation. The expected outputs are statistics on population and maps showing locations of household concentration or clusters by province.

This two-year nationwide undertaking commenced in January 2012. To date, preliminary maps and related outputs have been completed for six provinces, namely, Ilocos Norte, Ilocos Sur, Laguna, La Union, Pangasinan, and Zambales. Activities in various stages are ongoing for other target provinces. The project is expected to be completed by end of 2013.• ***Dr. Rijaldia N. Santos, Beata D. Batadlan, and Estela C. Gumabon***



Barangays within forestland in Laguna province; highlighted in red is Barangay Bukal in Nagcarlan



Clusters of household delineated on SPOT image

LAND COVER MAPPING

Land cover data serve as essential inputs in physical and developmental planning at the local, provincial, regional, and national levels. Updated land cover data is a valuable information theme required in various climate change mitigation and adaptation initiatives and especially in the identification of potential sites for the National Greening Program of the government.

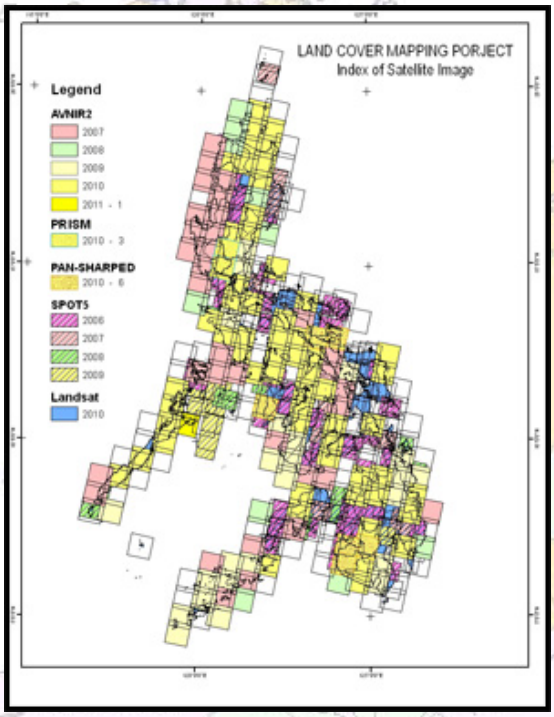
NAMRIA is currently implementing a land cover mapping project that will update the 2003 land cover maps and statistics of the country. A total of 138 Advanced Land Observation Satellite-Advance Visible Near Infrared Radiometer type 2 (ALOS-AVNIR 2), and 57 Satellite Pour l'Observation de la Terre 5 (SPOT 5) scenes were used in the project. These imageries are in 10-meter resolution and were taken mostly in 2010. Landsat 7 scenes taken in 2010 were also utilized to fill in the gaps. The satellite data were processed and interpreted using the same Food and Agriculture Organization (FAO) classifications used in the 2003 land cover maps.

Preliminary land cover outputs were validated on the ground, including comparison with results of the Forest Resource Assessment (FRA) project of the Forest Management Bureau. Phase Array type L-band Synthetic Aperture Radar (ALOS-PALSAR) imageries were used to crosscheck the coastline and forest boundaries.

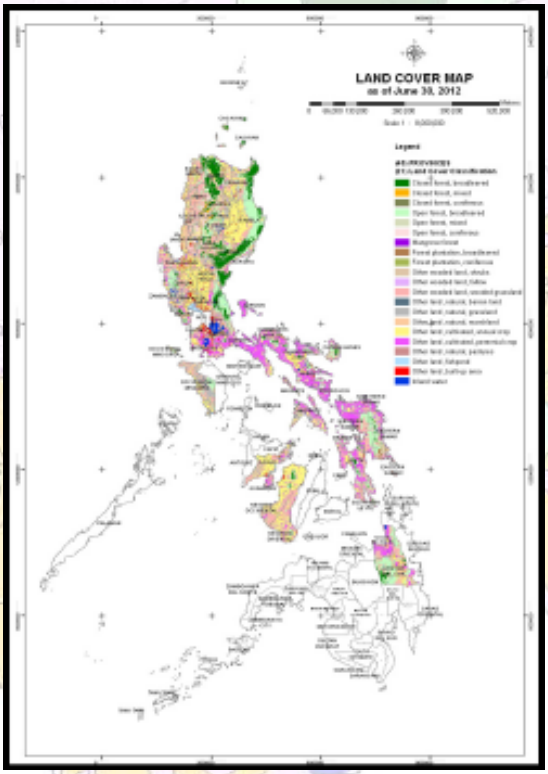
As of June 2012, a total of 45 provinces were completed with the final land cover maps to be launched by August this year. The areas covered are the provinces in mainland Luzon (except NCR) and the islands of Catanduanes, Masbate, Negros, Samar, Leyte, Guimaras, and Biliran. The remaining provinces are in various stages of processing.

The 2010 Land Cover Maps covering the whole country are expected to be available around first quarter of 2013. Funding support was partly provided by the Department of Environment and Natural Resources.•

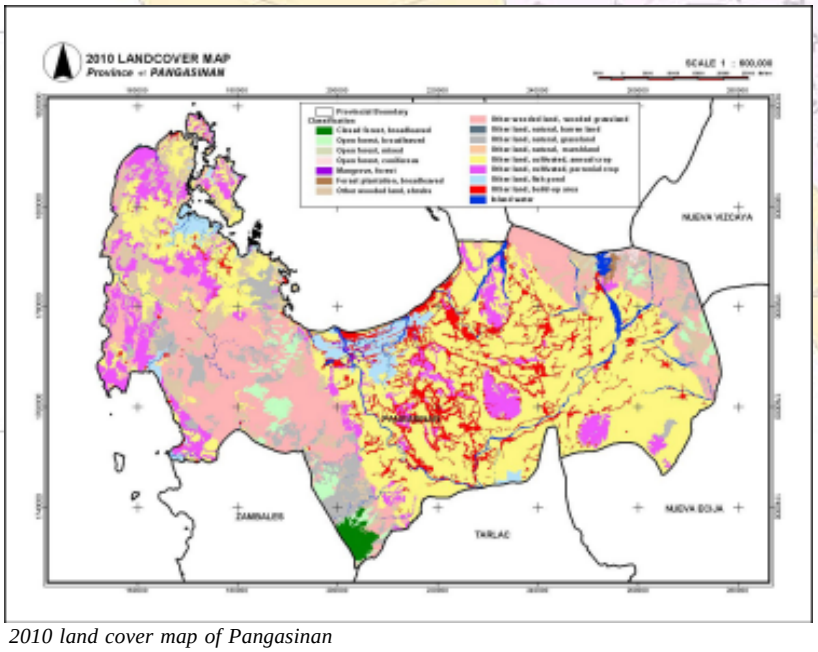
Olivia M. Vigneault and Raul T. Magabo



Satellite index map



Land cover map of completed provinces



2010 land cover map of Pangasinan

Events and Milestones in the 25 years of NAMRIA

1988

1989

1990

1991

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2004

2005

2006

2007

2008

2009

2010

2011

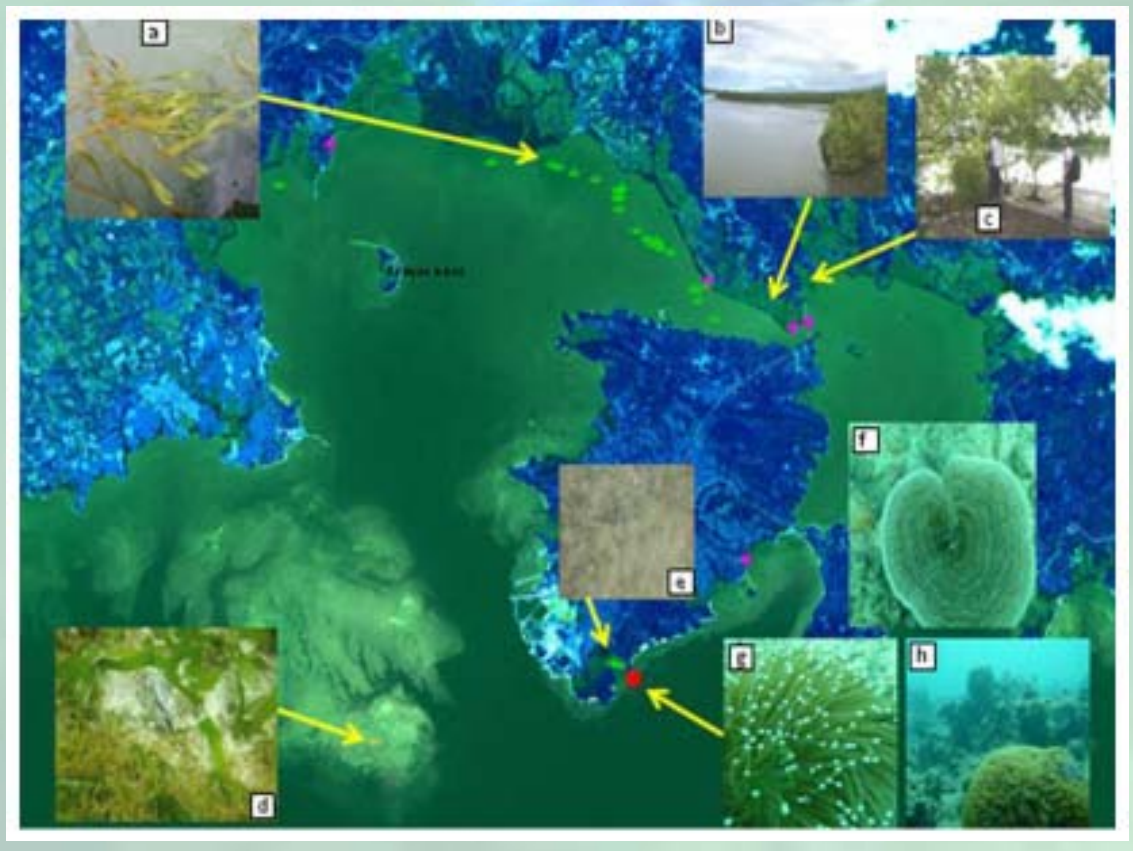
2012

COASTAL RESOURCE MAPPING

The immense economic and ecological value of coastal resources on coastal communities and nearby areas cannot be overemphasized. Increasing migration to coastal areas, unregulated human activities and changing climate patterns have brought enormous pressure on these resources. About 30 to 40 percent of seagrass in the Philippines have been lost in the last 50 years (Fortes, 2008). Based on the study conducted by The World Research Institute in 2001, it is projected that by year 2030, up to 90 percent of reefs will be threatened. According to experts this will have negative effects on the economy since coastal communities depend on reefs as their source of food and income. Consequently, there is a need for up-to-date data to establish reliable baseline information on coastal resources.

The objective of the *Coastal Resource Mapping and Assessment (CRMA) Project* is to map the geographical extent and determine the status of coastal and marine resources, particularly coral reefs, seagrasses, and mangroves, including detailed land cover/use within one-kilometer distance from the shoreline landward. These information are important inputs to address environmental and social issues within the coastal zone. They will also serve the data requirements arising from commitments of the Philippines as part of various international agreements on seas and oceans.

The project started in CY 2011, with Pagbilao in Quezon as the pilot area. A total of 56 sites all over the country are expected to be covered until CY 2016, given sufficient funding. Remote sensing techniques and GIS will be applied to process and analyze satellite imageries and other ancillary data complemented by ground validation.• ***Rolando A. dela Cruz, Federico D. Macaraeg, and Cristina B. de Leon***



Validated locations of coastal resources in Pagbilao, Quezon using SPOT5 satellite image: a and e - seagrasses; b and c - mangroves; d - seaweeds and seagrasses; f, g, and h - corals

PHILIPPINE GEOPORTAL

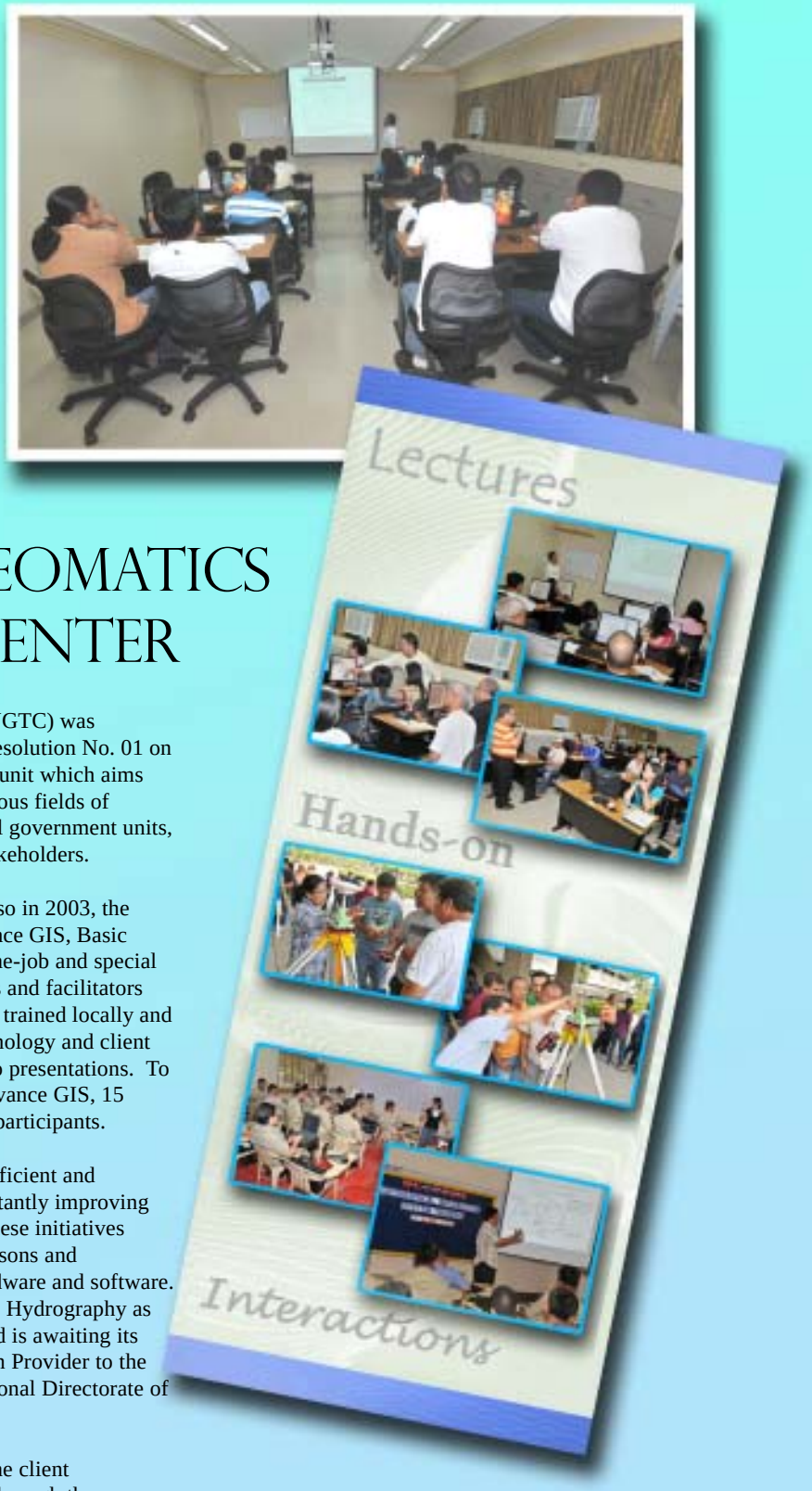
Under its geographic information management function, NAMRIA has steadily worked towards realizing a national spatial data infrastructure (NSDI). The NSDI is essentially designed to provide a mechanism for sharing of and access to geospatial information produced and maintained by the different custodians all over the country. First and foremost, the agency was instrumental in the creation in 1993 of the Inter-Agency Task Force on Geographic Information (IATFGI). The IATFGI, a group of GIS practitioners from government agencies, the private sector, and the academe, was the result of coordinative work between NAMRIA and the National Statistical Coordination Board. NAMRIA chaired the IATFGI in the performance of the latter's two primary tasks. One was promoting and coordinating the efficient development, management, and utilization of geographic information in the country. Another was leadership in the establishment of the NSDI. After the IATFGI officially ended in 2008, NAMRIA continued to undertake activities that would pave the way for the establishment of the NSDI. Its continued efforts to lobby and submit proposals to sponsoring agencies and institutions for the development of the NSDI finally paid off in November 2010 with the approval and consequent E-Gov funding by the Commission on Information and Communications Technology of the proposal for the Philippine Geoportal Project. The actual work started in January 2012. Secretary Ramon JP. Paje of the DENR is the Project Sponsor and NAMRIA Administrator Peter N. Tiangco is the Project Owner.

The three-year multiagency Philippine Geoportal Project, working on the *One Nation One Map* principle, essentially aims to unify the country in the use of one common multiscale basemap for different users. It likewise seeks to enable the widespread, democratic use of geospatial data via an Internet-based geographic information system. It is the agency's role to house its basemaps and the thematic datasets of other agencies and ensure that data standards are followed prior to their uploading onto the geoportal.

NAMRIA partnered with the Advance Science and Technology Institute of the Department of Science and Technology for network management and establishment of the offsite geoportal servers. The NAMRIA data center at the NAMRIA main office in Taguig City was installed for the buildup and integration of its fundamental databases. Trainings for technical personnel both from NAMRIA and stakeholder agencies were conducted to upgrade their capability on GIS, network administration, and geospatial data buildup.

In order to ensure an organized way of running the geoportal system in the long term, the Project Management Team (PMT) headed by Deputy Administrator Linda SD. Papa is spearheading the drafting of policy frameworks addressing concerns on data sharing and access, data exchange format and standards, data clearinghouse network, and institutional arrangements. The PMT is likewise leading the preparation of the phases 2 and 3 plans by incorporating other coverage areas from Metro Manila to Davao and Metro Cebu, and further improvement of the geodatabasing of the NAMRIA base maps. Other applications being considered in the immediate future are mobile geoportal applications and business cases development such as Disaster-Risk Reduction and Management, Climate-Change Adaptation, election, traffic management, among others.

NAMRIA is steadfast in getting commitment and support for the Philippine Geoportal from all stakeholders. The agency has been conducting IECs and meetings and attending conferences to achieve the vision of current and accurate geospatial information being readily available to the widest potential users.•



THE NAMRIA GEOMATICS TRAINING CENTER

The NAMRIA Geomatics Training Center (NGTC) was established by virtue of NAMRIA Board Resolution No. 01 on 14 March 2003. It was created as a special unit which aims to provide transfer of knowledge in the various fields of geomatics to the national government agencies, local government units, the academe, the private sector, and the agency's stakeholders.

Accredited by the Civil Service Commission also in 2003, the NGTC offers short-term courses on Basic and Advance GIS, Basic GPS, and GIS for Executives. It also conducts on-the-job and special trainings. The Center has a pool of resource persons and facilitators from the different departments of NAMRIA who are trained locally and abroad. The facility adheres to the demands of technology and client needs. Its training aids include interactive and video presentations. To date, the Center has conducted 70 Basic GIS, 27 Advance GIS, 15 Basic GPS, and 42 other courses to a total of 2,686 participants.

In line with the thrust of NAMRIA to deliver efficient and innovative transfer of technology, the NGTC is constantly improving and updating its training programs and facilities. These initiatives include the continuing education for its resource persons and facilitators and the regular upgrade of computer hardware and software. The Center is also working on the inclusion of Basic Hydrography as an additional short course in its training program and is awaiting its accreditation as a Continuing Professional Education Provider to the Philippine Regulation Commission through the National Directorate of the Geodetic Engineers of the Philippines.

The Center will soon be implementing the online client registration and assessment of training participants through the NAMRIA website. Other future endeavours lined up are the conduct of impact assessment of agencies that availed themselves of the NGTC's programs and the application for ISO certification.

Cherrylin D. Mendoza

PAGENET, GEODETIC OBSERVATION, AND OTHER FACILITIES

NAMRIA is equipped with various facilities that complement the performance of its mandated services. The agency hosts the Philippine Active Geodetic Network (PageNET), the new positioning infrastructure of the Philippines designed to support the PRS92 Project. The PageNET consists of permanent reference stations strategically located nationwide and a Data and Control Center set up at NAMRIA's Fort Bonifacio office. The PageNET provides real-time and high-precision geographic position data to its users and is envisioned to provide a modern fundamental referencing infrastructure to related applications like mapping, GIS and navigation; and to contribute to local and international Global Navigation Satellite System initiatives in support of Earth observation and scientific studies.

The PageNET data and control center

In 1991, the Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) beacon was installed in the agency's main office. DORIS is a French satellite system used for the determination of satellite orbits and for positioning. NAMRIA was chosen as one of the ground stations of the Segment Sol Multimission Altimetry and Orbitography (SSALTO), the multimission orbitography and altimeter center based in Toulouse which provides ground support systems for controlling DORIS.


DORIS beacon (left) and active geodetic station

NAMRIA also operates and maintains a magnetic observatory which became fully operational in 1993. Located in Muntinlupa City, the observatory regularly conducts magnetic observations and the magnetic data gathered are recorded and processed. In addition, a network of magnetic repeat stations throughout the country are regularly occupied and observed. These stations are linked to the Magnetic Observatory. Magnetic data are essential for determining the local variations that are reflected on NAMRIA's charts and topographic maps. They are used to correct compass bearings during navigation, surveying, and finding directions on land. Magnetic data are highly useful for safety of air and sea navigation. They guide the pilot as to the position of his/her vehicle at sea or in the sky relative to its true position.

Established in 2007, the NAMRIA Museum of Surveying and Mapping located at the agency's ground floor is the only museum dedicated to the Philippine surveying and mapping heritage. It features a timeline narrating the history of surveying and mapping in the Philippines from 1900 to the present; a showcase of old surveying and mapping equipment; a gallery of maps from the Spanish period to the first NAMRIA-produced analog and digital topographic maps, nautical charts, orthophoto maps, and land classification maps; and a photo and document section exhibiting photos of vintage survey vessels and American memorabilia.•

Magnetic observatory in Muntinlupa

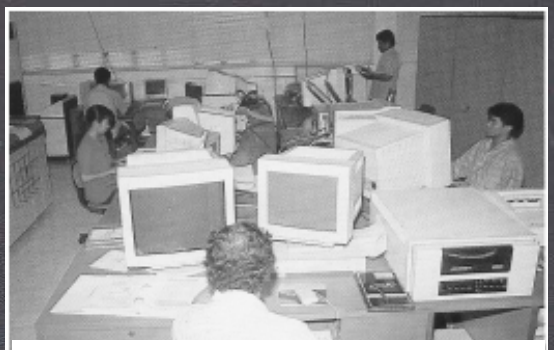
ENR MANAGEMENT

NAMRIA contributes to the implementation of programs for the comprehensive management of our country's environment and natural resources (ENR). There were two significant programs undertaken during the agency's early years of formation and development. One was the Natural Resources Management and Development Project (NRMDP), a partnership between the governments of the Philippines and Australia which was implemented from 1988 to 1993. Among other objectives, the NRMDP aimed to strengthen the capability of the Philippine government, particularly the DENR, in planning and implementing resource development programs; improve the system of utilizing resource use data for policy and planning; and establish standard reference points across the country to facilitate the accurate survey and mapping of land and natural resources.

NAMRIA was involved in the geodetic survey and resource management components of the NRMDP. Employing the Global Positioning System technology, the geodetic survey component established horizontal and vertical reference points across the country for use in integrated surveying and mapping programs. Other activities under this component were the setting up of tidal observation stations, the development of a geoid model throughout the country, and the installation of a computerized geodetic records system to facilitate the retrieval and analysis of survey records. The PRS92 was an outcome of the NRMDP. On the other hand, the resource management component aimed to develop a model for a Natural Resource Management Information System which operates at different administrative levels and has linkages with central and local information systems in other government offices.

The establishment of the National Remote Sensing Center (NRSC) through the Republic of the Philippines-Australia Remote Sensing Project (1990-1994) enhanced NAMRIA's capabilities in carrying out its role of contributing to the Philippine government's efforts in ENR conservation and management. Inaugurated in 1991, the NRSC served as the image archiving, processing, applications, and distribution center for remotely sensed data and information in the country. A wide variety of clients from the government and private sector benefited from the RS services and products of NAMRIA through the NRSC. The Center also formulated and implemented various remote sensing project applications and integrated the use of GIS to these applications. These projects included land cover mapping, resource mapping, land and marine resource mapping, and environmental mapping. A downstream project was the Land Use and Land Cover Change Project covering Magat Watershed and Puerto Princesa City which focused on the integration of RS with socioeconomic data in order to improve the understanding of the interannual dynamics of deforestation, regrowth, and other land use changes.•

Foreign Affairs Undersecretary Manuel Yan and Australian Ambassador Mack Williams sign the MOU for the RP-Australia Remote Sensing Project.



National Remote Sensing Center

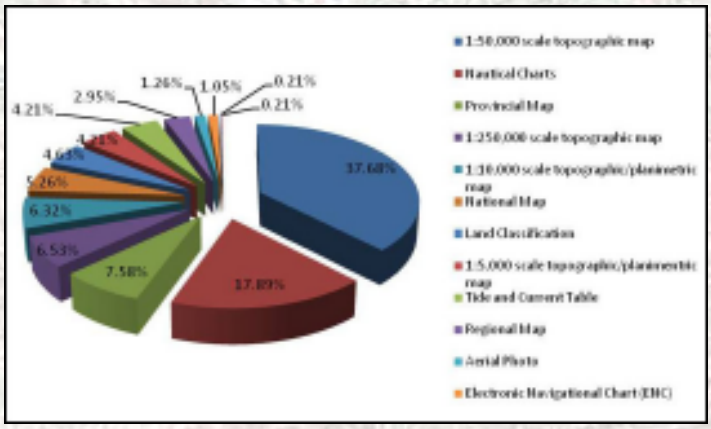
MSOs AND CLIENT SERVICES

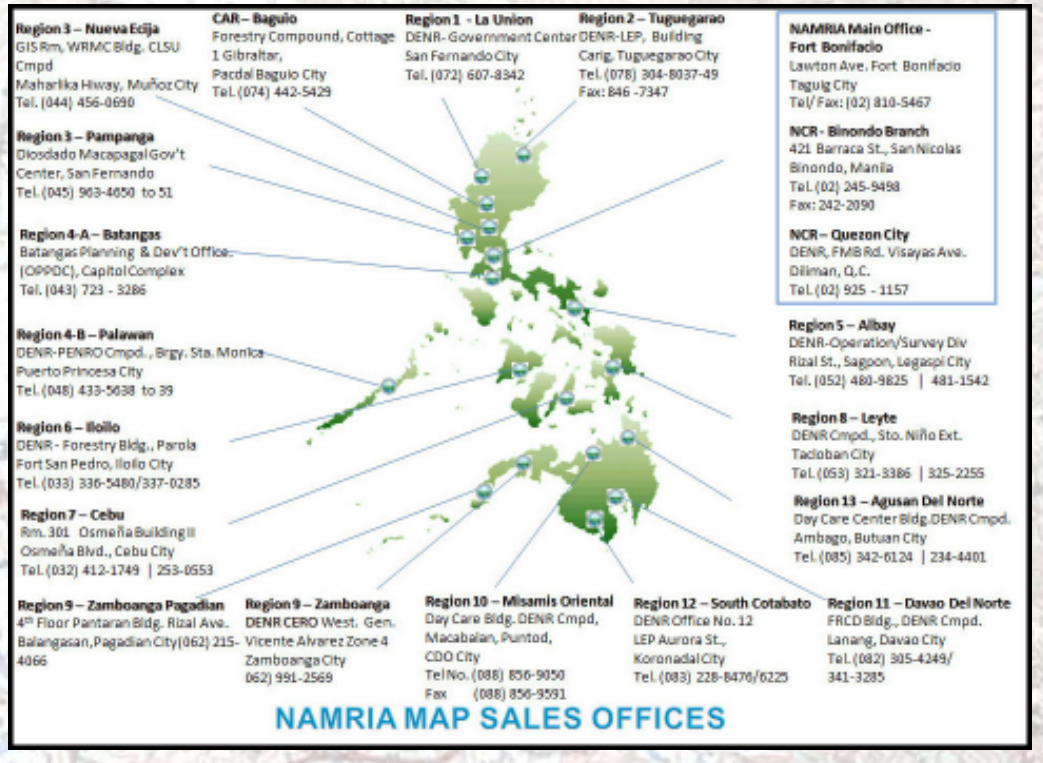
In an effort to enhance the agency's frontline client services, the ICSUs were created through NAMRIA Special Order No. 23, series of 2012. The ICSUs address the concerns of NAMRIA clients for customized/special and other digital products. The designated ICSUs per department are the following: Mapping and Geodesy–Office of the Director, Hydrography–Administrative Unit, Remote Sensing and Resource Data Analysis–GIS Archives Unit, and Information Management–NAMRIA Information Center.

Majority of the MSO and the ICSU clients come from the private sector. The rest are from the DENR, the academe, national government agencies, local government units, and nongovernment organizations. Committed to its clients' utmost satisfaction, NAMRIA will continue to enhance its MSOs and client services in the years to come.• ***Jacqueline T. Fagarang***

NAMRIA reaches out to the general public through its map sales offices (MSOs) and information and client service units (ICSUs). The agency established on its first year the MSO in Fort Bonifacio to increase the distribution outlet for analog maps in the National Capital Region. The MSO in San Nicolas, Binondo was the only sales office then. There is now a total of 20 MSOs nationwide which make NAMRIA analog products accessible to the clients especially those in the region.

The available analog maps for sale are contained in the NAMRIA Catalogue of Products and Services. Based on the 2011 survey conducted on the assessment of client needs, the most saleable product is the 1:50,000-scale topographic map followed by nautical charts, administrative maps, and 1:250,000-scale topographic maps.





DISASTER RISK REDUCTION AND CLIMATE CHANGE

The Philippines, being situated in the Pacific Ring of Fire and along the typhoon belt in the northwest Pacific Basin, is prone to natural calamities such as tropical cyclones, floods, earthquakes, and volcanic eruptions. The country is also a climate change hotspot as it is vulnerable to climate-change manifestations like temperature changes, extreme weather conditions, and sea-level rise.

NAMRIA contributes to disaster-risk reduction and management (DRRM) and climate-change adaptation (CCA) efforts through various undertakings. In the 1990s, the agency assisted in the rehabilitation efforts for areas in the country which were severely devastated by the tragic Luzon temblor, the eruption of Mt. Pinatubo, and the wrath of Typhoon Uring. Disaster management maps were also prepared covering the six-kilometer radius permanent danger zone around Mt. Mayon and the danger zones within the 7, 10, and 15-kilometer radius around Taal Volcano, including the location of the probable evacuation centers. In the aftermath of Typhoon Ondoy in 2009, NAMRIA mapped the extent and height of floods in the eastern portion of the National Capital Region.

Aside from producing the base maps, NAMRIA also integrates data to produce multihazard maps in collaborative milestone projects for preparedness in terms of natural disasters, i.e., the (a) Hazards Mapping and Assessment for Effective Community-based Disaster Risk Management or READY Project, (b) the Building Community Resilience and Strengthening Local Government Capacities for Recovery and Disaster Risk Management or Resilience Project, (c) the Enhancing Risk Analysis Capacities for Flood, Tropical Cyclone, Severe Wind and Earthquake for Greater Metro Manila or Risk Analysis Project, and (d) the Enhancing Greater Metro Manila's Institutional Capacities for Effective Disaster/ Climate Risk Management towards Sustainable Development or READY for GMMA Project. NAMRIA is moreover undertaking the mapping of low-lying areas vulnerable to sea-level rise. *(Please see related story.)*

With preparedness as the best defense, NAMRIA looks forward to more empowered and disaster- and climate-change resilient Philippine communities.•

Mapping and Assesment of Low-Lying Areas Vulnerable to Sea-level Rise

The Philippine coastline spans to about 37,000 kilometer and supports around 1,140 coastal communities where an estimated 60 percent of the country's population resides. Geographic location and economic condition make these communities highly vulnerable to flooding, coastal erosion and salt water intrusion especially with accelerated sea-level rise. Consequently, these events could bring about significant socioeconomic impacts including financial losses, demographic displacement and ecological damage or changes.

Indicative cluster sites in Luzon, Visayas, and Mindanao based on SRTM data

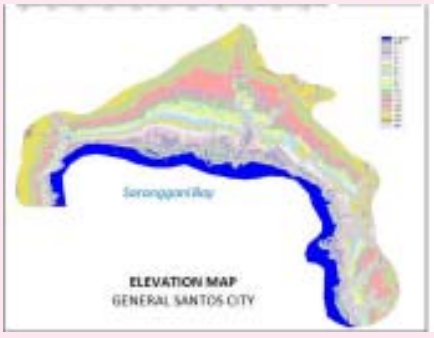
Detailed assessment of topography, prevailing land use and infrastructure, socioeconomic, and demographic profile of the coastal areas are necessary inputs in planning mitigation measures and adaptive strategies to counter such phenomenon. The project will conduct high-resolution elevation mapping to delineate accurately the extent of low-lying areas that will be affected by different sea level rise scenarios: 0.5m, 1m, 2m,… 5m up to 12m.

A total of 32 priority clusters: 10 each for Luzon and Visayas, and 12 in Mindanao will be covered by the project. Data sources include Shuttle Radar Topography Mission (SRTM) digital elevation model, Interferometric Synthetic Aperture Radar (IfSAR) high-resolution elevation and image data, NAMRIA large-scale topographic maps for selected urban cities, and elevation data collected using real-time kinematic global navigational satellite system instruments.

Activities for CY2012 include generation of detailed land cover and validation of IfSAR elevation data for the 12 cluster sites in Mindanao and selected Luzon clusters. The project is expected to be completed in three years.•

Dr. Rijaldia N. Santos and Saldivar Asprit

Elevation map based on IfSAR data



TECHNICAL ASSISTANCE ON MAPPING AND GIS

For a quarter of a century, NAMRIA has been providing technical assistance on mapping and geographic information systems to national government agencies, local government (LGU) units, and other stakeholders.

Tax Mapping and Zoning Information System

One of the earliest innovative assistance projects of NAMRIA was the Tax Mapping and Zoning Information System developed for the LGU of Muntinlupa in 1993. This project showcased the capabilities of geographic information systems (GIS) technology in the generation of tax and zoning maps, querying on land information, and processing of locational clearance applications. NAMRIA also conducted GIS training for Muntinlupa LGU personnel to ensure project sustainability.

Municipal Base Mapping

With the assistance of the Swedish International Development Cooperation Agency (SIDA), NAMRIA developed the municipal base mapping project using GIS for local governance applications between 1999 and 2001. The primary pilot sites for the project were San Juan (Metro Manila), Roxas City (Capiz), and Zamboanga City (Zamboanga del Sur). The secondary pilot LGUs included Pateros (Metro Manila), Tanay (Rizal), Laurel (Batangas), San Fernando (La Union), President Roxas (Capiz), and Dapitan (Zamboanga del Norte). The outputs were a training program on data management, GIS software and GIS advocacy training, a guideline to develop local government metadatabase, a GIS implementation strategy for the local government, a project homepage, and a report on nationwide development of GIS for the local government.

Maternal Health GIS

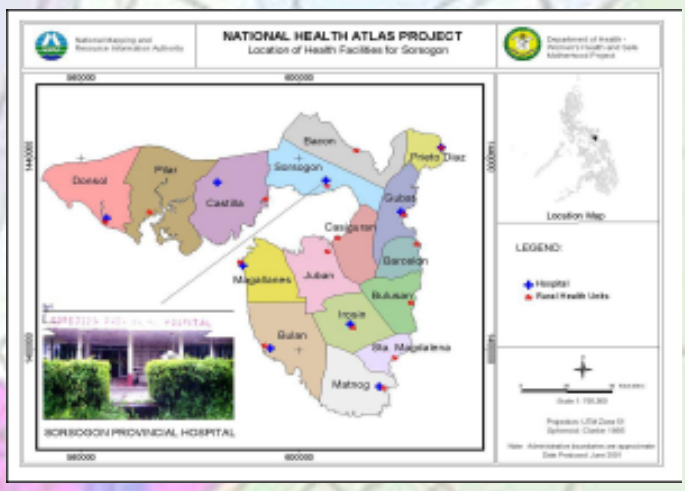
NAMRIA was also involved in 2001 in a project with the Department of Health on women's health and safe motherhood (WHSM). A nationwide global positioning system-based data collection of about 2,000 rural health units (RHUs) and public hospitals including their health profile was conducted to generate a health facility map. Using GIS, a health facility database system was also developed for this project under the overall National Health Atlas program. Features of the system include query, report generation, display, and analysis of maps under a modeling component. Project mission reviews were conducted by funding institutions such as the Asian Development Bank and the World Bank during the span of the project.

Database System for Heritage Sites

In 2001, NAMRIA and the National Historical Institute (now known as the National Historical Commission of the Philippines [NHCP]) carried out a collaborative project known as the "Development of a Database System for National Historic Structures and Sites using GIS Technology". The database system had the functionality to display pictures of heritage sites and location maps with description. The pilot site for Phase 1 of the project was Metro Manila while the following towns/cities were the project sites for Phase 2: Taal (Batangas), Pila (Laguna), Malolos City (Bulacan), and Silay City (Negros Occidental). Another output of Phase 2 was the production of an interactive multimedia CD, which contained maps, photographs, and historic data of the heritage sites. NAMRIA conducted on-the-job training for NHCP staff.

Climate Information System

In July 2002, NAMRIA and the Philippine Atmospheric, Geophysical and Astronomical Services Administration developed a GIS-based project entitled "Climate Information System" that served as basis in the development of climate models needed for identifying drought-prone areas, updating climate types, formulation of crop-weather calendars, and prediction of onset of the rainy season. The project also aimed to establish GIS facilities and provide classroom and on the job-trainings on GIS, MS Access, and SQL. The development of the information system was completed in June 2003, and was installed at the Climate Information, Monitoring and Prediction Services, a section of PAGASA, which is mandated to provide climate information and weather forecasts to the agricultural sector.



Technical Assistance...from page 31

Forestry Statistics Information System

In recognition of the importance of forestry statistics in crafting policy recommendations, in decision making, and in operations management, NAMRIA and the Forest Management Bureau signed a Memorandum of Agreement in 2003 to develop and implement the Forestry Statistics Information System. The system aimed to facilitate the generation of forestry-related statistics and geospatial data. Regions II and III were the pilot areas for Phase 1 which included applications developed for forestry land use planning, industrial forest management, community-based forest management, forest land grazing management, forest stock monitoring, timber-licensing agreement monitoring, special land use, private land forest management, and management of protected areas.

To sustain the project, 25 technical personnel from the Forest Management Service-Regions II and III were trained in Basic GIS in June 2003 at NAMRIA and a follow-up on-the-job training on data buildup was also conducted on site.

Tarlac GIS

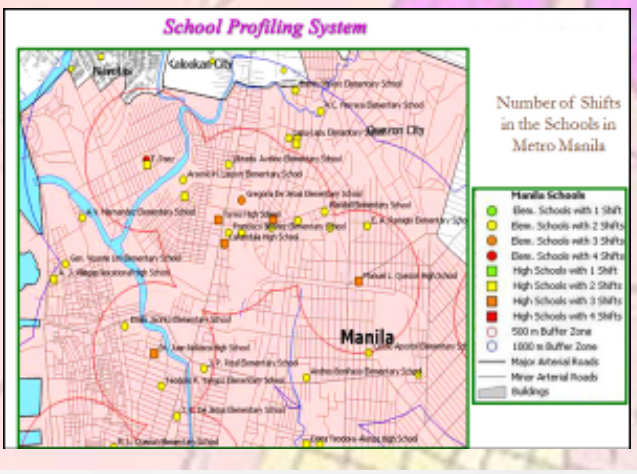
In September 2003, NAMRIA completed a project providing technical assistance to the Province of Tarlac. The project aimed to update Tarlac's geospatial database which is a key element in the formulation of the local government's development plans. The project outputs included an updated road network map, an infrastructure facilities map, a socioeconomic information map, a strategic agricultural and fisheries development zone map, and a land use/cover map.

Tourism Information System

In 2005, the Department of Tourism (DOT) engaged NAMRIA in the development of a Tourism Profiling System for Region III. The project aimed to generate tourism maps (e.g., tourism facilities, tourist attraction sites, potential tourist destinations, and tourism investment areas); to develop a database system; to conduct field survey and data gathering in various provinces (i.e., Aurora, Bataan, Bulacan, Nueva Ecija, Pampanga, Tarlac, and Zambales) and cities (i.e., Angeles, Olongapo, and San Fernando); and to build up the capability of the DOT head office and Region III personnel on GIS. The system was further enhanced in 2006 to give the public access to the data via short messaging service.

School Profiling System

After one of the world's worst landslides affected Southern Leyte in 2006, NAMRIA developed a GIS-based School Profiling System for the Department of Education. The project aimed to equip the department through the use of GIS in enhancing its planning capabilities in student distribution in public schools, in the improvement of student-teacher ratio, and in school site location. The project also generated geohazard maps showing hazard susceptibility of different school sites in *Barangay* Guinsaugon, located in the municipality of St. Bernard.



Boundary Delineation of the Clark Freeport Zone

In 2008, NAMRIA implemented a follow-up project for the Clark Development Corporation to delineate the boundary of the Clark Freeport Zone (CFZ). The first phase of the project was completed in 2006 with the following activities: the development of a database system called "Integrated Regulatory Database System" (IRDS), the establishment of Global Positioning System survey and control points, and, densification of boundary monuments. The second phase of the project was completed in 2008 with the following activities: the survey/delineation of the CFZ boundary, the establishment of third-order GPS survey control points, and the upgrade of the IRDS. The IRDS is the central repository of alphanumeric and geospatial data enhancing data management.

Rice Terraces Mapping

NAMRIA, in collaboration with the DOT, National Commission for Culture and the Arts (NCCA), Provincial Government of Ifugao, and the Ifugao Cultural Heritage Office, assisted in the rehabilitation and restoration efforts of the typhoon-damaged Ifugao rice terraces by mapping and surveying the area. The United Nations Educational, Scientific and Cultural Organization (UNESCO) had declared this 2,000-year old landmark a world heritage site in 1995 but due to neglect and natural calamities it was under threat of being delisted if rehabilitation was not met by 2012. NAMRIA deployed mapping survey teams to the municipalities of Banaue, Kiangan, Mayoyao and Hungduan between September and November 2011, and turned over core and buffer zone maps in 24 February 2012. These maps served as the basis for the conservation and sustainable management efforts of the Ifugao Rice Terraces.

Baroque Churches Mapping

In January 2012, NAMRIA carried out a mapping project for the NCCA of four baroque churches declared as World Heritage Sites in 1993 by UNESCO. UNESCO World Heritage sites are areas protected because of their outstanding value to humanity. NAMRIA's contribution was to delimit the buffer and core zones of the baroque churches which included: the San Agustin Church in Intramuros, Manila also called the Church of the Immaculate Conception, built in 1607; the Church of San Agustin in Paoay, Ilocos Norte, built in 1710; the Church of Nuestra Señora de la Asuncion in Santa Maria, Ilocos Sur, built in 1765; and the Church of St. Tomas de Villanueva in Miag-ao, Iloilo, built in 1786.

National Integrated Protected Areas System Mapping

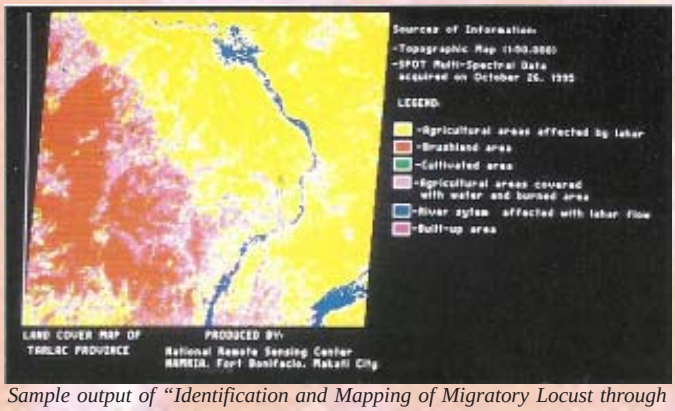
NAMRIA is presently collaborating with the Protected Areas and Wildlife Bureau in implementing the National Integrated Protected Areas System project for the Bicol National Park. NAMRIA shall update the land classification status (pursuant to the 1987 Constitution which states that public domain lands are to be classified into agricultural lands, forestlands, mineral lands, and national parks), and validate the technical descriptions of the NIPAS maps for the Bicol National Park, a protected area serving as habitat of rare and endangered plant and animal species. It was in March 2012 that NAMRIA conducted the field validation survey in Camarines Sur and Camarines Norte.• ***Ma. Mercedes O. Miguel-Manoos***

RESEARCH AND DEVELOPMENT INITIATIVES

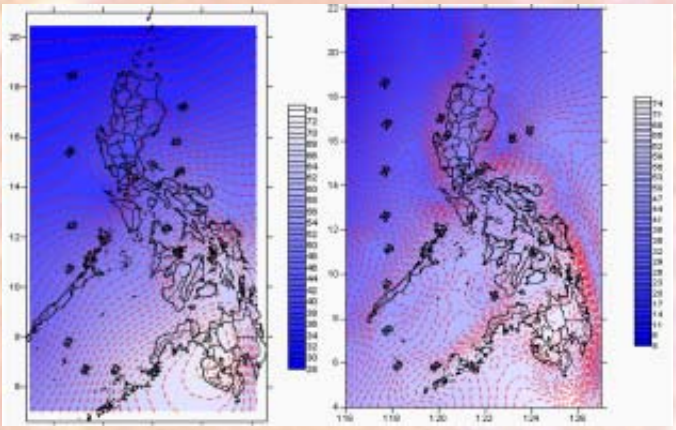
NAMRIA serves the needs of the DENR line services and other government offices with regard to information and researches. True to its mandate, it has initiated a number of research and development (R&D) activities since its establishment in 1987.

Among the research initiatives utilizing RS technology in the early 1990s were the environmental studies of marshes and the identification of potential migratory locust breeding sites. A major R&D project involvement of NAMRIA through the National Remote Sensing Center SC from 1997 to 1999 was the collaborative undertaking which investigated the potentials of AIRSAR and TOPSAR datasets (airborne radar imageries) for land cover mapping. In 2002, the agency carried out an R&D project on a detailed topographic/land use mapping of an area utilizing high-resolution earth imagery, a first in the country.

As a climate change hotspot, the Philippines is vulnerable to the phenomenon's worst manifestation: sea level rise (SLR). As such, NAMRIA conducts studies on SLR trends to serve as inputs for mitigation and adaptation strategies. One of these studies was the preliminary vulnerability assessment on the potential impacts of SLR on the coastal resources of Manila Bay which aimed to



Sample output of "Identification and Mapping of Migratory Locust through the Integration of RS and GIS" project



Geoid height map using EGM96 (left) and OSU89A (right)

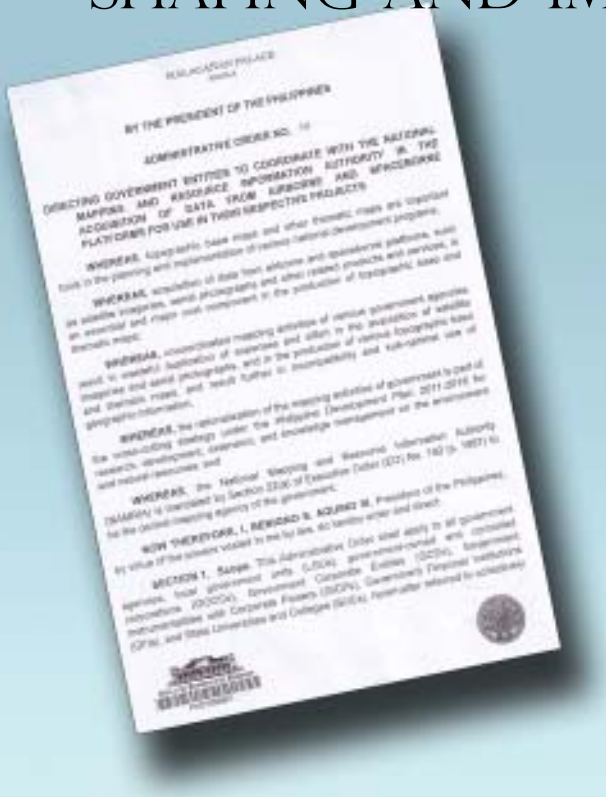
AIRSAR real-time survey product on coastal Panay Island

examine the possible effects of accelerated SLR on the coastal ecosystem and socioeconomic structures and activities in the coastal areas and to formulate response strategies by identifying potential costs and benefits. NAMRIA broadened research studies on SLR through the years in order to determine sea level conditions.

In 2008, an R&D project in support of the implementation of PRS92 was undertaken with the main objective of developing operational methodologies to define, provide access to, and maintain PRS92 in strengthening the national geodetic network as a means to support the national spatial data infrastructure. Specifically, the initiative aimed to (a) provide a sound scientific basis towards the adoption of a common national horizontal and vertical datum; (b) analyze the applicability of well-known geoid model/s as a basis for horizontal and vertical positioning using Global Navigation Satellite System; (c) analyze the state and recommend methods to reconcile different coordinate systems used in mapping and surveying and prescribe their conversion to a single unified system; and (d) develop practical and appropriate tools to build and increase local capacity on accurate positioning using PRS92.

NAMRIA continues to conduct research and develop its capabilities in the application of RS, geodesy, surveying, photogrammetry, oceanographic, and geomatics technologies for the acquisition and handling of natural resources and geospatial information, including the development of models and techniques in processing, analyzing, and presenting resource and environmental information.•

SHAPING AND IMPLEMENTING POLICIES



NAMRIA helps shape and implement national policies which in turn contribute to national development. The latest of these policies is Administrative Order (AO) Number (No.) 16 signed by President Benigno S. Aquino III on 05 July 2011. The AO directs all government entities to coordinate with NAMRIA in the acquisition of data from airborne and spaceborne platforms for use in their respective projects. It aims to rationalize the mapping activities of the government which is part of the Philippine Development Plan 2011-2016 strategy for ENR research, development, extension, and knowledge management.

Significantly beneficial to both fishermen and local government units was the DENR AO No. 17-2001 (DAO 17) which is about the delineation and delimitation of municipal waters. The Department of Agriculture (DA) AO No. 01 series of 2004 repealed DAO 17. This policy outlines the guidelines for delineating/delimiting municipal waters for municipalities and cities without offshore islands. NAMRIA, however, continues to delineate or delimit the boundaries of municipal waters on maps or charts in accordance with the authority granted by the DA under Republic Act 8550 or the Fisheries Code of 1998.

In order to effectively manage the country's natural resources through the adoption of a single survey reference system, DAO 2005-13 was promulgated to prescribe the guidelines for the full implementation of PRS92. The guidelines provide for the completion and maintenance of the national geodetic network and for the integration of the old surveys and maps into the new network. DENR Memorandum Circular (DMC) No. 2010-6 was later issued pursuant to DAO 2005-13 on the Integration of Surveys and Maps section. The DMC aims to (a) provide standards in converting and transforming cadastral data, surveys, and maps into PRS92; (b) ensure spatial consistency in the integration of these datasets into PRS92, preparation of control/land information maps (projection maps), and utilization of these data by other users; and (c) adopt basic database management practices to ensure dataset quality, integrity, and accessibility.

DAO 2006-12 was issued in recognition of the importance of geographic information to the country's socioeconomic and physical development and to facilitate its acquisition, management, access and exchange. The order established specific guidelines, technical standards, quality specifications, and institutional arrangements for the development and management of a seamless digital topographic database. The database is a collection of logically related continuous digital topographic data organized in a manner following a data model, standards, and specifications. NAMRIA continues to frame policies in furtherance of national development. A presidential AO, patterned after a proposed presidential executive order crafted for the creation of a National Geographic Information Council, is being drafted for the establishment of a national geospatial data infrastructure through the Philippine Geoportal.•

FOSTERING GENDER AND DEVELOPMENT

NAMRIA supports the integration of women as full and equal partners of men in national development. Through the years, it has been carrying out organization- and client-focused Gender and Development (GAD) activities which are mainstreamed in and harmonized with the agency's programs and projects. The GAD framework aims to examine the social, cultural, political, and economic realities in society and how the different roles, responsibilities, and expectations are assigned to women and men.

A landmark achievement of NAMRIA in terms of the organization-focused activities is the formulation of policies to address discrimination and inequality and to remove gender bias. These policies include the DENR Administrative Order No. 31 series of 2004, which provides for the admission of women into the corps of commissioned officers (COs) of the NAMRIA Hydrography Department, and the scholarship and training policies of the Agency. The *Manual of NAMRIA Commissioned Officers* incidentally is undergoing review and revision to incorporate revised policies involving women COs and enlisted personnel.

NAMRIA is also very active in the nationwide celebration of Women's Month wherein monthlong activities anchored on the national theme are conducted to promote awareness on GAD concepts and issues. The agency moreover conducts gender-sensitivity trainings to heighten awareness on GAD concepts and livelihood trainings to promote entrepreneurship activities especially among women.

> The GAD framework aims to examine the social, cultural, political, and economic realities in society and how the different roles, responsibilities, and expectations are assigned to women and men.

With the end view of providing safe and healthy working conditions for women employees and taking into account their maternal functions, health and wellness programs such as health fairs, herb planting, and cervical cancer awareness campaign and vaccination are implemented. The NAMRIA Day Care Center was moreover established in 2001 to assist parents in the performance of their child-rearing responsibilities and to develop, protect, and care for the children of those parents working during the day.

NAMRIA client-focused activities include, among others, the technical assistance for the formulation of LGU gender and development plan using GIS and the production of maps with gender-disaggregated information for low-lying areas and population density. The agency also participated in the DENR GAD Congress in 2008 and produced for the DENR Focal Point System an audio-visual presentation entitled *"Magkasama Tayo: Ang GAD ng DENR para sa Kababaihan at Kalalakihan, Kapwa Pagbabago, Kapwa Pag-unlad."*

NAMRIA remains a committed partner for the attainment of a society where women and men are given similar opportunities to fully harness their potentials without violence, coercion, or discrimination.•

STRENGTHENING THE INSTITUTION

Clockwise from leftmost photo: NAMRIA staff meeting, presentation of the NAMRIA Quality Manual, unveiling of the NAMRIA Quality Policy, NMPC Board of Directors meeting, oathtaking of the 2012-2014 ONE officers, and leadership seminar activity

Committed to provide accurate and reliable geospatial information, NAMRIA perseveres in strengthening its capacity in order to be better equipped in performing its functions and fulfilling its mandates. Institutional strengthening includes the access to high quality information, the development of human resources, and the building of networks and partners.

In 1993, the Information Technology Strategic Plan (ITSP) Project was undertaken with support from the Canadian government to develop an overall systems plan and implementation strategy for the improvement of NAMRIA's operation and services. The ITSP aimed to create a framework for an efficient and cost-effective integrated information system that will support NAMRIA's various functions. The ITSP is the precursor of the Information System Strategic Plan of the agency pursuant to Executive Order No. 265, series of 2002 which approves and adopts the Government Information Systems Plan as a framework and guide for the computerization of key frontline and common services and operations of the government to enhance overall governance and improve the efficiency and effectiveness of the bureaucracy.

With human resources as NAMRIA's greatest assets, programs are continuously conducted to develop the skills, competencies, and abilities of its employees. The agency also maintains linkages with local and foreign institutions, such as the Philippines-Australia Human Resource and Organizational Development Facility and the University of the Philippines Training Center for Applied Geodesy and Photogrammetry, which provide training and scholarship grants to employees. NAMRIA has sent a number of scholars in various universities abroad for masters' degrees. It is also a beneficiary of several project funding grants from foreign institutions such as the United Nations and World Bank and from the governments of Australia, Germany, Japan, Norway, Sweden, the United Kingdom, and the United States.

Boosting the welfare and morale of NAMRIA personnel are two independent employees associations established in the 1990s. The Organization of NAMRIA Employees (ONE) was organized in 1993 to foster harmonious and progressive management-employee and employee-employee relations, to protect and uphold individual and collective rights of employees, and to promote social justice, moral upliftment, and economic well-being of members. The establishment of the NMPC in 1999 aimed to cushion the impact of the economic recession being felt in the country and to alleviate the problem of employees in meeting their daily needs by providing them with basic commodities at convenient terms. In 2011, the NAMRIA Provident Fund (NPF) was established to provide supplementary benefits to employees. An interim committee is drafting the initial policies and guidelines of the NPF.

Institutional strengthening also entails structural reforms. In 2008, the Geodesy and Geophysics Division of the Coast and Geodetic Survey Department (CGSD) was transferred to the Mapping Department (MD) to enhance the capacity of NAMRIA in the field of geodesy and geodetic surveys and to enable the departments to refocus their priorities and provide quality products to their clientele. With the transfer, the CGSD and MD were renamed Hydrography Department and Mapping and Geodesy Department, respectively. The agency also underwent a strategic review of its operations and the organization of its component units in compliance with Executive Order No. 366, series of 2004. The approval of its rationalization plan is still pending.

Moreover, NAMRIA is currently working to achieve an agencywide certification on the International Organization for Standardization (ISO) requirements for 9001:2008 Quality Management System (QMS). The agency's adoption of ISO 9001:2008 QMS is pursuant to Executive Order No. 605, series of 2007, which institutionalizes the Government Quality Management Program. NAMRIA has already completed its Quality Manual, Quality Policies, Quality Core Procedures, and the Standard Operating Instructions. The Agency is now undergoing third-party audit by a certifying body in preparation for its eventual certification to ISO.

NAMRIA continues to strengthen its capabilities through the unwavering support of its employees, the competent leadership of its officials and governing board, and the constant support of its local and foreign partner institutions.•

THE NAMRIA WORKFORCE AND THINK TANK

NAMRIA is a merger of skills. Majority of its workforce occupy technical positions and are experts in hydrography, oceanography, geodesy, cartography, reprography and printing, photogrammetry, remote sensing, information management, and other related fields. Included in its manpower is a pool of uniformed service and enlisted personnel.

The agency is governed by a five-man policy making board whose members come from the departments of environment and natural resources, national defense, transportation and communications, public works and highways, and agriculture. The general administration and operations are vested in an Administrator assisted by three deputies.

Operations are tasked to five major departments, namely, Mapping and Geodesy Department (MGD), Hydrography Department (HD), Remote Sensing and Resource Data Analysis Department (RSRDAD), Information Management Department (IMD), and Engineering Services Department (ESD).

General administrative support services are tasked to four divisions, i.e., the Administrative Division, the Financial Management Division, the Plans and Operations Division, and the Security and Intelligence Division.

With the dedication of its staff and the able leadership of its officials and governing board, NAMRIA looks forward to contributing more to efforts for national development and security.

The NAMRIA Leaders Now

At the helm of NAMRIA today is former NAMRIA deputy administrator Dr. Peter N. Tiangco, CESO I. The deputy administrators and other key positions they held in the agency are DA for Information Management Linda SD. Papa, then IMD and ESD Director; DA for Remote Sensing and Engineering Services Efren P. Carandang, then ESD Director; and DA for Mapping and Hydrography Jose C. Cabanayan Jr., then RSRDAD Acting Director and Assistant Director.

The department directors are Jose Galo P. Isada Jr. for MGD; Commo. Romeo I. Ho for HD; Dr. Rijaldia N. Santos for RSRDAD; John Santiago F. Fabic for IMD; and Enrique A. Macaspac for ESD who also served as CGSD assistant director. The assistant directors are Ruel M. Belen for MGD; Capt. Virgilio P. Antonio and Cdr. Jacinto M. Cablayan for HD; Jesus L. Gerardo for RSRDAD; Febrina E. Damaso for IMD; and Nelson M. De Leon for ESD. The department directors and assistant directors rose from the ranks. The Head Executive Assistant is Rowena E. Bongalos.

The NAMRIA Leaders Then

NAMRIA was steered to great heights through the leadership and determination of dedicated individuals, namely, Administrators Jose G. Solis, Liberato A. Manuel, Isidro S. Fajardo, and Diony A. Ventura; Deputy Administrators Ricardo T. Biña, Evangeline C. Cruzado, Ananias A. Batilaran, and Napoleon A. Palo; Coast and Geodetic Survey Department Directors Renato B. Feir and Rodolfo M. Agaton and Assistant Directors Capt. Manuel M. Calibo, Capt. Rodrigo R. Pascua, Capt. Avelino V. Dalisay, Capt. Eduardo R. Campaña; and Capt. Audie A. Ventirez; Mapping and Reprography Department Assistant Directors Ponciano C. Ciceron, Leandro A. Sanchez, and Randolf S. Vicente; RSRDAD Directors Virgilio F. Basa and Virgilio I. Fabian and Assistant Directors Virgilio S. Santos, Victoriano V. Ladero, and Artemio V. Bajo; IMD Directors Francisca N. Dayrit, Virgilio S. Santos, and Wilhelmina P. Capistrano; and ESD Directors Tomas C. Jimenez and Godofredo M.A. Calderon; and Head Executive Assistants Rodolfo P. Yambao, Rodolfo R. Villanueva, Hernando L. Correa, Salvador E. Dimen, and Georgia E. Ventura.•

TOWARDS THE FUTURE OF PHILIPPINE MAPPING

Following its creation 25 years ago to serve as the country's central mapping and resource information agency, the subsequent years of the agency's formation and development were under the leadership of four presidential appointees, all former military officials. Things significantly changed in 2010 with the first ever appointment of a technocrat and a civilian from the Department of Environment and Natural Resources (DENR).

Since prior to his appointment, NAMRIA employees have gotten used to seeing this affable NAMRIA official quietly going about his duties. On 24 May 2012, he took time off from his very busy schedule and met with us for a lengthy interview in his office at the agency's main building in Taguig City. For this 25th NAMRIA anniversary issue of the *Infomapper*, we take an up-close look at **Dr. Peter Nilo Tiangco, CESO I**, NAMRIA's fifth appointed administrator.

Administrator in Training

Administrator Tiangco first became part of NAMRIA as Deputy Administrator in 2001, the time of former Administrator Isidro S. Fajardo. He described NAMRIA's third administrator as "a very nice guy," a fine friend, and a truly understanding boss. Administrator Tiangco greatly appreciates his former superiors both from DENR and NAMRIA who gave him work to do that he could truly learn from. Indeed, learning from others and his own experiences has always been part and parcel of Administrator Tiangco's strategy for succeeding in his career. And of course, first and foremost, formal education is something he truly values. He was taught early on by his parents to take his studies seriously.

The administrator of NAMRIA was born in Aparri, Cagayan. His parents Bonifacio Tiangco and Maningning Nilo are both from Nueva Ecija but his father's work entailed their moving to his different places of work assignment. It was in Santiago, Isabela where his family finally settled. His parents have a total of eight children. The fourth and fifth are twins—Administrator Peter and Paul; and the sixth, seventh, and eight are triplets—Jesus, Mary, and Joseph. Jesus died of meningitis at the age of one year.

Administrator Tiangco studied from kindergarten to elementary grade one at St. Paul School in Aparri; from elementary grade two to high school at University of La Salette in Santiago City, Isabela; and college at the University of the Philippines in Los Baños, Laguna. There were many private businesses dealing with forest products in their area so forestry was Administrator Tiangco's practical choice as undergraduate course. The sight, however, of denuded mountains during his frequent road trips from Isabela to Manila likewise instilled in him the importance of natural resources development and management. His very fond memories of the tree farm of his mother's family in Nueva Vizcaya, when it still was beautiful with its fruit trees and a creek, also spurred him on to thinking that something had to be done with the barren areas he saw.

Wanting to make a difference led to his decision to become part of government, specifically the DENR. Upon his graduation he took the board examination for foresters where he emerged as one of the topnotchers. His career path was not at all smooth. When he first applied at the DENR Region II office, the only available position was that of forest guard. His first big break came with the later opportunity to be a casual forester also in DENR Region II. This was followed by his taking part in the community development training for casual foresters all over the Philippines. He topped this training and was later offered by the training director Mr. Gregorio I. Texon to work at the DENR Parks and Wildlife Bureau (PAWB) which was then being re-organized. Administrator Tiangco joined PAWB with Mr. Wilbur G. Dee as his boss. Together they established the Integrated Protected Areas System at PAWB. At some point he likewise served as the technical assistant of the PAWB Director at that time, Mr. Samuel R. Peñafiel.

The next big break for the Administrator came when he was accepted as a scholar for masteral studies under the Interdisciplinary Natural Resources Development and Management Program of the Asian Institute of Technology (AIT) in Thailand. He topped his class and had the good fortune of being chosen by the visiting Mekong Secretariat of the United Nations (UN) Development Programme to be the technical adviser/overall administrator for their land use mapping project in Cambodia. After working in Cambodia for more than a year, he

Family portrait with President Aquino during his oath-taking ceremony as NAMRIA administrator on 21 July 2010

returned to the AIT determined to pursue post-graduate studies. In between applying for scholarships, he worked on remote sensing projects at the AIT, some of which brought him to different places in Europe because most of the projects were funded by the European Space Agency.

From 1995 to 1999, with a scholarship from the Australian Agency for International Development, he studied and finished his doctorate degree in geomatics at the University of New South Wales (UNSW) in Australia. By then he had married Cindy Cisneros, his batchmate in AIT who was with the School of Energy Technology. While waiting for his wife to finish her doctorate degree also at the UNSW, he took on various technical jobs at the university. He went back to the Philippines in 2000 and he served as a DENR consultant of then Secretary Heherson T. Alvarez and a consultant at the Philippines-Australia Governance Facility from 2000 to 2001.

Even before joining NAMRIA, Administrator Tiangco believed he could help optimize the agency's potential to greatly serve the country. There was no doubt about his having the right fields of expertise for this objective: forestry, natural resources development and management, and geomatics. He knew, however, that he had to be the agency's top leader in order to make things happen and to truly make a difference in the government service. Even as a deputy administrator he already recognized that the following should be the agency's piorities: the need for new base maps and the associated remotely-sensed imageries/data of both the land and the sea, the need for good guidance from the top management to better implement priority projects, and the need for good rapport with other agencies.

Dream Fulfilled

With the mandatory retirement of the fourth administrator, Mr. Diony A. Ventura, a retired police major general, he was appointed as NAMRIA Administrator with the rank of Undersecretary by former President Gloria Macapagal Arroyo on 03 March 2010. Certainly it was a joyous occasion. "At last, it seemed to already be the biggest break I had been waiting for in my career," he said. He was reappointed by President Benigno S. Aquino III on 21 July 2010.

Prior to this, there had been many offers for him to work in the private sector but government service won out in the end. According to him, "In the private sector, you will just be one of the technocrats, one of the working guys, but here there is a vacuum, there is a need that I can address. I recognized my niche in the government service, in the bureaucracy. If I had worked elsewhere, say at the UN, I will work until I grow old, highly paid, yes, but only that. At the end of the day, what have I truly fulfilled or achieved? The opportunity of making a difference for our country's sake is bigger in the government service."

Even when he was still deputy administrator, Administrator Tiangco helped formulate proposals with then DENR Secretary Alvarez whom he credits for the idea of cost-sharing among stakeholders, such as for the updating of the country's topographic maps and unified mapping. As NAMRIA Administrator, he made the updating of the agency's topographic maps its priority concern. He spoke highly of NAMRIA's partnership with other agencies for financial and technical assistance on this task, the latest one being the

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The Administrator with President Aquino, DENR Secretary Paje, and other key DENR officials in Malacañang during the 25th DENR anniversary celebration on 19 June 2012

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agency's breakthrough project with the Mindanao Development Authority with the assistance of the Japan International Cooperation Agency. Administrator Tiangco pushed for the approval and implementation of a future NAMRIA project on the unification of mapping activities to avoid wastage of billions of pesos due to duplication of expenses and efforts in the thematic mapping activities of government agencies. A landmark policy which the Administrator helped to formulate is Administrative Order (AO) number 16, which directs government entities to coordinate with NAMRIA in the acquisition of data from airborne and spaceborne platforms for use in their respective projects. The landmark AO was signed and approved into law by President Aquino in 2011. Administrator Tiangco likewise headed the Philippine delegation that successfully defended the Philippine Submission to the UN Commission on the Limits of the Continental Shelf at the UN Headquarters in New York, USA for the Country's Entitlement to Extended Continental Shelf in the Benham Rise Region.

Asked how he is after two years as NAMRIA administrator, he answered: "There are a lot of work to do but I am happy because we are realizing one by one the projects we formulated." Other recent equally important projects which the Administrator mentioned as among the projects the agency can be proud of for its 25 years are the ongoing Philippine Geoportal Project, forest boundary delineation project with the DENR, and mapping of low-lying areas. He also cited the successful completion of two projects with the United Nations Educational, Scientific, and Cultural Organization—

Addressing the participants of the NGP tree-planting activity in Dinalupihan Bataan on 20 August 2011

Mapping of the World Heritage Sites-Philippine Cordillera Rice Terraces and with the National Commission for Culture and the Arts, the Buffer and Core Zone Delimitation of Philippine Baroque Churches. In support of the National Greening Program (NGP) of President Benigno S. Aquino III, and per advice of DENR Secretary Ramon J. P. Paje, NAMRIA will also be employing the use of the Unmanned Aerial Vehicle (drone) to monitor NGP planting sites all over the country. Gone are the days when reported planting accomplishments remain unvalidated due to accessibility, unfavorable peace and order situation, and related problems in the various planting sites.

The Administrator is very much amenable to ventures that would further improve the agency's products and services. For one, NAMRIA will be acquiring two additional survey vessels to improve the base maps of the sea. He also cited the agency's human resource development program in close coordination with funding agencies as the potential partners. He mentioned the good number of NAMRIA employees sent abroad for scholarship or training. Incidentally, with the implementation of the rationalization plan for the agency, the Administrator looks forward to the filling up of vacant positions especially in the NAMRIA technical departments.

ISO and Promoting NAMRIA

In January of 2011, the Administrator gave the go signal for the agency to start its quest to work towards ISO certification. He acknowledges the quest to be difficult but necessary "if only to show and to ensure that the products and the processes we are delivering to our clients are truly of high quality, on a par with international standards."

The Administrator wants more and better public knowledge about NAMRIA and what it does. He wants the general public to be assured that NAMRIA delivers its mandate. The Administrator does his own information campaign on the agency through broadcast interviews, speaking engagements, and attendance in meetings. He said, "Even if I cannot attend all these events, there are many in NAMRIA whom I can send in my place. We need to be present in these events in order to present the true NAMRIA, to explain our programs to others. Therefore we can better provide the needs of our clients."

MOA signing on 29 July 2011 with the Development Academy of the Philippines for the development of an ISO-certifiable NAMRIA Quality Management System

"The Morning Show" program live interview with host Ms. Veronica B. Jimenez held on 23 March 2011

Education for Success

The Administrator greatly acknowledges the big role of education in his career path and wants the same for NAMRIA employees. He said, "My career path thankfully has all been according to my grand plan. While still young, we should arm ourselves with all the education we can attain. Education is a great equalizer. If we have reached the highest level of education, what remains is dealing well with others. This is easier than to lack in education. This is why I always advise those in NAMRIA to study while they still can and still have the opportunity for it so that later, it would just be like reaping the fruits of your labor. You, your family, the agency, the country will benefit." The Administrator encourages his own child to strive in life first and foremost by studying hard. He likewise advises his friends whose children do not wish to study to persevere in encouraging their children to value education. He further said, "There is a stiff competition for jobs at present, even if you have finished a certain field of study. The situation is even worse if you have not finished anything. We also have to consider that there are a lot of bright Filipinos. You have a lot of competitors if you have just a bachelor's degree. As you go higher in educational attainment, however, the competition is made less severe."

The Administrator has no immediate plans for formal studies in other fields. Believing, however, that learning is never-ending, he said he will just update himself on what new things he needs to know. He said it is fortunate that in NAMRIA there are many opportunities for attending technical seminars and conferences held locally and abroad, learning in the process from colleagues and, at the same time, sharing what NAMRIA does. He said, "I learned a lot on the technical side. On the personal side, I met a lot of people, my social network certainly broadened." Now he is paying forward by letting others have the privilege. "All these opportunities are not just for one person to benefit from. What we are doing now is distributing the privilege among officials and employees."

Administrator Tiangco visits the family he lived with during the community immersion he attended in 2011 as part of the CES Board's SALAMIN-DIWA learning course

"Outstanding Professional of the Year" awarding ceremony with Dr. Monina T. Uriarte, Chairperson of the Professional Regulation Commission Board for Foresters

Leadership Merits and Style

The Administrator shares in the opinion that there can be two bases for judging the merits of a leader: one the quality of the accomplishments of the unit and two, the well-being of his followers and their opinion or the opinion of those outside the unit. He said, "Let's just say that our accomplishments are good enough to stand for themselves. We can also say that it all depends on the people, those within and outside of NAMRIA."

Presentation of orthoimages and a nautical chart on the Iloilo River to Sen. Franklin M. Drilon at the Senate Building, 15 February 2011

The Administrator also has this to say about his leadership style: "I show my staff that I trust them. I just provide them with appropriate guidance. To empower them, I tell or make them feel that they can do the job. I want them to have the good feeling that comes with realizing the output on their own or with others. The accomplishment of the work is better this way, rather than the leader dictating everything that should be done and finding out later he is wrong."

The Administrator said that at work it is best to engage in civility especially in the face of conflicts which anyway cannot be avoided. He said further that if there is camaraderie in the workplace, a lot more will be accomplished for no one would certainly want to work in an environment full of animosity.

The Administrator Revealed

"Administrator of the People" can probably best sum up how the Administrator prefers those in NAMRIA to describe him. Personally, he describes himself as someone who wants to be friends with everyone. He said, "My office is open to all those who wish to see me. They just have to understand that sometimes I have a lot of visitors or work to do. All are welcome to see me if I am available. If I can help, I will help." He also wants to be accessible especially

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Addressing NAMRIA employees

to the rank and file because "once upon a time, I was one of them." Professionally, the Administrator describes himself as someone who studied a lot and makes up for what he lacks in technical knowledge through self-study or attendance in conferences and the like.

The Administrator said he is still able to sleep well notwithstanding his heavy workload. For those curious as to the typical workday of our Administrator, he gives it here: "I have an office at home with Internet connection. If I have no breakfast meeting, I start working in the house. Then when I reach the office I will work on the papers awaiting me on my desk. Oftentimes there are visitors so I will leave the office quite late. Family time is when I reach home, on the average about 7 o'clock or 7:30 in the evening. Before I go to sleep, I work one last time on the computer. So I sleep at about 12:30 or 1 o'clock in the morning. Others don't know that I start work at home and that I am still here in the office when they are already in their own homes having dinner."

With other NAMRIA officials during the 2011 DENR Budget Reprogramming held January 2011.

The Administrator does not mind this schedule for he enjoys his work and is someone used to having only a few hours of sleep. This dates back to his days as a masteral and doctoral student when working in the laboratory was most convenient in the evening because many students used it in the daytime. He would then go home and sleep in the morning and then do part-time work in the afternoon. He said that some fellow-Filipino students abroad unfortunately were unable to finish their studies because they prioritized employment in good-paying odd jobs outside the university.

The Administrator said he was very much into sports before. His long-time favorite sport was basketball and then tennis when he studied abroad. He took up scuba diving when he got back to the Philippines and is a licensed scuba diver like his wife. He hopes to get back into his old sports routine or at least find the time to ride the mountain bike he recently bought.

The Administrator sings and plays the guitar. Way back in high school he and a friend sang in folk houses earning about fifty pesos per night and singing the songs of Simon and Garfunkle and Peter, Paul, and Mary, among others.

The Administrator shared that his childhood and high school life were both happy times. As a child he enjoyed the simple games and amusements of his generation. He said: "My playmates were my neighbors, actually the children in the *barangay.* We played the *lastiko* or rubber band game, "text" or comic card game, and trading card game using empty cigarette boxes. We played until early in the evening when our parents would call on us to eat dinner. At that time, there were only the basic amenities in the house. Our favorite ritual before going to sleep was to read comic books. Nowadays whenever I meet with my childhood friends, we reminisce about the old times. We had simple things but we were happy."

The Administrator until now has preference for the simple basic things. He is not very much into attending nightly social gatherings other than those he has to attend as part of his official duties. His major role models are his parents whom he described as both hardworking. His mother gave up teaching home economics to take care of him and his siblings. He credits them both for providing him with values education, teaching him and his siblings to always be a good person no matter what stature in life they reach. The Administrator is as busy as his wife who is presently an Energy Specialist of the Central and West Asia Department of the Asian Development Bank. Whatever free time they have is family time. He tries his best to impart to his son the values he got from his parents.

After NAMRIA

If given the opportunity, Administrator Tiangco is open to the idea of staying in the government service even after this administration. Then again, however, he would rather move on to other things only after all his dreams for NAMRIA have materialized.

He wishes to be remembered after his term as head of NAMRIA, as one person who tried to help the agency to realize its potential, to accomplish all that it has to do. "I may not be able to lead NAMRIA towards achieving everything it should achieve but at least I could be instrumental in setting up the right foundations for the smooth accomplishment by the agency of all that it has to accomplish." This well sums up the thoughts of the NAMRIA Administrator for the future of Philippine mapping. Cheers to him and to NAMRIA! •

NAMRIA QUALITY POLICY

We at NAMRIA are committed to our clients' utmost satisfaction by providing accurate and reliable geospatial information.

We will uphold professional and ethical standards, ensure efficient utilization of resources, empower our employees to continually improve our quality management system, and respond to the needs of our changing time through world-class technology.