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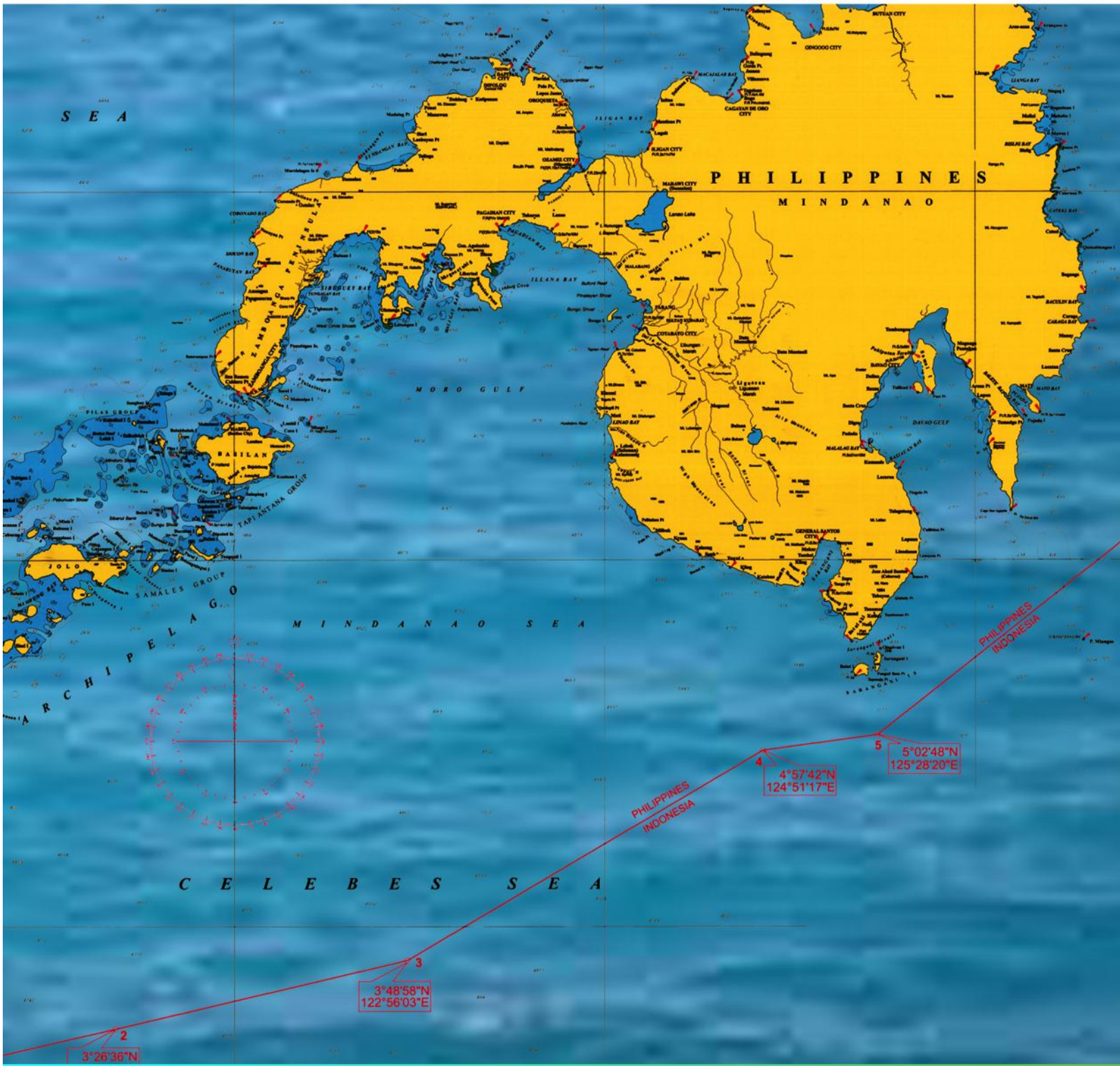

Delimitation of Maritime Boundaries

Editorial

A Leaner and Meaner NAMRIA, Post-Rationalization

In 2004, Executive Order (EO) number 366 was issued, "Directing a Strategic Review of the Operations and Organizations of the Executive Branch and Providing Options and Incentives for Government Employees Who May Be Affected by the Rationalization of the Functions and Agencies of the Executive Branch." The said issuance cited the following as the foremost reason for the rationalization: *WHEREAS, in the midst of challenges facing the public sector such as globalization, increasing demographic pressures and scarce resources, the government has to define its proper role in society, focus its efforts on its core governance functions and improve its performance on the same.* A reference material of the Department of Budget and Management (DBM) simply says that *The Rationalization Program seeks to result in a government with greatly improved performance, and organizational structures that are highly efficient and results-oriented.*

The Department of Environment and Natural Resources (DENR) was one of the departments of the Executive Branch covered by the EO and NAMRIA being an agency attached to the DENR was also affected. NAMRIA started implementing the EO in 2005 with the issuance of the Implementing Rules and Regulations on 20 May of the year. The agency formulated its Rationalization Plan which was approved by the DBM on 26 June 2013 and officially implemented it through NAMRIA Administrative Order number 003, series of 2013. The agency's Rationalization Plan documents the modifications done to its organizational structure and staffing pattern. The modifications involved the abolition, merging, transfer, consolidation, and creation of offices and the abolition, renaming, and creation of new positions.

Significantly by 2012, NAMRIA had successfully achieved certification to ISO 9001:2008 or Quality Management System (QMS) Standards. In the same year, NAMRIA had also started the adoption of a competency-based approach in its human resource management through its developed Competency-Based System (CBS), and the revision of its erstwhile existing performance evaluation system into the Strategic Performance Management System (SPMS). Also in 2013, NAMRIA's strategic planning was done which resulted in the agency's development of its Strategic Plan that articulates the agency's long-range goals and strategic direction. In 2014, the agency successfully passed the fourth surveillance audit for its continued certification to ISO 9001:2008; was conferred its Level-II accreditation status under the Program to Institutionalize Meritocracy and Excellence in Human Resource Management of the Civil Service Commission (CSC); began implementing the SPMS; and its CBS was integrated into recruitment, selection, and placement. To date NAMRIA continues in its efforts to maintain its QMS and its CSC Level-II accreditation status, and the implementation of its other organizational development programs such as Employee Engagement and its Strategic Human Resource Development (HRD) Plan.

NAMRIA's ISO certification, Rationalization Plan, Strategic Plan, Employee Engagement, Strategic HRD Plan, its CBS, and the SPMS—all basically complement one another in achieving an improved agency that performs to the utmost its mandated functions mainly with an improved, competent human resource base. Their adoption or institutionalization in the agency resulted in the conscious effort among its leaders and planners to align resources, systems, and personnel with strategic programs and priorities and ensure the attainment of the agency's major final outputs. This incidentally happens to be the essence of performance management as promoted by the SPMS. Thus in 2014, NAMRIA made it through the difficulties and challenges of its first year of dealing with the changes brought about by the Rationalization Plan after its implementation.

The stories in this issue afford us a definitive picture of NAMRIA's future, post-rationalization. With the staff component of any organization greatly determining its success, and considering NAMRIA's rightly sized workforce, highly competent personnel are essential for the agency's present and future workloads. However, in the light of competition especially from overseas organizations, maintaining a productive level of competent staff is a great challenge for the agency to fulfill its vision to be a center of excellence, building a geospatially-empowered Philippines by 2020.•

Editors' Note: Due to space constraints, we cannot publish all of the references consulted for the articles for this issue. Interested individuals may avail themselves of the list from the authors.

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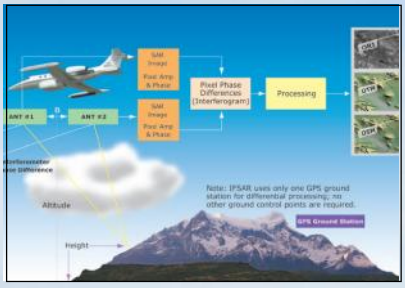
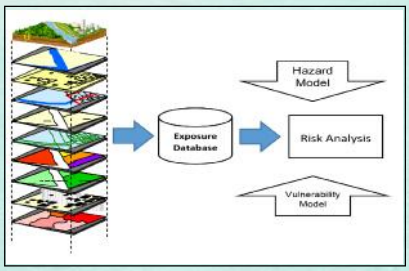
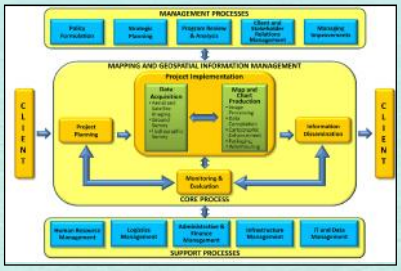




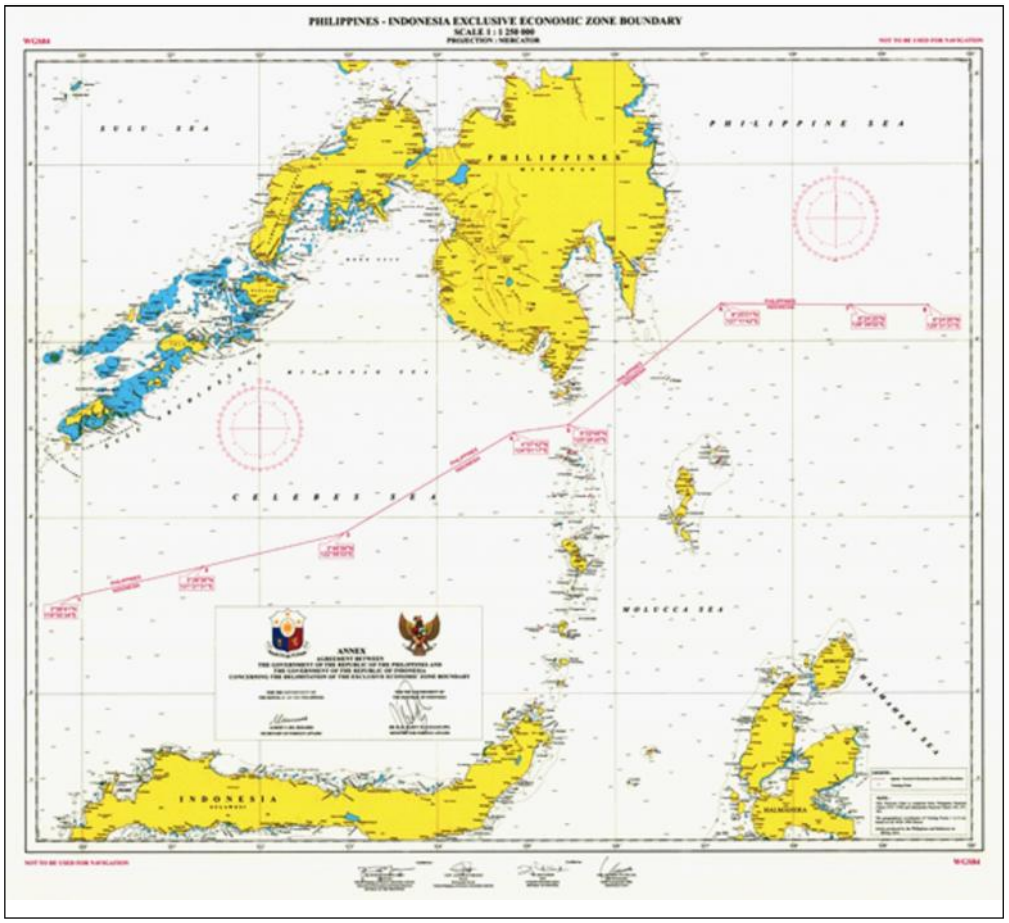


NEWS:

NAMRIA draws PH-Indonesia EEZ Boundary Map

by the NAMRIA representatives, Philippine Technical Panel on Maritime Boundary Delimitation and GISD-GISMB

A major triumph came in 2014 for NAMRIA in one of its major functions, the delimitation of the maritime boundaries of the Philippines. On 23 May 2014, the monumental signing of the new maritime boundary agreement between the Philippines and Indonesia was held in Malacañang on the occasion of the state visit to the Philippines of Indonesian President Susilo Bambang Yudhoyono. President Aquino and President Yudhoyono witnessed the signing of the agreement by their respective foreign ministers, Philippine Foreign Affairs Secretary Albert F. del Rosario and Indonesian Foreign Affairs Minister Dr. R. M. Marty M. Natalegawa. The agency was part of the 20-year negotiations that led to the signing of the new maritime boundary agreement between the two countries which defines the limits of their Exclusive Economic Zones (EEZs) in the Celebes Sea and southern Philippine Sea.



EEZ boundary chart of the Philippines

NAMRIA determines the different maritime zones, delineating them in accordance with domestic laws and the United Nations Convention on the Law of the Sea (UNCLOS) and works closely with the Department of Foreign Affairs (DFA) when it comes to maritime boundary issues. Under the UNCLOS, the EEZ is a 200-nautical-mile (370-kilometer) expanse of sea from the baselines where a country has the exclusive rights to fish and exploit undersea resources such as oil, gas, and other mineral deposits. The negotiations were made by diplomatic and technical representatives of the two archipelagic states to find an equitable solution to their overlapping maritime areas. In the Celebes Sea, the distance is much lesser than 400 nautical miles, hence the overlap. The EEZ boundary line is composed of eight turning points and has a total length of 627.51 nautical miles (1,162.2 kilometers). The EEZ boundary line, which cuts across the Celebes Sea unto the Philippine Sea, has varied distances from the archipelagic baselines of both countries, the shortest of which is 16.07 nautical miles from Sarangani Island of the Philippines and 15.37 nautical miles around Marore Island of Indonesia.

NAMRIA was present from day one of the negotiations in Manado in June 1994 until its conclusion in Jakarta on 18 May 2014. It assisted the DFA in crafting a negotiating strategy with the national interest as a primordial consideration along with the common interest of both countries. NAMRIA and its Indonesian counterpart assisted the Philippines-Indonesia Joint Permanent Working Group on Maritime and Ocean Concerns (JPWG-MOC) in preparing the charts for the EEZ boundary. The NAMRIA representatives who were part of the Philippine Technical Panel on Maritime Boundary Delimitation were Deputy Administrator Efren P. Carandang, Hydrography Branch (HB) OIC-Assistant Director Capt. Herbert L. Catapang, and Geophysicist IV Dennis B. Bringas. The NAMRIA delegation took part in the fourth preparatory meeting held in Jakarta, Indonesia on 17 May 2014 to resolve the remaining issues pertaining to the draft EEZ boundary agreement and agree on the final design of the accompanying EEZ boundary chart. The boundary agreement stipulates among others that it

shall not prejudice the rights or positions of both sides with regard to the delimitation of the Continental Shelf boundary. The NAMRIA delegation also attended the eight meeting of the JPWG-MOC held on the following day to endorse the draft agreement for signing of the respective foreign ministers and certify the accompanying chart. Administrator Peter N. Tiangco and HB Director Capt. Jacinto M. Cablayan along with their Indonesian counterparts signed the EEZ boundary chart.

The boundary agreement is the first for the Philippines, and possibly the first between two major archipelagic states. It is being hailed both locally and internationally for setting a good example on how two neighboring states can, in a friendly and peaceful manner, resolve a dispute that otherwise has become very contentious between and among several countries in other parts of the region. For both sides, the agreement will not only provide a clear reference line for the exercise of their respective jurisdictions, but will also promote more cooperation in terms of managing and preserving the resources in the Celebes Sea and southern Philippine Sea. To date the agency continues to provide the national government with the technical expertise particularly in dealing with maritime boundary issues to ensure that the metes and bounds of the national territory are always safeguarded.•

President Aquino and Indonesian President Yudhoyono witness the signing of the charts showing the EEZs of their respective countries.

Administrator Tiangco (at right) signs the EEZ boundary chart jointly produced by the Philippines and Indonesia. Beside him is Dr. Asep Karsidi who heads the Geospatial Information Agency of the Republic of Indonesia.

(center) DFA Undersecretary Evan P. Garcia in a handshake with Madam Wiwi Setyawati Firman, Acting Director General for Legal Affairs and International Treaties of Indonesia; along with other officials from the Philippines—HB Director Cablayan, Administrator Tiangco (1st and 2nd from left respectively); and from Indonesia—Dr. Karsidi and Cdre. Drs. Dede Yuliadi, Indonesian Chief Hydrographer (5th and 6th from left respectively)

National Coast Watch System

*by Joselito T. Reasol**

The National Coast Watch System was established by virtue of EO 57, series of 2011, entitled *Establishing a National Coast Watch System, Providing for Its Structure and Defining the Roles and Responsibilities of Member Agencies in Providing Inter-Agency Coordinated Maritime Security Operations and for Other Purposes*.

The implementation of EO 57 is based on the State's policy to safeguard our country's sovereignty, territorial integrity, national interests, and right to self-determination. The government justifies its assertion of our country's sovereignty and sovereign rights in accordance with the Philippine Baselines Law and the UNCLOS of 1982. The country faces serious maritime challenges that need to be deterred. These include the following: threat to territorial integrity, peaceful existence of Filipinos, and inherent rights to be free from threats such as piracy, armed robbery, terrorism, proliferation of weapons of mass destruction, trafficking (i.e., of persons, drugs and firearms), smuggling, illegal fishing, transnational crimes, national disasters, climate change, and marine environment degradation.

The pressing need for the government to address maritime security challenges in the Philippines, particularly those that adversely affected peace and order in the area, and posed danger to the environment and the national patrimony, among others, is a priority for action.

The government, by virtue of relevant laws, designates government bodies, both in the military and civilian sectors, to address these issues. Examples of these government bodies are the Philippine Navy, which is designated to be responsible for naval defense of the Philippines, and the Philippine Coast Guard (PCG), which is mandated to ensure maritime safety, safety of navigation, enforcement and maintenance of maritime security, prevention or suppression of terrorism at sea, and the performance of enforcement functions within the maritime jurisdiction of the Philippines. The Philippine Navy, for instance, forged the establishment of an infrastructure for a national coast watch system, the *Coast Watch South* (CWS). The CWS has the primary objective of providing maritime domain awareness in support of security operations in Southern Philippines.

The government also looks into the advantage of having international and regional cooperation in maritime security that would enable the Philippines to develop needed capabilities at a faster pace. The government promotes our national interest by enhancing the maritime security in the seas that link our country with other neighboring States. Government agencies also have complementing programs and activities which can be integrated into a national coast watch system towards enhancing maritime domain and security awareness. Along this line, it is fit for the government to integrate and strengthen its maritime security initiatives through effective inter-agency cooperation, collaboration, and coordination to bring about efficient and effective maritime security policy.

In view of the above, the President, by virtue of Section 17, Article VII of the Philippine Constitution, has the power and control over executive departments, bureaus and offices, as well as the continuing authority, under existing laws, to reorganize such executive departments, bureaus and agencies,

The President ordered, through EO 57, the establishment of the National Coast Watch System (NCWS). The NCWS, as the central inter-agency mechanism for a coordinated and coherent approach on maritime issues and maritime security operations towards enhancing governance in the country's maritime domain.

The *National Coast Watch Council*, also referred to as the *Council*, was also established under EO 57. The Council is headed by the Executive Secretary and its members are the Secretaries of the Departments of Agriculture, Energy, Environment and Natural Resources, Finance, Foreign Affairs, Interior and Local Government, Justice, National Defense, and Transportation and Communications.

The Council shall be in charge of formulating strategic direction and policy guidance for the NCWS. Its specific areas/domains of concern are the following: (a) strategic direction and policy guidelines for NCWS; (b) maritime security operations and reportorial requirements to the President and the National Security Council; (c) policies and procedures in managing and securing the country's maritime domain, including administrative rules and regulations to enhance maritime security in the Philippines; (d) capability plans and fund requirements relative to maritime security missions; (e) coordinated roles and relationships of different government agencies; (f) involvement of inter-agency committees and/or working groups; (g) policy-formulation, implementation and coordination with other government agencies, experts and organizations, both foreign and local, on all maritime issues affecting the country; (h) support and/

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or assistance of any department, bureau or agency of the government in the pursuit of its mandates and functions; (i) rules and regulations as may be necessary for the Council to perform its mandate under this Executive Order; and (j) other functions deemed necessary by the Chairperson for the effective discharge of its mandate or as may be directed by the President.

Under EO 57 was also established the *Coast Watch Council Secretariat*, also referred to as the *Secretariat*, to provide technical and administrative support to the Council. The Secretariat shall be headed by an Executive Director, who shall be appointed by the Chairperson, upon the recommendation of the Council. The Council shall determine the personnel requirements of the Secretariat in accordance with applicable laws, rules and regulations. The Secretariat shall perform the following functions: (a) consultative research and administrative services; (b) assistance to the Council regarding proposing and reviewing legislative and administrative issuances on maritime security; (c) assistance to inter-agency committees and working groups created by the Council; and (d) other functions and tasks the Council may direct.

The *National Coast Watch Center*, also referred to as the *Center*, shall also be established in accordance with the strategic direction and policy guidance issued by the Council, and shall implement and coordinate maritime security operations. The Center shall be established and headed by the PCG. It shall have the following functions: (a) gather, consolidate, synthesize, and disseminate information; (b) develop and maintain effective communications and information systems to enhance inter-agency coordination in maritime security operations; (c) coordinate the conduct of maritime surveillance or response operations upon the request of a member agency or when an exigency arises; (d) plan, coordinate, monitor, evaluate, document, and report on the conduct of maritime security operations; (e) coordinate cross-border and multinational maritime security cooperation as may be ordered by the Council; (f) coordinate support for the prosecution of apprehended violators; (g) develop a common operating picture to enhance maritime situational awareness; (h) conduct periodic assessments on maritime security; (i) initiate cross-border and multinational maritime security cooperation when authorized by the Council and in coordination with the DFA; and (j) perform other functions as may be directed by the Council.

The following agencies shall provide manpower, equipment and material support to the Center and its operations: Philippine Navy, Philippine Coast Guard, Philippine National Police Maritime Group, National Prosecution Service of the Department of Justice, Bureau of Customs, Bureau of Immigration, National Bureau of Investigation, Bureau of Fisheries and Aquatic Resources, and Philippine Center on Transnational Crime.

The roles and responsibilities of each of the support agencies in the conduct of maritime security and enforcement operations shall be defined in the rules and regulations to be promulgated by the Council. All other government agencies like NAMRIA were also directed to actively coordinate and cooperate with the Council and support the maritime security operations of the government. In 2014, NAMRIA participated in the planning activities scheduled by the Council.

EO 57, in line with the continuing efforts to streamline and rationalize the functions of government offices, also abolished the Commission on Maritime and Ocean Affairs (CMOA) created under EO 612, series of 2007, as amended. The mandate and functions of the CMOA shall be performed by the Council.

The Council and the Center are authorized to accept donations, contributions, grants, bequests or gifts from domestic or foreign sources, for purposes relevant to their mandates and functions, in accordance with applicable laws and rules and subject to government accounting and auditing rules and regulations. •

Reference:

Executive Order number 57, series of 2011, *Establishing a National Coast Watch System, Providing for Its Structure and Defining the Roles and Responsibilities of Member Agencies in Providing Inter-Agency Coordinated Maritime Security Operations and for Other Purposes.*

Coastline in Iba, Zambales

Modernization of the National Geodetic System

*by Charisma Victoria D. Cayapan**

In 2013, NAMRIA, through its Mapping and Geodesy Branch (MGB), included in its *Philippines 2020: Building a Geospatially-Empowered Philippines Strategic Plan* the modernization of the national geodetic system (NGS). The modernization program aims to develop and maintain an NGS that is accurate, up-to-date, accessible, and reliable by making full utilization of the latest geodetic technologies to support multisectoral applications.

The program plans to address gaps in both the horizontal and vertical datums which are used as reference for surveying and mapping activities in the country. Initially, the roadmap to a modernized NGS included the following program components: Migration to Geocentric Datum, Development of the Philippine Geoid Model, and Unification of the Philippine Vertical Datum.

Through a series of consultative meetings with the various stakeholders of the national geodetic system over the past two years, these program components have been further refined to the following specific activities: densification of the Philippine Active Geodetic Network (PageNET), the country's network of continuously operating reference stations; development, and validation of a deformation model; migration to a semi-dynamic geocentric datum/alignment to the International Terrestrial Reference Frame (ITRF); development and maintenance of a Geoid-Based Vertical Datum (Philippine Geoid Model 2014); and strengthening of core competencies on geodesy.

Updates on Activities

Although the modernization program has been recently formalized in NAMRIA's strategic plan, prior activities of the Geodesy Division-MGB for the past seven years have been aligned with the end-goal of modernizing the NGS. Through the Philippine Reference System of 1992 (PRS92) Project in 2007-2010, NAMRIA was able to establish the PageNET, densify the passive geodetic control points and benchmarks all over the country, establish gravity stations, and interconnect the benchmarks by the Global Navigation Satellite System (GNSS) or GNSS/leveling.

Fiscal Year (FY) 2014 turned out to be equally very productive, with significant progress made in the modernization program. The highlights of the year include: creation and mobilization of the NGS Modernization Technical Working Group (TWG), drafting of the executive order on adopting the Philippine Geocentric Datum (PGD) of 2020 (PGD2020), and preparation of the *Modernization of the NGS Strategic Plan 2016-2020*; continuing densification of active geodetic stations and gravity stations; tide gauge benchmark (TGBM) connection to level network; GNSS/leveling; and computation of the Philippine Geoid Model 2014.

Creation of the NGS Modernization TWG

Following the recommendation brought forth during the stakeholders consultation, a TWG on the modernization of the NGS has been created and mobilized. The TWG comprised representatives from various sectors such as: government agencies with surveying and mapping mandates—NAMRIA, Land Management Bureau-DENR, and Philippine Institute of Volcanology and Seismology (PHIVOLCS)-Department of Science and Technology (DOST); academe—University of the Philippines (UP) and FEATI University; private sector/professional organizations—Geodetic Engineers of the Philippines and Philippine Geodetic Engineering and Geomatics Society.

Among the functions of the TWG are to refine the strategic plan for the modernization, as well as to identify and propose solutions to the technical, legal, and Information, Education, and Communication issues that will arise from this program. In 2014, three meetings were held for the discussion of, among others, the drafting of the executive order mandating the adoption of the PGD2020 and the improvement of the *Modernization of the NGS Strategic Plan 2016-2020*.

Continuing Densification of Active Geodetic Stations and Gravity Stations

In 2014, additional five new active geodetic stations were established, bringing the total to 28. The new stations, PMAS, PMOG, PCAT and PNDO, are mostly located in the central part of the archipelago, with the exception of PBAS in Basco, Batanes. The addition of these stations increases the availability of the PageNET to users for improved positioning services.

Similarly, densification was also carried out for the gravity network, with 547 new second- order stations established in 2014. This brought the total number to 1,908 gravity stations, i.e., 87 first order and 1,821 second order.

The densification of active geodetic stations is needed for the migration to semi-dynamic geocentric datum/alignment

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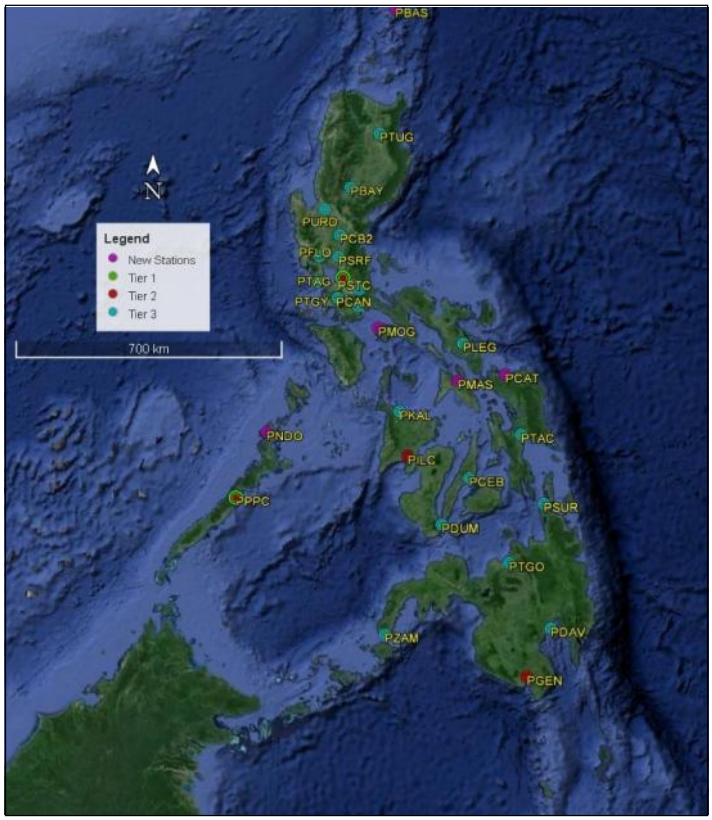

Figure 1: Status of the PageNET as of 31 December 2014

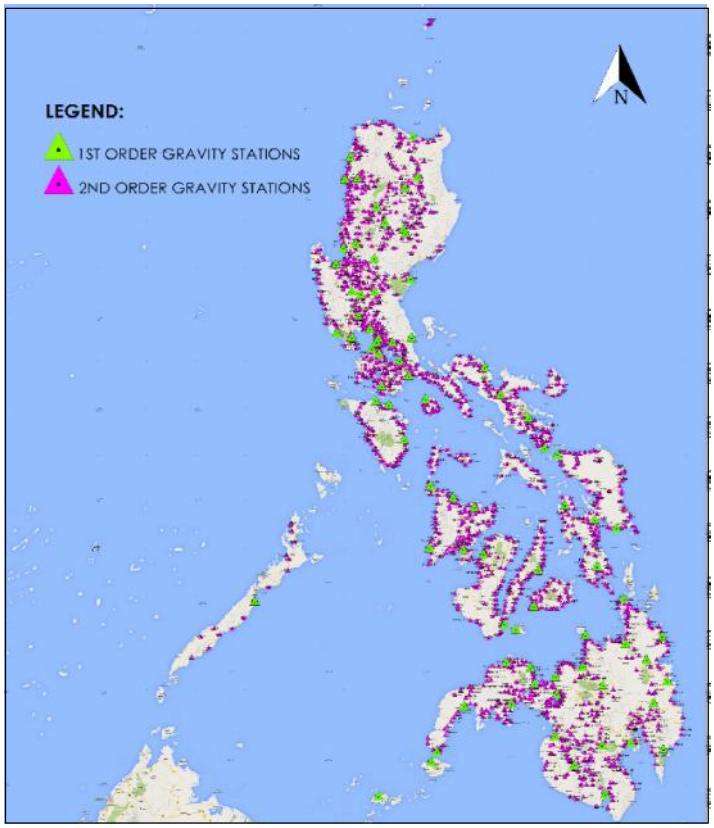

Figure 2: Status of the gravity control network as of 31 December 2014

to the ITRF, as well as for the development of the country's deformation model. The gravity stations, meanwhile, are additional inputs for the recomputation and refinement of the Philippine Geoid Model of 2014.

TGBM Connection to Level Network

The mean sea level (MSL), the datum used for elevation measurements in the country, is defined using long periods of tidal observations at different tide stations located all over the country. Most (35 of 47) of the tide stations were established during the PRS92 Project in 2007-2010. It was also during this period that NAMRIA propagated the level network to the rest of the archipelago, with around 22,852 benchmarks already established as of October 2014. As the densification of the level network and the establishment of tide stations were carried out almost simultaneously, the resulting level lines have yet to be connected to the TGBMs. This connection is needed to provide the reference elevation to the level network. In 2014, NAMRIA completed the connection of 18 TGBMs to the level networks, bringing the total number to 45.

Coming up with a unified vertical datum is quite challenging, even more so for an archipelagic nation such as the Philippines. Different island groups are on different level

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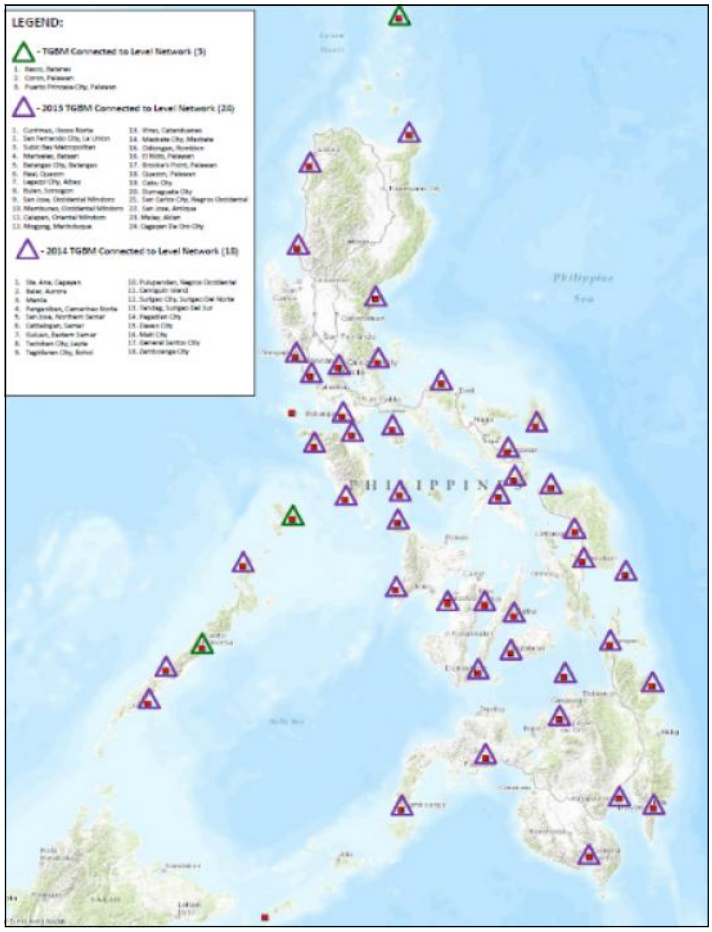

Figure 3: TGBM connection to the level network

surfaces, and this has an implication on how the level network is propagated and adjusted throughout the country. To come up with a homogeneous vertical datum, it is important to define the relationship among and between the local mean sea levels. With this end goal in mind, NAMRIA conducted GNSS observations on the TGBMs, or GNSS/leveling, as well as in selected benchmarks throughout the country. In places where benchmarks are not available, GNSS observations were conducted along coastlines at 'zero' elevation. In FY 2014, 22 clusters (~83 points) and 8 islands (~178 points) were observed. This activity not only defines the relationships between MSLs on tide gauges but also determined the geoid heights (N) of the points. These geoid heights were temporarily used as correction surface in the absence of a geoid model in estimating MSL elevation (H) using GNSS thru the formula H = h – N, where h = ellipsoidal height.

Computation of the Philippine Geoid Model 2014

A major milestone in the modernization of the NGS is the preliminary computation of a geoid model for the Philippines, referred to as the Philippine Geoid Model of 2014 (PGM2014). This was made possible through NAMRIA's partnership with the National Space Institute–Technical University of Denmark (DTU-Space) that provided the technical expertise, and the United States National Geospatial-Intelligence Agency that funded the airborne gravity survey as part of projects to improve the global gravity field model EGM2008.

The PGM2014 was computed based on a combination of airborne, terrestrial (from NAMRIA), and satellite (Earth Gravitational Model2008 and Gravity Field and Steady-State Ocean Circulation Explorer RL5) gravity data. The digital elevation model used in the computation was a Shuttle Radar Topography Mission 15-second data for the region.

The nationwide airborne gravity survey conducted from March 2014 to May 2014, was spearheaded by Dr. Arne Olesen of DTU-Space. Using a LaCoste & Romberg Air/Sea gravimeter S-38 and a Chekan-AM gravimeter #24 mounted onboard a Cessna Caravan aircraft, the survey team made a total of 350 flying hours over 75 flight lines to cover the whole Philippines.

The resulting gravimetric geoid was fitted to the local level network thru GNSS/levelling to make a new vertical datum

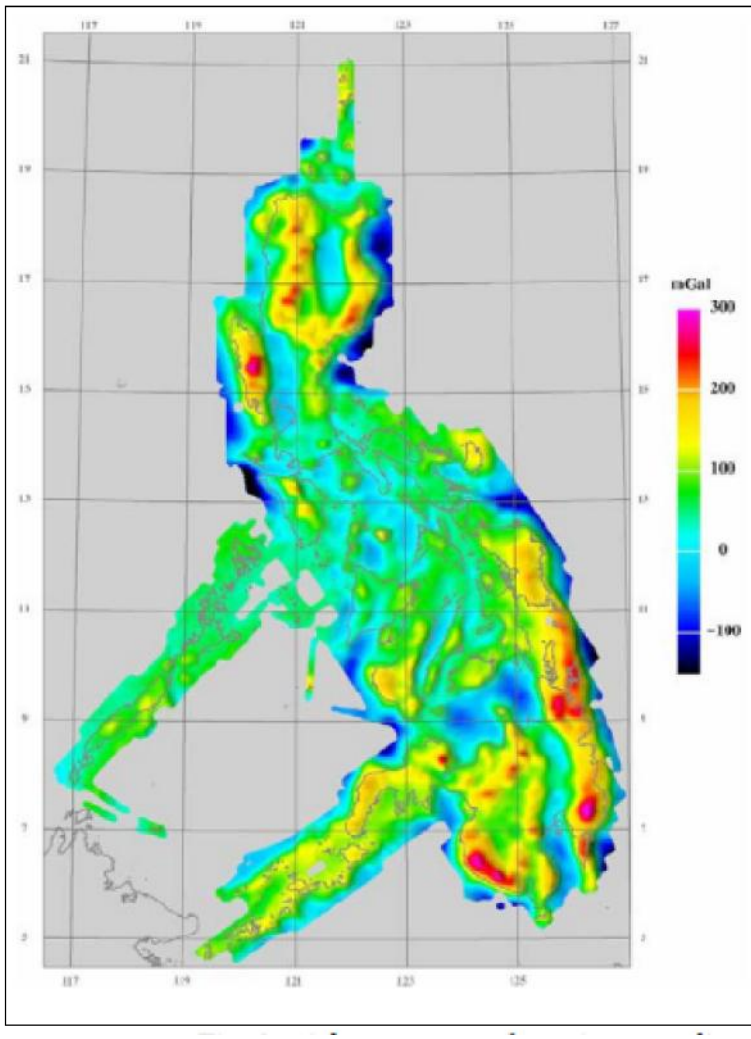

Figure 4: Airborne survey free-air anomalies

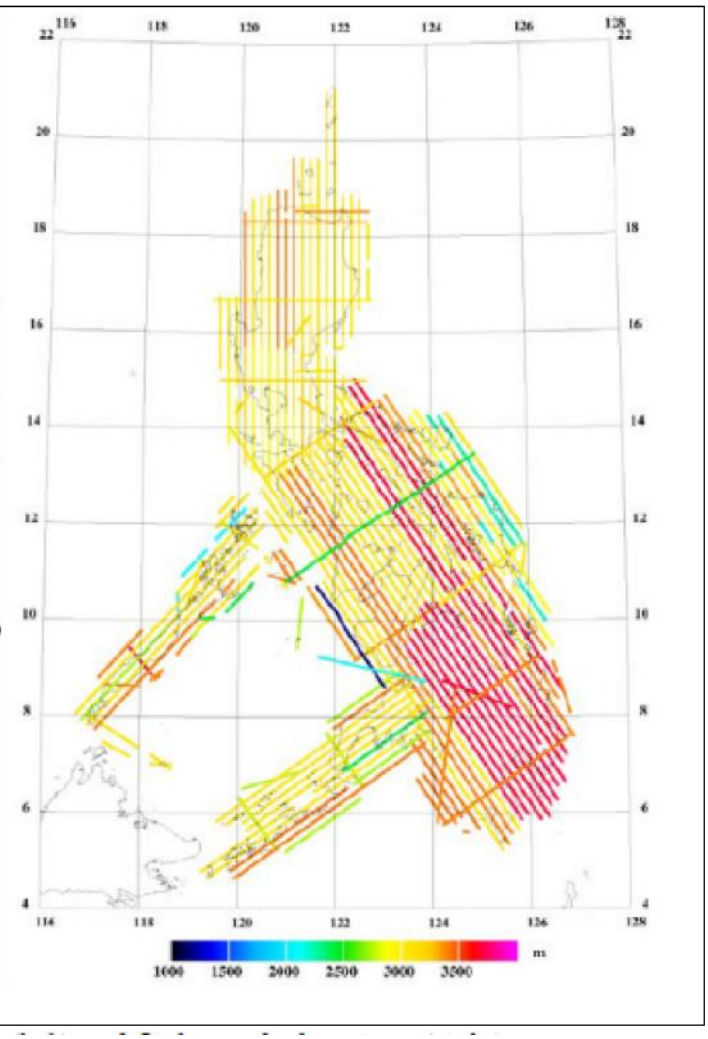

Figure 5: Airborne survey flight-track elevations

based on the geoid. A comparison of the final geoid with selected levelling benchmarks observed with GNSS showed relatively large errors, particularly in some regions, which may be caused by a combination of geodynamic effects and levelling or GNSS errors. These errors will be corrected thru the adjustment of the level network nationwide.

The PGM2014 was computed during a geoid training workshop held in NAMRIA on 29-31 October 2014 and conducted by the leading geoid expert Dr. Rene Forsberg, also of DTU-Space.

Steady and Sure towards the Goal

NAMRIA is on track in its roadmap to a modernized national geodetic system. The PageNET's fiducial network is almost complete, and it is already providing vital GNSS data needed to properly align to the ITRF, at the same time delivering useful positioning services to the public. Having a preliminary geoid model is likewise a major and significant first step, along with the continuing densification of gravity stations in towns and cities for the development of the PGM2014. All these provide vital information needed to develop a reliable and homogeneous geodetic reference system. As expected, the more the information that come in, the more the challenges and opportunities are discovered, explored, and utilized.

The agency continues to work, through its dedicated employees and with its partners both here and abroad, to improve the provision of accurate and updated geodetic reference information to its stakeholders.•

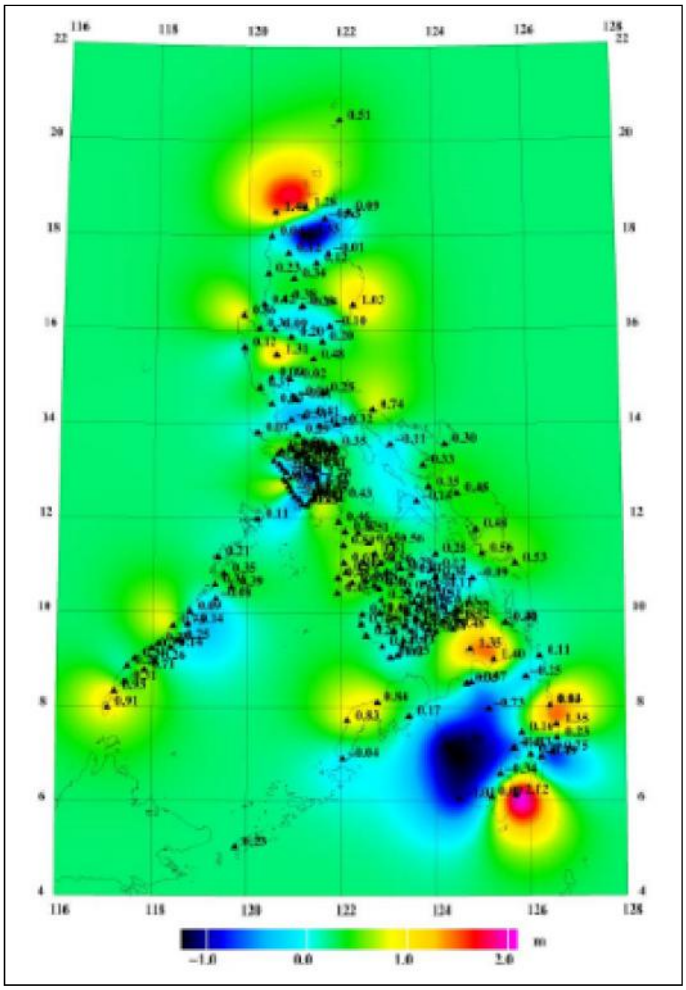

Figure 7: Offset values between GNSS/levelling data and final geoid

References:

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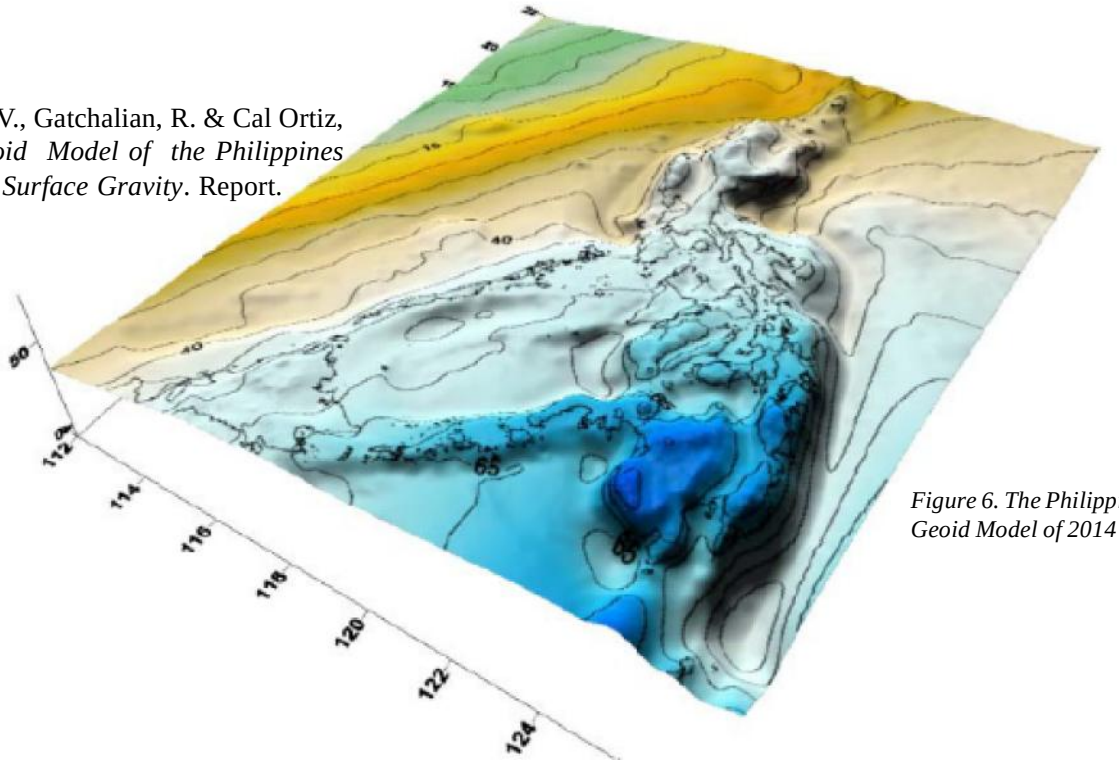

Figure 6. The Philippine Geoid Model of 2014

Acquisition of IfSAR for the Production of Nationwide DEM and ORI for the Philippines under the Unified Mapping Project

by Leo B. Grafil[1] and Ofelia T. Castro[2]

Digital Elevation Models (DEMs) are indispensable inputs in a variety of applications. They are essential in modelling hydrology, hazard risk analysis, and prerequisites for many civil, military, and industrial applications. A DEM is a topographical model, a representation of the ground or landscape of natural surface features. There are two types of DEM: the Digital Surface Model (DSM), which represents feature elevations like top of canopies and structures, and the Digital Terrain Model (DTM) or bare earth (where the elevations of vegetation and man-made features have been removed). The quality and resolution of the DEM greatly influence the accuracy of the derived and final products. There is an increasing demand for high-resolution geospatial data not only in the traditional mapping community but in support of new applications that are driven to address the impacts of climate change, natural disasters, urban development, and population growth.

Unfortunately, availability of large-scale maps is very limited in the Philippines. Most of the existing topographic maps are outdated, have lower scale and accuracy. NAMRIA as the central mapping agency of the government recognizes the problem and pushed for the approval of the Unified Mapping Project (UMP). The project aims to provide updated and accurate nationwide geospatial information to serve the requirements of government agencies and the general public for their thematic mapping and other related activities. One of its components is the generation of homogeneous elevation data through airborne Interferometric Synthetic Aperture Radar (IfSAR) technology.

IfSAR is a remote sensing technology that provides X, Y, and Z coordinates of a location imaged by a radar beam at high accuracy. IfSAR was adopted for the UMP project because it is the fastest and most efficient way of acquiring 3D topographic information under challenging circumstances such as cloud cover, extreme weather conditions, and rugged terrain. The Philippines is located in the cloud-belt region. Radar beam can penetrate through clouds. It allows all-weather day and night imaging. Along with the elevation data (DEM), corresponding Orthorectified Radar Image (ORI) can be generated.

NAMRIA does not have the capability to conduct radar imaging. In January 2013, NAMRIA entered into a contract with Intermap Technologies Inc. and Certeza Infosys Corporation for the acquisition of airborne IfSAR and production of nationwide DEM and ORI. The project covers 12,751 map sheets at 1:10,000 scale consisting of 5.0-meter resolution DSM and DTM at 1.0-meter root-mean-square error vertical accuracy and 0.625 meter resolution ORI at 2.0-meter horizontal accuracy.

IfSAR Theory

IfSAR is a well-established active remote sensing technology for obtaining high-resolution elevation data and corresponding radar images of the earth's surface from airborne and spaceborne platforms. It uses the relative phase difference between two coherent Synthetic Aperture Radar (SAR) images obtained by two antennas separated by an across-track baseline to derive the surface elevation. Raw SAR data are not viewable as an image. Extensive processing is required to transform it into a meaningful image. These systems rely on radio waves transmitted as high-power pulses of microwave energy. Figure 1 shows a conceptual view of Intermap's IfSAR system process flow. The system utilizes two antennas, which are separated by an interferometric baseline (B) that transmits radar pulses toward the terrain and records received reflected energy. The two antennas simultaneously provide the system with two SAR images containing amplitude and phase information that describe the same point on the ground, and are separated only by the phase difference created by the space between the two antennas. As the aircraft passes over the terrain, additional data are collected. These are global positioning system (GPS) data from both aircraft and ground-based GPS receivers and navigation data from an inertial

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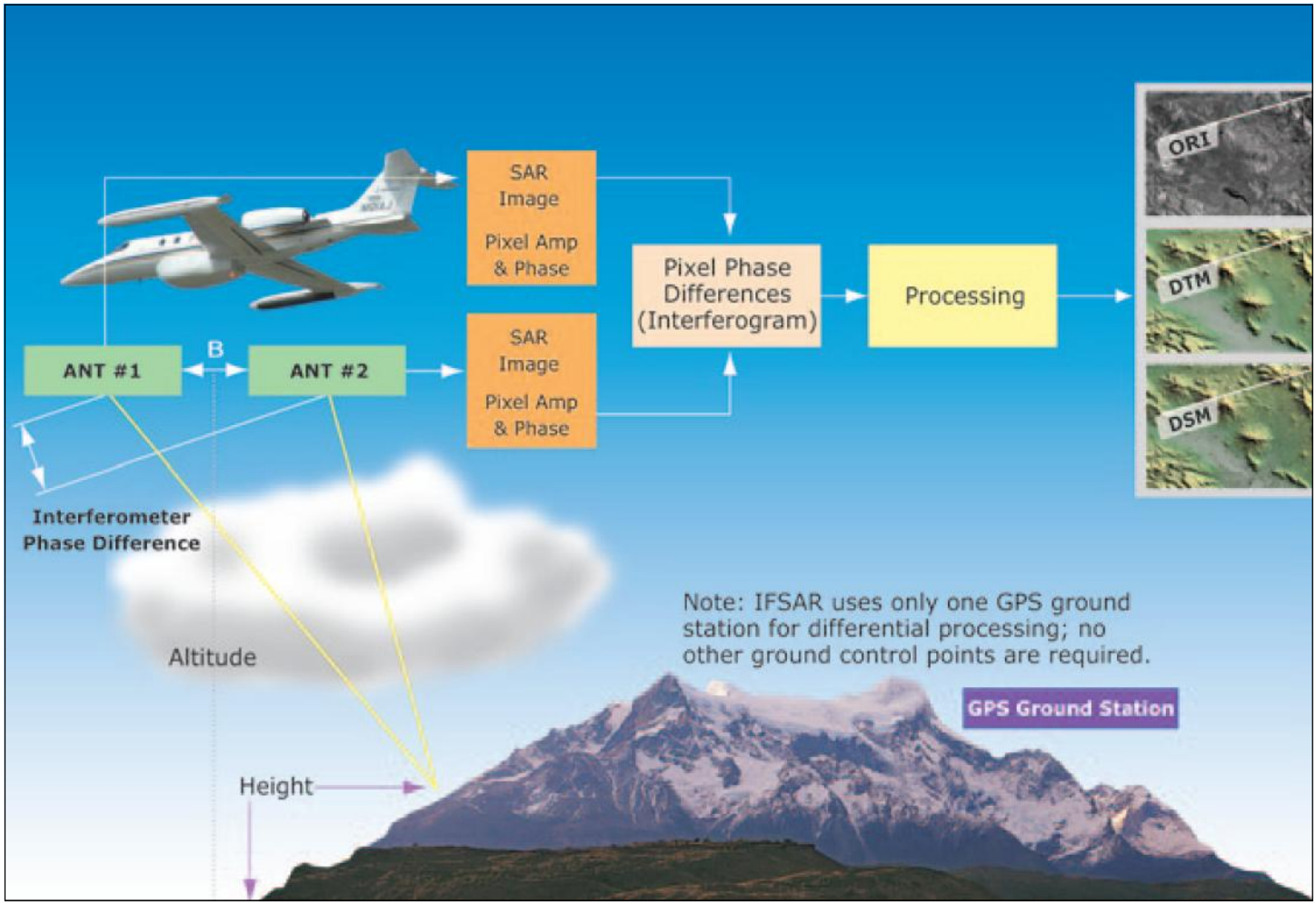

Figure 1: Conceptual view of Intermap's IfSAR system process flow

measurement unit onboard the aircraft. The phase difference between the antennas for each image point is used, along with range, baseline, GPS, and navigation data, to infer the precise topographic height of the terrain being imaged. This enables the creation of an interferogram (depicting the phase difference) and subsequent phase unwrapping from which the DSM is derived. Further complex intelligence processing is necessary to generate the DTM.

Airborne IfSAR Data Acquisition

Airborne IfSAR data acquisition lasted for 3.5 months from19 March 2013 to 01 July 2013, with STAR-3 radar system integrating an X-band IfSAR on Learjet 36A aircraft.

There were several problems encountered during the data acquisition that caused delays in the project implementation but nevertheless the project was completed on time in December 2013. Processing of necessary security and aviation permits took a while and additional flight hours were required over the Metro Manila area due to air traffic congestions. A security officer from the Philippine Air Force was assigned to accompany the aircraft throughout the operation from acquisition to delivery of final output. Permits were also secured for aircraft maneuvering over the regions of Japan, and Taiwan. Owing to diplomatic issues, however, Turtle Islands were excluded from the project. Officials from Intermap, Certeza, and NAMRIA met with those from the Lands and Surveys Department of Sabah and concluded that the security zone over Malaysia must be enforced. Spratly Islands were also excluded due to the conflict in the South China Sea.

There were delays in the flight mission. The aircraft sustained damage on the underside of the left tip tank and was disabled for 30 days with additional two days due to bad weather. There were a total of 123,559 line kilometres, 154 sorties flown in 63 days , and 13 import/export aircraft days to complete the airborne data acquisition component.

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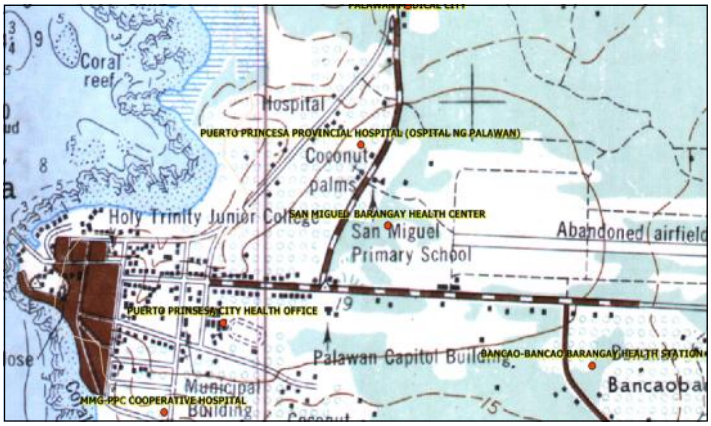
Geo-Tagging Standard for the DOH Philippine Health Atlas Project

by Benjamin P. Balais[1] and Eriberto N. Brillantes[2]



Palawan Health Facilities overlaid on a topographic map

Managing fixed assets requires location-based information. This is true especially in the delivery of health services. Knowing the location of the health facilities and monitoring the capacity to serve target clients are essential in ensuring that basic health services are being delivered even in the farflung areas of the country.

This is the primary reason why the Department of Health (DOH) is maintaining a location-based dataset of its health facilities under the National Health Atlas Project. NAMRIA was engaged by the DOH to conduct the geo-tagging of health facilities not covered by previous field surveys. These health facilities are the least accessible ones for their being situated in remote barangays. NAMRIA hired ten geospatial information systems (GIS) technology surveyors to do the actual geo-tagging.

Geo-tagging, a form of geospatial metadata, is the process of adding geographical identification metadata to various media such as a geo-tagged photograph or video, websites, Short Message Service messages, Quick Response Codes, Really Simple Syndication feeds.

The actual geo-tagging covered a period of six months and 10 provinces. More than 2,500 health facilities were geo-tagged. Considering the location of the health facilities, the safety of the field surveyors became one of the primary concerns of the project.

NAMRIA follows a simple set of guidelines when conducting handheld GPS survey activities. This is done to standardize the geo-tagging process. The activities range from planning and pre-departure to the actual survey stages.

Planning Stage

Define the specific requirements of the project. The type of objects that need to be geo-tagged must be explicitly defined. For standard data collection, attributes that are collected in the field must be determined depending on the requirement of the database. For the National Health Atlas Project, health facilities were geo-tagged as point objects.

Plan for the trip. Prior to provincial visits, a complete list of facilities and their geographical locations that will be geo-tagged must be prepared and verified. This is done to plan the order by which the health facilities will be visited. The strategy is to visit the farthest facility from point of origin first and then work one's way back. This ensures that the distance to cover during the return trip is lessened. The safety of the group is of primary concern. Reporting to supervisors from time to time helps in monitoring the geo-tagging process.

Coordinate with the local government units (LGUs). Advanced coordination with the LGU is of utmost importance. Before embarking on the field survey activities, a courtesy call on the highest local government official is made to get information on the security situation of the area. Any form of assistance for field surveyors may be offered by the LGU during courtesy calls.

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[2]*Information Technology Officer II, GDMD-NAMRIA GISMB*

Palawan Health Facilities overlaid on Google Earth satellite image

Pre-Departure Stage

Inspect all the materials needed for the trip. Apart from the list of health facilities, the checklist includes the following: a GPS, camera, extra batteries, daily travel itinerary, barangay map, auditing requirements, geo-tagging survey forms, Travel Order, official identification cards, and data cable.

Take note and bring the "essentials for hiking." This gives consideration to the reality that most of the health facilities to be surveyed are hard to reach and almost inaccessible. The "essentials for hiking" are items like food, water, sun protection gear (e.g., cap, umbrella, sun visor, sun protection cream or lotion), medicine, rain coat/jacket, matches/lighter, and a cellphone for communication.

Test equipment especially the GPS receiver before leaving the lab. A working GPS receiver is essential to get the job done.

PROVINCE	BHS	BHC	RHU	MHO/ CHO	HOSPITAL	SATELLITE CLINIC	MEDICAL CLINIC	BIRTHING CENTER
Abra	107	3	19	4	6		1	
Aurora	102	6	4	4	6			
Davao Oriental	142	53	5	7	6	1		
Guimaras	68	16	2	2	3			
Masbate	226	53	3	3	13		3	9
Negros Oriental	233	133	8	8	13	1		
Negros Occidental	341	265	16	16	26	2	2	1
Occidental Mindoro		142	2	2	11		2	
Palawan	182	83	7	7	19	4		2
Quirino	63	15	1	1	5			
TOTAL	1464	769	54	54	108	8	8	12

Health Facility Type and Total Number of Health Facilities Surveyed

Actual Survey Stage

Several devices were considered for the survey. It was a matter of choosing between smartphones and stand-alone GPS, or between a simple camera and GPS receiver with a camera. The DOH and NAMRIA opted to use the GPS with a camera.

Handheld GPS devices have inherent accuracy. Even the cheapest handheld GPS delivers about the same default accuracy as the most expensive one.

Guidelines must be followed. In conducting geo-tagging activities, certain guidelines should be set and adhered to. This ensures that the geo-tagged features are accurate enough for use in geospatial analysis.

NAMRIA suggests a set of procedures to be followed. As a standard guideline for geo-tagging using handheld GPS devices, the following should be followed:

· Use ddd° mm' ss.ss" (degrees, minutes, seconds) for position format.

· Use World Geodetic System 1984 as the map datum.

· Allow up to 15 minutes for the GPS to reorient itself if it has been moved 500 kilometers from where it was last used.

· As much as possible, make sure you have a clear view of the sky when getting the coordinates of the feature you wish to record.

· Wait for the GPS to have at least five satellites in view and make sure that the Dilution of Precision (DOP)/ Positional DOP has a low value for more accurate reading.

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PGP Post-Phase II

*by Benjamin P. Balais**

The Philippine Geoportal: One Nation One Map project is a three-year, three phase e-government funded project spearheaded by NAMRIA and sponsored by the DENR. The Philippine Geoportal Project (PGP), which started in January 2011, is the realization of the national spatial data infrastructure that envisions a common technology and web-based facility for the sharing of and access to geospatial information. It works on the "One Nation One Map" principle which essentially aims to unify the country in the utilization of a common multiscale basemap for different users.

The first phase of the PGP foreruns and paved the way for the creation of the National Spatial Data Infrastructure (NSDI), also known as the Philippine Geospatial Data Infrastructure (PGDI). The successful establishment of the collaborative platform consisting of hardware, network, software, and application systems for sharing of available base maps, geospatial data, and thematic maps is due to the concerted efforts of the stakeholders. The resources and services of this collaborative platform are now available to stakeholders for their respective purposes.

During its second year of implementation, the PGP has undergone a major shift in strategy. From being a mere provider of assistance to the requirements of the contracted foreign system developer, NAMRIA assumed an active role in the development of the system. With lessons learned from the initial year of development, native talents within NAMRIA embarked on the development of a system that is more sustainable and more client-focused than the previous system.

The shift from the use of a proprietary software system to that of an open source system was the primary objective in the second year to align the project with the harmonization of Information and Communications Technology (ICT) projects of the national government. This move has put the PGP in a more sustainable position.

The move was made despite the major advancement in the cloud-based system of data sharing feature of the proprietary system used in the previous year. The advanced features of the system used in the previous year collectively served as a model for the local/internal system developers to emulate. While this may seem at first glance to be a case of a trying-to-reinvent-the-wheel proposition, more weight was given on the cost of sustaining and ensuring the long-term implementation of the project.

This thrust was emphasized during the launching of the project in the Good Governance Summit 2014. The Summit was held at the Philippine International Convention Center, Manila on 15–17 January 2014 with the theme "Good Governance through Open Government and Sustainable Procurement." The launch was conducted in the afternoon of 16 January 2014 after the Summit breakout session on "Open Governance through Citizen Engagement."

Another major improvement in the second phase of the PGP was to allow users to submit to NAMRIA tabular statistics aggregated by different levels of administrative boundaries for viewing in the portal. Initially, the PGP targeted only geospatial information in GIS-machine- readable formats. Following the second phase, users are now allowed to submit statistical data that are geocoded and/or aggregated by administrative jurisdiction. The move was made in line with the thrust of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) to Integrate Statistical Data and Geospatial Information in order

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to provide a spatial dimension to erstwhile tabular statistical data. The UN-GGIM firmly believes that with geospatial data, there is a better way to measure, monitor, and manage sustainable development. Agencies that do not have the technical expertise on GIS can still be stakeholders of the PGP.

Closer attention was also given to data sharing during the second phase of the PGP, which was a persistent issue during the first year of implementation of the PGP. The Data-Sharing Agreement was enhanced to clarify the data-sharing scheme the owner of the data would allow. The data-sharing scheme identifies whether the data owners would allow users full-downloading in machine-editable format or just provide images and/or Web Map Service standard protocol version of the dataset shared in the PGP. While the final decision on whether or not to share the fundamental data shared in the PGP is given to the owners of the data, the PGP has made strides toward adopting an open-data policy or a modified version of it.

The PGP is also exploring the idea of issuing data licenses instead of adopting a full Open-Data concept where acceptance has been very slow. Among the data-license types being considered are *By Attribution*, *Non-Commercial*, *No Derivative*, and *Share Alike* and their combinations. This system is being implemented by the Creative Commons organization. Data owners may be more amenable to this system since they still have some control over the distribution of their datasets while satisfying most of the provisions of the open-data policy.

Section 24 of the 2015 General Appropriations Act calls for the adoption of open-data policy for all government datasets subject to applicable laws and legally mandated restrictions. To comply with this policy issuance, the PGP has introduced a simplified process to facilitate data downloading by PGP users. The procedure requires users to submit a formal request addressed to the NAMRIA Administrator, which contains the list of layers being requested and the purpose for their use together with some contact details. Clients will then receive an email with passcode, download link, including Memorandum of Understanding and Order Slip forms that need to be filled out by the client. The client may use the passcode to download the requested data.•

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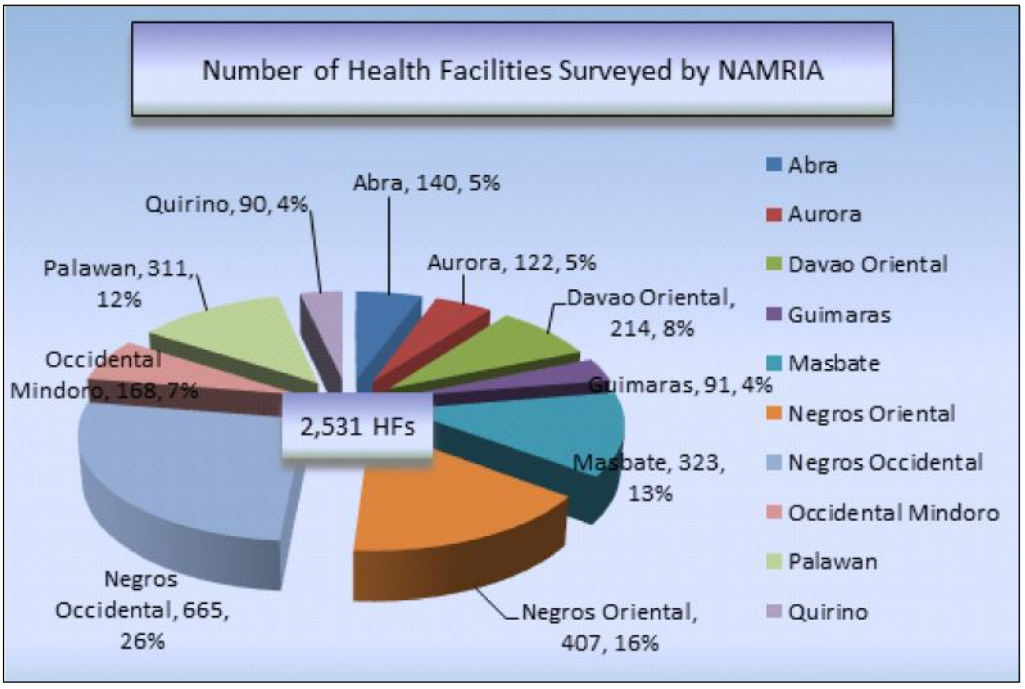
· For a slightly more accurate waypoint reading, make sure that the GPS is stationary by placing it on stable ground and use the Position Averaging feature of the GPS. Allow the GPS to average the position for about 5 to 10 minutes or upon reaching the 100% sample confidence.

· Assign the proper identification/ record number for the waypoints.

· Take a picture of the object you are geo-tagging.

· Fill out the geo-tagging survey form as a back-up document in case files in the GPS are erased. The survey form must include a sketch map of the location of the geo-tagged feature.



Distribution of health facilities surveyed

The Result

For the project, a total of 89 days were spent for the actual GPS surveys. The collected coordinates were of 2,531 Health Facilities covering the provinces of Abra, Aurora, Davao Oriental, Guimaras, Masbate, Negros Occidental, Negros Oriental, Occidental Mindoro, Palawan, and Quirino.•

Land-Use Mapping in Exposure Information Development

*by Rosal H. Dolanas**

The agencies of the Collective Strengthening of Community Awareness for Natural Disasters (CSCAND), in partnership with Geosciences Australia, and Australia's Department of Foreign Affairs and Trade, implemented in 2011 the project entitled *Enhancing Risk-Analysis Capacities for Flood, Tropical Cyclone, Severe Wind, and Earthquake Hazards for the Greater Metro Manila Area Risk-Analysis Project* (GMMA-RAP). The project aimed to provide and enhance risk-analysis capacities of technical agencies on the three main hazards that could significantly affect the GMMA. To be able to analyze the risks from these hazards, datasets and information on hazard, exposure, and vulnerability were developed. Component 2 of the project focused on the development of exposure information.

Exposure, in the context of risk analysis, is referred to as the "elements at risk" from natural hazards. These include buildings, infrastructures, facilities, population, communities, production areas (e.g., agricultural land), among others which are crucial to the functioning of a society. Of particular importance to risk analysis is the potential loss of lives and the value of properties that may be affected by hazards. Exposure information on the other hand are the characteristics that describe exposure. When stored in an up-to-date, consistent, and organized manner, meaningful information are provided that risk analysts can use in conjunction with hazard and vulnerability models to calculate physical damage, economic loss, and probable casualties in the event of potentially damaging hazard/s.

Exposure information is derived from a range of sources to meet specific risk-analysis needs. Data may be sourced from national government agencies, local government units, other organizations, or from a variety of data collection activities. In GMMA RAP, numerous data in the form of maps, aerial imageries, satellite imageries, and statistics from national government agencies, regional offices, provincial governments, LGUs, as well as from completed projects and Geosciences Australia (GA) were reviewed and assessed for their suitability for exposure information development.

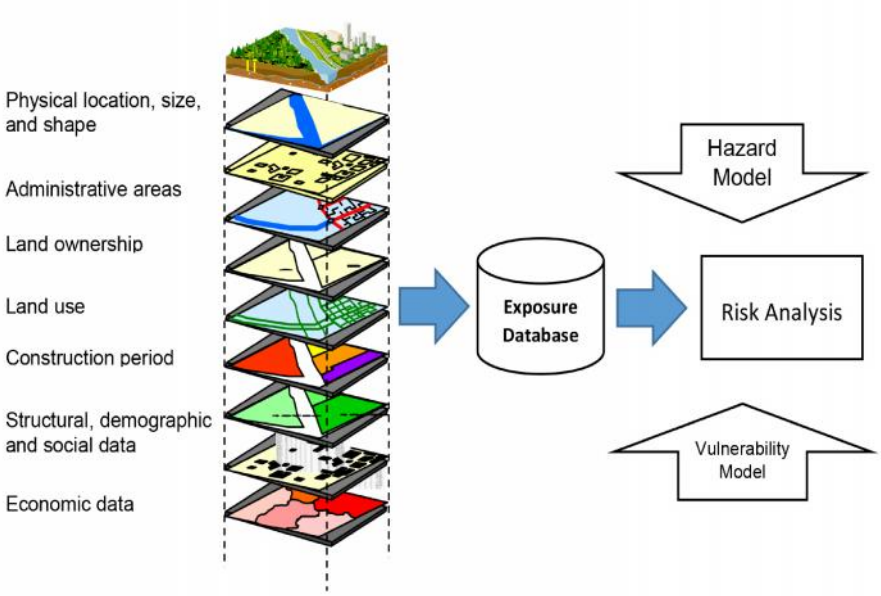


Figure 1: Data Inputs for Exposure Information Development in Support of Risk Analysis

There are two approaches for the development of exposure information. One is the feature-based approach which involves recording the characteristics of every feature represented as point, line, or polygon. The complexity of this approach depends on the number of features to be recorded, the geometry of the features, and the level of detail of attributes that need to be managed for each feature. The second is area-based where essential exposure characteristics are summarized based on a defined polygon. The latter approach was used in GMMA RAP to build exposure information on buildings and population. The area-based approach was adopted in the absence of an appropriate and complete detailed information at the feature level for the entire GMMA. Also, considering the complexity of GMMA's landscape, attempting to acquire, maintain, and manage data at the feature level would be difficult and time-consuming.

Taking off from the success of the GMMA RAP, the GMMA RAP (Phase II) Bridging Project began in July 2014. The 12-month undertaking seeks to create enhancements on the exposure information in Metro Manila. It aims to incorporate improvements in the development process through the use of an expanded land-use classification scheme, infusion of local knowledge and input datasets, and the introduction of data management methodologies with the end view of improving calculation of building-floor area and population estimates. These enhancements were carried out in

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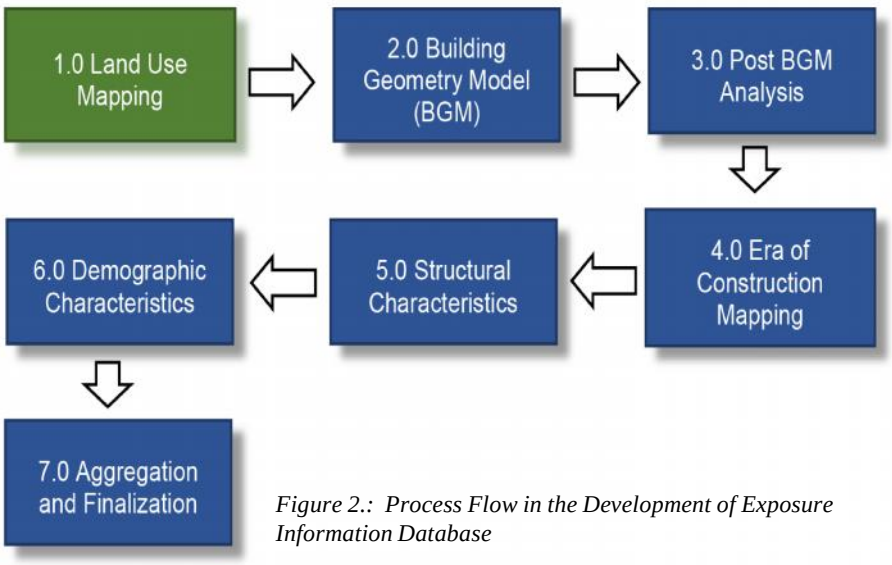

Figure 2.: Process Flow in the Development of Exposure Information Database

the City of Muntinlupa as pilot area. Figure 2 shows the processes undertaken in the development of an enhanced exposure information database.

Land-use mapping is critical to the building of exposure information. It is the most effective way of spatially representing the current mix of urban and rural environment in the metropolis. In an area-based approach, it serves as a framework over which exposure information is built. The accuracy of the land-use classification eventually affects the calculations of attributes in the exposure information database. The development of a consistent land-use map depends on the following influences which should be given due attention:

Understanding of the land-use classification schema. – The expanded land-use classification schema contains more than 140 land uses at Level 5. A definition of these classes should be developed to avoid confusion and maintain consistency in the attribution of land use at Levels 5 and 4.

Delineation of political/administrative boundary. – Editing and correction of the administrative boundary i.e., making sure that the lines do not cross building structures, is important as it affects the statistical aggregates later in the process. This also requires validation with the local authorities.

Proper delineation of the non-developable land areas and the water areas. – Non-developable land areas and water areas are defined for exclusion from the estimations later in the process.

Interpretation of the available information. – In the case of Muntinlupa, aerial images were used as backdrop in the building and updating of the land-use map. Misinterpretation of land-use polygons may occur which could potentially introduce incorrect identification of building type and eventually, miscalculations of building-floor area. This in turn could also lead to incorrect distribution of population resulting in distorted population estimates.

Geometry issues and errors. – Topological error checking should be handled to ensure integrity of the land-use data.

Land-Use Classification Scheme

In GMMA RAP, a five-level land-use classification scheme was developed. The scheme is a refinement of the various land-use classification from different data sources. The hierarchy of land use is organized in such a way that it first identifies the general classification of land while providing more detailed classes as it moves up the hierarchy.

The land-use classification scheme considers the area of interest at Level 1. Level 2 further defines the general uses which are, namely, developable land areas, non-developable land areas, and water areas. Developable areas are those areas where approved land improvements occur, those which can feasibly be developed into residential, commercial, industrial, or mixed uses. Non-developable lands are those intended for public access such as roads, railways, etc. Water areas are the artificial and natural waterways such as rivers, lakes, creeks, canals, reservoirs. These exclude water areas specifically for ornamental purposes.

Building on the defined land-use classification in GMMA RAP, the Bridging Project came up with an expanded and more detailed land-use classification. More than 140 land uses were identified in the current scheme. For instance, formal settlements are further classified into nine classes from three classes in the GMMA RAP scheme. The Housing and Land Use Regulatory Board (HLURB) equivalent land-use category is also integrated in the expanded scheme giving it a familiar feature particularly to those who are involved in land-use planning in the LGUs.

Land-Use Mapping

Ideally, the land-use dataset should come from the LGUs. However, in the absence of a land-use dataset that is appropriate for exposure information development, this can be built from a variety of sources such as cadastral maps, topographic maps, land-use plans, zonal maps, and the most recent aerial

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NAMRIA Strategic HR: A Snippet of the Transformation Journey

by Xenia R. Andres[1]

Administrator Peter N. Tiangco accepts the certificate from CSC Chairperson Dr. Francisco T. Duque III for NAMRIA's Level-II accreditation status under the CSC PRIME-HRM.

NAMRIA recognizes that its human resources (HR) are the agency's most important assets and resources. They add value to the organization by using their skills and knowledge in regenerating other resources to produce and deliver relevant and quality products and services on time. They are also the great differentiators and sources of competitive advantage. Office technologies and machineries make things possible, but it is the people who make things happen.

The agency's ISO 9001:2008 certification in 2012 and the Strategic Planning Project culmination in 2013 gave birth to a Competency-Based System (CBS) and a Strategy Map in guiding its courses of action. NAMRIA embraced the strategic approach in human resource management (HRM)[2] and has kept gains snowballing in managing its HR. This approach is reflected in the agency's strategic directions and objectives as well as strategic initiatives or programs. These strategic directions and objectives are geared towards developing and maintaining a sufficient pool of competent HR, and having enhanced organizational capacity. The strategic initiatives or programs which correspond to the aforementioned directions and objectives are Strategic Human Resource, Morale and Welfare, and Organizational Performance Management. The programs are implemented with and by all the working units of the agency, and spearheaded by the Administrative Division and the Policy and Planning Division.

The Strategic HR Program covers the agency's flagship human resource initiatives such as CBS, Strategic HR Plan, Career Pathing, and Succession Planning. It also identifies strategies to address HR issues, institutionalize HR systems, and formulate HR mechanisms and interventions vital to the efficient and effective management of priority HR needs of the agency.

The Morale and Welfare Program, meanwhile, focuses on the mechanisms for productive and balanced work life environment and harmonious management and employee relationship. It seeks to ensure the total wellbeing of employees by responding to possible needs in their physical, mental, intellectual, spiritual, and social spheres.

The Organizational Performance Management Program is a planned effort to increase NAMRIA's relevance and viability through effective development strategies intended to sustain the agency's quality management system (QMS). Projects under this initiative are enhancement of QMS, monitoring and evaluation, and implementation of the Strategic Performance Management System (SPMS). The program outcomes are improved agency and unit performance and accomplished target outputs according to standards.

Strategic HR Program

Milestone Year for the Strategic HR Program

The year 2014 was a milestone year for NAMRIA in human resource and organizational development (HROD). The agency was conferred Level-II accreditation status under the Civil Service Commission (CSC) Program to Institutionalize Meritocracy and Excellence in HRM (PRIME-HRM). Administrator Peter N. Tiangco accepted the certificate from CSC Chairperson Dr. Francisco T. Duque III in a simple ceremony held at the Luxent Hotel in Quezon City on 27 March 2014.

Compliance with PRIME-HRM is one of the activities under the Strategic HR initiative. The PRIME-HRM is a program to inculcate meritocracy and excellence in public service HRM through a program of reward, recognition, empowerment, and continuous development (CSC Memorandum Circular number 3, series of 2012). It is a

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[2] Strategic HRM is an approach to making decisions on the intentions and plans of the organization concerning the employment relationship and its recruitment, training, development, performance management, reward and employee relations strategies, policies, and practices. The key characteristic of strategic HRM is that it is integrated. HR strategies are generally integrated vertically with the business strategy and horizontally with one another. The HR strategies developed by a strategic HRM approach are essential components of the organization's business strategy. (Source: http://www.citehr.com/10060-what-strategic-hr-human-resource.html)

mechanism that assesses, assists, and awards government agencies by strengthening their competencies, systems, and practices in four HRM areas toward HR excellence. The four HRM areas are *Recruitment, Selection, and Placement*; *Learning and Development*; *Performance Management*; and *Rewards and Recognition*.

The HRM maturity levels of an agency are assessed and classified into Transactional HRM (Level I)[1], Process-Defined HRM (Level II)[2], Integrated (Level III)[3], and Strategic HRM (Level IV)[4]. The agency continues to closely coordinate with CSC for the PRIME-HRM implementation and continues to maximize the benefits of a program like the promotion of a greater engagement of the agency's officials, rank-and-file employees, and HRM practitioners. Being able to obtain Level-II accreditation affirms the agency's capacity to develop and advance in the HRM areas toward HR excellence.

NAMRIA also embarked on a three-month Employee Engagement Project in May 2014 to improve organizational and employee performance through the implementation of employee engagement mechanisms. The project aimed to conduct a survey of baseline data on the drivers of employee engagement in NAMRIA based on the Investors in People (IiP) framework; develop awareness and competence of NAMRIA officials and middle managers on employee engagement through coaching and mentoring; and recommend strategies to institutionalize employee engagement in NAMRIA.

The baseline data provided valuable inputs in understanding, addressing, and raising the level of employee engagement in the agency; determining the issues on which to focus improvement efforts; and identifying management actions necessary to create an engaged workforce. The overall results show that the main employee engagement driver in NAMRIA where initiatives are strong and can be sustained is in the area of *Continuous Improvement*. The areas for improvement are in *Business Strategy, Leadership and Management Strategy, Management Effectiveness, Involvement and Empowerment*, and *Performance Measurement* while major improvement areas are in *Learning and Development Strategy*, *People Management Strategy*, and *Recognition and Reward*.

Project Executive Sponsor/Champion Deputy Administrator Efren P. Carandang welcomes the NAMRIA leaders and middle managers to the employee engagement orientation.

Mr. Arthur Luis P. Florentin, Fellow in Personnel Management, discusses Performance Culture: Beyond Engagement.

In order to initially address the employee engagement survey results in one of the three improvement areas, which is Leadership and Management Strategy, and one of the major improvement areas, which is People Management Strategy, the seminar workshop on Creating a People Strategy and Leadership Branding was held in the NAMRIA Lecture Hall on 30-31 July 2014. The activity aimed to provide the top and middle managers of NAMRIA with the technology to create a people management strategy plan that links people management processes and organizational priorities; and to develop the agency's leadership brand statement. It also intended to complement the CSC PRIME-HRM and CBS requirements. The outputs of the seminar workshop were people management strategy per branch and NAMRIA organizational and leadership brand which are currently being implemented.

IiP Philippines *Working with the Standards* Program Membership

NAMRIA also joined the IiP Philippines *Working with the Standards* Program on 16 June 2014. The membership would pave the way for the development of NAMRIA's people strategy

[1]The maturity level where HR assumes personnel function that is mostly separate from agency/business and talent needs
[2]The level of HR where there is a set of defined and documented standard operating procedures established, although it needs improvement; characterized by goal-oriented decision making; there is some automated system but little integration of data
[3]The level of HR that uses process metrics for continuous improvement, an HR management toolkit, and data-driven decision making; HR function supports agency business needs
[4]The level of HR where processes are focused on continually improving process performance; systematically managed by a combination of process optimization and continuous improvement; HR helps to drive agency business decision on people, data, and insight and HR strategy is already part of the agency strategy (Source for footnote entries 1-4: http://web.csc.gov.ph/cscsite2/2014-02-21-08-16-56/2014-02-21-08-17-24/2014-02-28-06-36-08)

and plan that are linked with best people management practices and the agency's priorities and strategic initiatives. It is in line with NAMRIA's initiatives to effectively implement HRM systems and programs in accordance with the CSC PRIME-HRM, which adopts the IiP standards in assessing the HR systems of government agencies.

Among the benefits of membership are expert support to develop a people strategy and plan and online support/individual company consultations to implement it, access to online learning resources and community forums, and free learning sessions. Since the time of its membership, NAMRIA has participated in learning sessions on Performance Management and Appraisal System, Creating a People Strategy, and Strategic Planning.

Getting Started with the Strategic HRD Plan

The preparation, approval, and implementation of the NAMRIA Strategic HRD Plan are ways wherein the agency pursues efforts at developing and maintaining a sufficient pool of competent HR. NAMRIA is a recipient of a one-year technical assistance (TA) from the Philippines Australia HROD Facility for the development of the agency's Strategic HR Development (HRD) Plan 2015-2019. The Strategic HRD Plan would be the medium-term roadmap of NAMRIA for people and organizational development. It will integrate and align the HR strategies and systems necessary in the attainment of the agency's goals and objectives. It will also detail NAMRIA's intended learning and development interventions, which will build individual and organizational capabilities and competencies for organizational effectiveness.

The TA aims to gather, assess, and enhance all current policies and guidelines, specifically those that directly affect NAMRIA's priority programs and strategic directions, and to undertake appropriate improvements on recruitment and retention policies. It also includes a critical assessment of the HR functions and the legal and policy framework of the HRD function in NAMRIA.

Part of the project was the conduct of an HRD system audit which aimed to provide baseline information on the current state of NAMRIA HRD and institutional strategies. The audit findings identified six organizational capabilities that NAMRIA and HR need to focus on to ensure the agency's success. These organizational capabilities are motivating employees to high performance and accountability, flexibility, collaboration, leadership, continuous learning, and value-adding service. The audit findings also point out that NAMRIA needs to direct its efforts on the behavioral organizational capabilities and to address strategic HR issues in order to build the desired organizational capabilities.

Morale and Welfare

The Morale and Welfare Committee and Subcommittees were created on 08 July 2014 to strengthen institutionalization, implementation, and coordination of the various activities of the Morale and Welfare Program. For a holistic approach, the program enables NAMRIA to assist employees in addressing specific individual concerns as a means to achieve improved employee engagement vital to enhance organizational capacity and to retain a pool of competent HR. It is implemented through health and wellness, sociocultural, socioeconomics, working environment, and psychosocial subcommittee activities.

The health and wellness activities promote a healthy lifestyle through the conduct of sports events and other physical fitness activities, health awareness and management programs, and medical and dental services. Efforts at health and wellness also include the establishment and strengthening of linkages with health maintenance organizations, hospitals, and clinics.

The sociocultural activities involve the conduct of socio-cultural, educational, and spiritual events that establish rapport and promote camaraderie amongst employees and officials, sense of belonging, and teams. Activities for this aspect include photography, music, liturgical and other ecumenical activities, and *Bayanihang Bayan*. *Bayanihang Bayan* is the agency's volunteerism program which seeks to harness employees' interests, talents, and expertise as they render voluntary services at work and in the community.

Morale and Welfare Committee meeting

The socioeconomic activities seek to support and help strengthen the economic viability of employees through the implementation of financial management, welfare, and livelihood programs. The activities include loan packages, housing scheme, shuttle services, cooperative, and provident fund. Activities focusing on the work environment include developing an ecologically- and safety-conscious organization through the promotion of 5S and quality workplace standards, occupational health and safety, and environmental sustainability in the workplace.

The psychosocial activities institutionalize coaching and counseling programs, establish employee suggestion schemes, and enhance the positive discipline, and the recognition and award programs of NAMRIA. It likewise provides legal assistance to employees as well as services and assistance to employees with special needs (e.g., senior citizens, persons with disabilities, and pregnant women).

Organizational Performance Management

A two-batch seminar workshop on Employee Engagement through Coaching and Mentoring was held at the NAMRIA Lecture Hall on 02-03 and 26-27 June 2014. The general objectives of the seminar workshops were to capacitate top, middle, and line managers on employee engagement mechanisms that lead to organizational and individual performance improvement and to establish a coaching and mentoring mechanism for the implementation of the SPMS.

Specifically, the seminar workshops aimed to (1) illustrate the importance of the role of line leaders and managers in HRM, (2) discuss the advantages of coaching and mentoring in fostering employee engagement, (3) explain key concepts in coaching and mentoring, (4) conduct mentoring conversations that are conducive to learning through relevant topics, (5) identify ways to manage mentoring relationships, and (6) recommend and commit to implement strategies that would help enhance the levels of engagement among employees in the workplace through coaching and mentoring.

The outputs of the activities were action plans per participant, division, and branch on engaging employees through coaching and mentoring. The action plans aimed to establish a coaching and mentoring culture in the agency to support work performance, target accomplishment at all levels of the organization, career management, and development of employees. The action plan items were included in the Individual Performance Commitment Review of supervisory and managerial levels held from July to December 2014.

The participants mirror each other in a structured learning experience for the topic on mentoring relationships.

GISMB Assistant Director Febrina E. Damaso shares her insight on coaching and mentoring.

The Gains and Continuing the Journey

The range of activities around the NAMRIA Strategic HRM is numerous, varied and multilevel. It has kept everyone in the organization busy and having their thoughts, decisions, and behaviors focused on contributing to a strengthened HR. The range of gains likewise mirrors that of the range of activities undertaken. It spans having numbers to base decisions on, knowing directions to tread, officials and employees being aware and having an awareness of approaches to HR excellence, having plans to follow, advancement in HR accreditation, memberships to ensure alignment within the initiatives, and more activities to undertake. More inputs will have the agency seeing more snowballing of gains in strategic HRM.

Indeed, people are the prime movers and drivers of organizational success. Organizations must sustain their efforts to foster engagement in the workplace. NAMRIA is committed to undergo the necessary transformation through strategic HRM. As such, the agency is persistently working on initiatives to continuously improve its HR systems and processes. These initiatives include, among others, sustained partnership with CSC for the PRIME-HRM implementation; continued certification of the NAMRIA QMS to ISO 9001:2008; integration of CBS to HR systems; implementation of capacity-building programs on coaching and mentoring, development planning, career pathing, and succession planning; and strengthening of HR business partnership with line managers.•

Updating the NAMRIA Organization and Operations Manual

by Lorelei E. Peralta

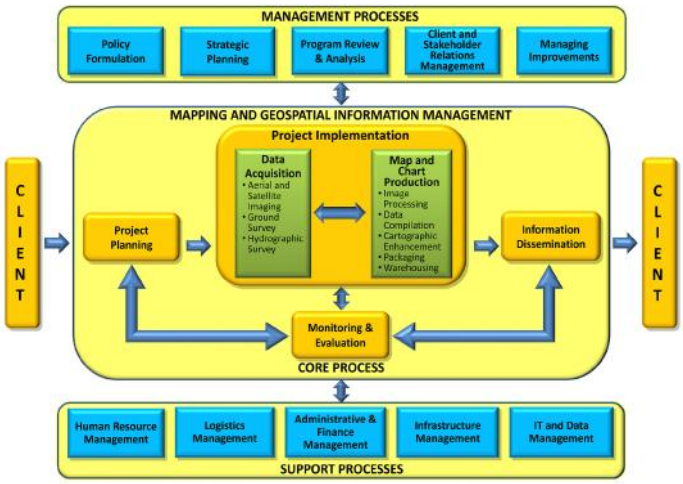
An organization and operations manual is the authoritative guidebook on how things are done in the organization. It serves as an effective way of communicating policies and procedures, and gives employees the security they need to operate in their jobs for maximum results. It serves as a quick reference to know how things work right from the start.

As the central mapping agency of the Philippines, NAMRIA performs highly technical functions in the field of geomatics[2]. NAMRIA adopted its first Organization and Operations Manual (OOM) in 1992,[3] in order to guide all personnel in the work standards and procedures of the organization. The 1992 OOM made extensive use of data flow diagrams (DFD)[4] to illustrate the different work processes and systems employed by the organization, followed by specific instructions on how each step is conducted. The different forms used in the different work processes are also included in the manual.

Pursuant to Executive Order No. 605, Series of 2007[5]Executive Order No. 605, series of 2007, "Institutionalizing the structure, mechanisms, and standards to implement the Government Quality Management Program, Amending for the Purpose Administrative Order No. 161, S. 2006, NAMRIA, in February 2011, started establishing its Quality Management System (QMS) certifiable to ISO 9001:2008. As part of its QMS, NAMRIA adopted a Core Process Model that defines the relationships among the management processes, core processes, and support processes (see figure).

On 02 October 2012, NAMRIA received its ISO 9001:2008 certification for Mapping and Geospatial Information Management from Certification International Philippines, Inc. (CIP). It then effectively revised its 1992 OOM to "keep pace with the advancement of technologies in the performance of its core functions." The first revision of the NAMRIA Operations Manual (or NOM_Rev1) was adopted on 01 January 2013.

NOM_Rev1 is essentially a compilation of organizational charts, functions, work procedures, standard operating instructions (SOIs), and controlled forms. The SOIs were prepared by the different process owners and as such are limited only to describing the specific processes to which they are intended. There is therefore a need to come up with a more integrated and holistic perspective of the relationships of the different processes. That said, NOM_Rev1 still does not contain integrated process-level (e.g., map and charts production) operating guidelines and standards that are consistent with the NAMRIA Process Model as illustrated in the figure.



NAMRIA Core Process Model

With the approval of the NAMRIA Rationalization Plan,[6] a new NAMRIA Organizational Structure and staffing pattern was realized. The implementation of the agency's approved Rationalization Plan made significant effects on the horizontal and vertical relationships of the different work units (branches, divisions, and sections), that seemingly affected the way the organization produces and provides its products and services.

From January to August 2013, NAMRIA went into a participatory process of Strategic Planning, setting its long-term directions where it sees itself as performing a strategic role in nation building. It also has adopted a system of ensuring that short-term operational plans are aligned with the strategic plan.

In order to sustain the gains of the aforementioned key developments in NAMRIA, it is critical that each member of the organization is in sync with achieving planned results in a consistent and predictable manner. This is more so especially in light of the recent implementation of the agency's Rationalization Plan. Against this backdrop, the review and updating of the NAMRIA Organization and Operations Manual becomes essential.

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[1] *Planning Officer IV, Policy and Planning Division-NAMRIA SSB and is a candidate for the degree of Master of Maritime Studies, University of Wollongong, NSW, Australia.*

[2] *Geomatics is the science that deals with the collection, analysis, and interpretation of data relating to the earth's surface.*

[3] *The 1992 OOM is organized into three major sections, to wit:*

1. *Organization of NAMRIA. This section presents the mandate, organizational structure, and functions of all divisions and departments.*
2. *General Administration. This section describes the general administrative policies and procedures.*
3. *Operations of Line Departments. This section covers the operating guidelines and procedures of the departments.*

[4] *A data flow diagram (DFD) illustrates how data is processed by a system in terms of inputs and outputs. As its name indicates, its focus is on the flow of information, where data comes from, where it goes and how it gets stored. (http://www.smartdraw.com/data-flow-diagram/)*

[5] *Executive Order No. 605, series of 2007, "Institutionalizing the structure, mechanisms, and standards to implement the Government Quality Management Program, Amending for the Purpose Administrative Order No. 161, S. 2006*

[6] *The DBM approved the Rationalization Plan of NAMRIA in June 2013.*

In December 2013, NAMRIA commissioned the services of a consultant to essentially review and update its Organization and Operations Manual, as a strategic step towards achieving organizational alignment and performance excellence. It intends to bring into line its Core Process Model, and make it consistent with the new Organizational Structure based on its approved Rationalization Plan.

Specifically, the project aims to document the new NAMRIA organizational structure and functions of each element; define and illustrate the different support, core, and management processes[7] and systems including their relationships between and among these processes; to establish responsibility and accountability for the different elements in the said processes; develop/update current SOIs into what are now called procedures[8] and work instructions[9] for the different processes.

Expected Outputs

The project intends to produce an updated and integrated NAMRIA Organization and Operations Manual in three volumes. The specific details are as follows:

Volume 1: NAMRIA Organization and Support Processes. This volume contains the new organizational structure and the functions of each work unit and staffing patterns, as well as the workflow diagrams for the different support processes (i.e., Human Resource Management, Management of Goods and Services, Financial Management, Infrastructure Management, ICT Resource Management, System Development, Data Management, and Records Management), procedures, work instructions, and controlled forms.

Volume 2: NAMRIA Core Processes. This volume contains workflow diagrams, procedures, work instructions, and controlled forms for NAMRIA's core processes for Mapping and Geospatial Information Management (i.e., Hydrography and Nautical Charting, Physical Oceanography, Geodetic Network Development and Management, Topographic Base Mapping, Thematic Mapping, and Geospatial Information Management).

Volume 3. NAMRIA Management Processes. This volume contains the workflow diagrams for the different management processes (i.e., Policy Formulation, Organizational Performance Management, Strategic Planning, Medium-Term Planning Annual Planning, and Budgeting, Program Review and Analysis, Monitoring and Evaluation), procedures, work instructions, and controlled forms.

Methodology

The project is a technical assistance intervention whereby the consultant is primarily responsible for the production of outputs. However, in order to guarantee the quality, acceptability, and ownership of outputs, the consultant will work closely with the different NAMRIA work units and process owners in the documentation of work processes, and with the NAMRIA management in the review and approval of the different outputs. NAMRIA, therefore, established the different committees and secretariats,[10] that include a steering committee,[11] a technical committee,[12] a project secretariat,[13] and a branch secretariat[14].\

The outputs shall build on existing available documents provided by NAMRIA, including the approved Rationalization Plan, Quality Manual, SOIs, Citizen's Charter, and other documents relevant to the work processes. These documents shall be the basis of the consultant in building the initial drafts of the different parts of the manual.

Status

As of this writing, the project has completed the development of the "NAMRIA Integrated Flow Chart" which operationalizes the NAMRIA Core Process Model and describes how the various processes interact with each other. Likewise, the High-Level Flowcharts (HLFC) for the different key processes have been finalized with the NAMRIA Process Model serving as guide. These HLFCs will ensure the alignment and synchronicity of management and support processes with the core processes.

With the approval of the HLFCs, the next stage is to define the specific work processes involved in each major work process. The outputs in this stage shall include specific work procedures, work instructions, and controlled forms for each of the processes identified. •

Reference:

Claur, J. C. (2014). *Review, Enhancement, and Packaging of the NAMRIA Organization and Operations Manual*. Inception Report.

[7] *Processes are cross-functional and define what is done and by whom. They are often depicted in diagrammatical form such as a decision tree or flowchart where the work performed is split into logical interrelated steps or "activities." Processes should always have a "trigger" or start event and a "terminator" or end event that achieves a specific result. All processes should seek to fulfill a successful outcome.*

[8] *Procedures define how the work is performed. They are typically documented in a step-by-step order with de tailed descriptions of how the work is to be performed and who is responsible for performing the work.*

[9] *Work instructions add a level of confusion to the puzzle, but are generally recognized as a subset of procedures. The way they differ is that the work instruction is typically written to describe how to do something specifically for a single role, rather than procedures that may contain instructions for several different roles within an organization.*

[10] *Special Order Nos. 467, s, 2013 and 546, s. 2013*

[11] *The steering committee is responsible for providing overall technical inputs and guidance in the development of the different 12elements of the manual. The steering committee is composed of the deputy administrators and branch directors and led by a project lead/champion.*

[12] *The technical committee is responsible for developing the different elements of the manual and is composed of technical personnel directly involved in the work process.*

[13] *The project secretariat is in charge of the coordination and provision of necessary technical, administrative, financial, and logistical support to the steering committee, led by a project coordinator and shall be under the direct supervision of the project lead/champion.*

[14] *This is organized by the heads of the different branches and in charge of the provision of necessary technical, administrative, and logistical support to their respective technical committees.*

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FOR THE GOVERNMENT OF
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ALBERT F. DEL ROSARIO
SECRETARY OF FOREIGN AFFAIRS

FOR THE GOVER
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DR. R. M. MARTY M. NA
MINISTER FOR FOREIG

Preparation of Maritime Boundary Chart

Review and Appro

Certified by :

DR. PETER N. TIANGCO, CESO I
Administrator
National Mapping and Resource Information Authority
Department of Environment and Natural Resources
REPUBLIC OF THE PHILIPPINES

CAPT.

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Delimitation Meetings

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Signing of Approved Maritime Boundary

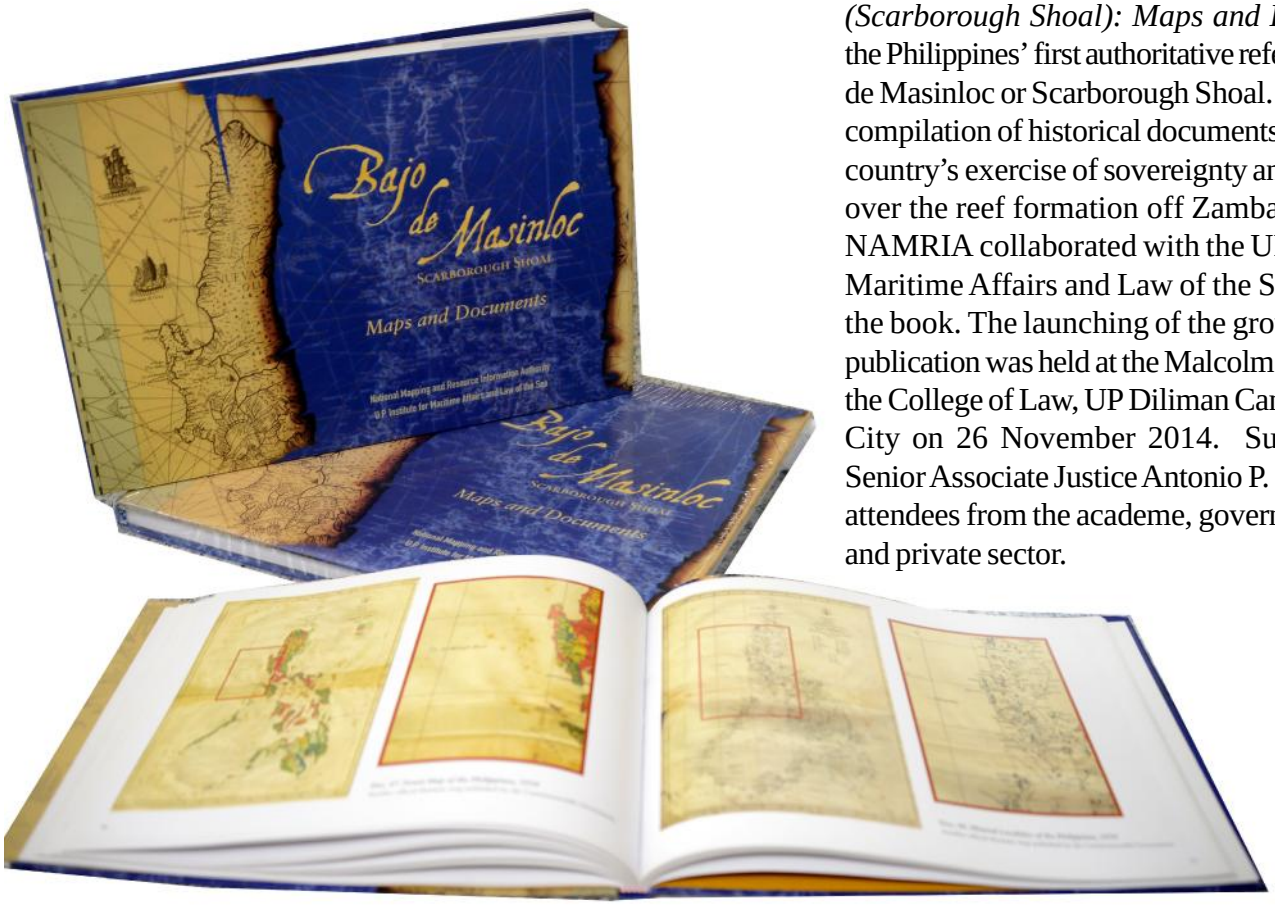
Certified by :

JACINTO M. CABLAYAN
Director
ydrography Branch
nd Resource Information Authority

DR. ASEP KARSIDI
Head
Geospatial Information Agency
REPUBLIC OF INDONESIA

CDRE. Dr. DEDE YULIADI, M.Sc.
Chief Hydrographer
Hydro-Oceanographic Office
INDONESIAN NAVY

NEWS



The Philippines' First Book on Bajo de Masinloc - The book *Bajo de Masinloc (Scarborough Shoal): Maps and Documents* is the Philippines' first authoritative reference on Bajo de Masinloc or Scarborough Shoal. The book is a compilation of historical documents that show the country's exercise of sovereignty and jurisdiction over the reef formation off Zambales Province. NAMRIA collaborated with the UP Institute for Maritime Affairs and Law of the Sea to produce the book. The launching of the ground-breaking publication was held at the Malcolm Hall Lobby of the College of Law, UP Diliman Campus, Quezon City on 26 November 2014. Supreme Court Senior Associate Justice Antonio P. Carpio led the attendees from the academe, government offices, and private sector.

Ceremonial handover of the book

From left: Director Jay L. Batongbacal, Dean Danilo L. Concepcion, Justice Antonio P. Carpio, Administrator Peter N. Tiangco, Deputy Administrator Efren P. Carandang

NAMRIA 4th ISO survillance audit

by Cherrylim D. Mendoza

Administrator Tiangco (center) together with NAMRIA officials and the CIP auditor during the presentation of audit areas

NAMRIA successfully passed the fourth surveillance audit for its continued certification to ISO 9001:2008. The audit was conducted by Certification International Philippines, Inc. (CIP) in Taguig City and San Nicolas, Manila on 11 November 2014. The CIP auditors were Mr. Arnel D. Guevara, team leader and Mr. Justo R. Batoon, Jr., member.

The one-day audit covered the following areas: (1) Land Resource and Data Analysis Division and Land Classification Division of the Resource Data Analysis Branch (RDAB); (2) Human Resource Management Section and Property and Supply Section of the Administrative Division of the Support Services Branch (SSB); (3) Client Satisfaction and Client Feedback under GISMB; (4) Internal Audit Corrective/ Preventive Action and Management Review Validation of Scope of Certification and Use of Certification Mark; (6) Hydrographic Surveys Division and Nautical Charting Division of HB; (7) Human Resource Development Section and Records Section of the Administrative Division under SSB; and (8) Verification of CMO 01-S3/All 01-S3/All 02-S3.

At the closing meeting, the CIP auditors presented the results and findings of the audit. One minor non-conformity was reported for the Records Section. This was on the effective implementation of NAMRIA Quality Procedure-02 Control of Records due to the lapses seen in the utilization of QP-02 Form No. 2 "Records Master list." The records were not available and could not be presented at the time of the audit. The agency is required to submit an action request report for this non-conformity. Two non-conformities from the previous surveillance audit were closed while one remained partially open. The Instrumentation and Communications Engineering Division failed to show evidence on the measurement for the repair of technical equipment. There were reported opportunities for improvement in the areas covered. The Client Satisfaction area was commended for its very comprehensive analysis report.

In his message, Administrator Peter N. Tiangco cited the significance of the surveillance audit for it helps identify the agency's strengths and weaknesses. He also expressed his appreciation to the CIP for being a very helpful partner of NAMRIA in the area of QMS.•

Audit for the Land Classification and Land Resource Data Analysis Divisions

Audit for client needs and client feedback of GISMB

NEWS

NAMRIA's latest printing equipment: The Suprasetter 145 platesetter

by Jeff N. Hunt

Validation of incoming digital data of topographic maps, nautical charts, and other other publications to check against standard specifications for charts and maps

NAMRIA, through the Reprography and Printing Division (RPD) of the NAMRIA MGB, took a step forward in the use of reprography and printing technology and machinery through an upgrade and departure from the conventional reproduction process. The conventional process formerly done by RPD is derived from the photographic process using light sensitive chemicals and photographic films to transfer images from original materials to printing plates. In 2014, the agency acquired the latest Computer to Plate (CTP) equipment, the Suprasetter 145 platesetter.

The Suprasetter 145 platesetter is a Heidelberg large-format, cylinder-type, and internal-drum platesetter with patented intelligent diode system that incorporates many features like deep depth of focus for optimal production, internal temperature stabilization system, and unique ease of operation. These features allow the setting of a new standard when it comes to reliability, flexibility, and ease of use. The Suprasetter 145 platesetter has a fully automated loading unit that can hold up to six different formats, each with 100 plates having an overall volume of 600 printing plates. It also features automatic selection of the correct plate type that ensures highly efficient plate production. This model can be fitted with an internal punching system that delivers printing plates with maximum register accuracy.

The model also makes use of Prinect as operating system and is based on the universal Job Description File Format and the latest version of the Adobe Portable Document Format Print engine. These enable the combination of production with management processes in one workflow to fully optimize processing of print jobs through plate outputs. The plate outputs save not only time but make multiple use of the original document. Prinect operates with all screening processes, from the classic amplitude-modulated screening to frequency-modulated screening through hybrid screening. Hybrid screening refers to the excessive highlight gain and minimum dot requirements caused by the nature of small dots on flexo-plates to "squash" and become bigger **(**www.hybridscreening.com**).** This system versatility ensures that an optimal screen can be selected for all customer configurations for plates, image setters, papers, and presses.

To fully grasp the functionalities of the CTP in achieving a process-less plate, it is necessary to understand its basic principles. The CTP is an imaging technology used in modern printing processes where an image is created with a desktop-publishing application and outputted directly to

Setting up of computer-to-plate machine for operation

the printing plate. This technology allows the imaging of metal or polyester plates made of polymer coating, and applied to a flexible aluminum plate that can be printed directly from the plate for printing and publication without the use of film, thus eliminating the stripping, compositing, and traditional plate-making processes. A platesetter is also able to receive a raster image from a raster image processor and in turn creates a lithographic plate suitable for use on an offset press. This modern printing process is used presently to produce posters, maps, books, newspapers, and packaging or just about any smooth, mass-produced item with printed text and graphics on it.

Printers with CTP also have better on-press performance and their digital plates have sharper dots. They offer better control of dot gain and enable incorporation and presetting of the ink fountains. This kind of printing equipment has better registration which leads to a shorter, more economical, and less wasteful production process. With fewer steps, there is lesser chance of error.

RPD Officer In Charge, Celedonio DJ. Pili cited the Suprasetter 145 platesetter's accuracy, consistency, and stability for significantly improving the capability of the division to do its functions. Long-time RPD head pressman Mr. Melchor S. Almeda Jr. and pressman from the plate making section Mr. Jaime R. Santos both underscored the advantages of using CTP technology. They particularly cited the resulting savings in time, effort, and materials such as from forgoing the use of film from the plate production process. Mr. Pili and his staff were one in saying that the technology is not only beneficial to their division but to the agency as a whole.

Inserting thermal plate for automatic plate exposure in the CTP machine

NAMRIA acquired and is using its new printing equipment to have greater advantage in mapmaking. As the central mapmaking agency of the Philippine government, NAMRIA needs mainstream technology for the high quality of its printed products, thereby enhancing its capability to perform its significant role in nation building. To make the technology more user-friendly, the service provider in the Philippines of the Heidelberg brand is providing, along with continuous service support, training on the basic operation of the equipment until all of the agency's printing personnel are adept in using the platesetter.•

Automatic plate processing

NEWS

Two modern catamaran-type survey vessels for NAMRIA

by Elinor C. delos Reyes

The two newly acquired 23.55-meter aluminum catamaran–type hydrographic survey vessels of NAMRIA arrived at Bravo Wharf in Subic Bay Freeport Zone, Olongapo City on 18 June 2014 (for BRP HYDROGRAPHER ANDRES HIZON) and 21 July 2014 (for BRP HYDROGRAPHER CAYETANO PALMA). The survey vessels were designed and built by the Colorado Shipyard Corporation (CSC) in Consolacion, Cebu.

Both vessels underwent sea trials along Camotes Sea in Cebu province before their delivery from Cebu City to Olongapo City. The sea trials were conducted by representatives from the CSC headed by Mr. Scott Cole, with the participation of HB Director, Commo. Jacinto M. Cablayan; HB Assistant Director, Capt. Ildefonso S. Pascual Jr.; and HB Survey Support Division Officer In Charge, Cdr. Sheilon T. Cadaoas together with designated commanding officers and executive officers of both vessels, selected commissioned officers, and enlisted personnel.

The sea trial is conducted to test the performance and general seaworthiness of a watercraft/vessel and is usually the last phase of the construction. It takes place on open water and lasts for hours. One of the activities conducted during sea trials is the testing of the vessel's speed and maneuverability and its hydrographic and oceanographic equipment.

From 23 July to 15 August 2014, Mr. Mark Chang of Seismic Asia Pacific conducted hands-on training/orientation on the ship's survey system for all officers and enlisted personnel aboard both vessels. The orientation covers ship survey system; CTD* casting; side-scan-sonar deployment; and tide station, GPS reference station, and winch and A-frame installation.

From 28 to 29 November 2014, CSC representatives headed by Capt. Joseph Andrew Lape and Mr. Cole also conducted training in vessel maneuvering when docking and undocking a vessel. All officers of both vessels with the assistance of enlisted personnel aboardship took part in the activity.

Both hydrographic survey vessels will help strengthen NAMRIA's current fleet to attain the agency's mission of providing accurate and up-to-date geospatial information. They will be utilized mainly for the following activities: (1) gathering the latest hydrographic and oceanographic data within Philippine waters specifically in ports, harbors, and domestic sealanes from 10 meters to 3,000 meters water depth to produce and update nautical charts, electronic navigational charts, and other publications for ensuring safety of navigation and aiding in natural hazard mitigation and marine scientific research; and (2) detecting sunken objects in shallow waters.•

"CTD" is the abbreviated name for an instrument package that includes sensors for measuring the **Conductivity, **T**emperature, and **D**epth of seawater (source: http://www.pmel.noaa.gov/eoi/PlumeStudies/WhatIsACTD/CTDMethods.html)*

NAMRIA conducts trainings for UNICEF

by Alvin F. Laurio and Cherrylin D. Mendoza

The NAMRIA Geomatics Training Center (NGTC) conducted on 31 March-31 July 2014 a series of trainings on GIS technology for 446 participants under the Philippine Government-United Nations Children's Fund (UNICEF) 7th Country Programme for Children. The trainings were conducted at the NGTC in Fort Bonifacio, Taguig City except for the On-the-Job training (OJT) and the training on GIS for Executives which were conducted in the City of Borongan in Eastern Samar, Iloilo, and Tacloban.

The UNICEF expanded its partnership with NAMRIA through an amended Memorandum of Agreement signed by NAMRIA Administrator Peter N. Tiangco and UNICEF representative, Mr. Abdul Alim on 17 March 2014. NAMRIA committed to provide technical assistance to UNICEF's 46 priority LGUs that were devastated by Typhoon Yolanda (Haiyan). The primary objective was to build the GIS capability of these LGUs in order for them to use the technology as a tool in their management and decision making for planning, monitoring, evaluating, and policy-making activities related to Disaster-Risk Reduction and Management (DRRM), Comprehensive Land-Use Plan (CLUP), and Tax Mapping.

The NGTC provided the LGUs with trainings including lectures and hands-on exercises on Basic GIS, Advanced GIS, and GIS for Executives using the Manifold System and the OJT. The training on Basic GIS focused on map basics, basic cartography, projections, and overview of GIS and there were hands-on exercises on geo-referencing of topographic cadastral maps, tracing of lots, editing, and map layouting, including spatial data analysis using topology overlay and spatial overlay of Manifold. The training on Advanced GIS covered additional topics on acquiring and building up spatial data such as technical description, lot data computation, and Global Positioning System (GPS). The OJT included a lecture and presentation of the outputs while the training on GIS for Executives focused more on the information and uses of GIS technology.

Training videos on specific topics were provided to all participants to serve as their reference materials. To date, NGTC resource persons still continue to give technical assistance to these LGUs thru e-mails and text messaging.•

Basic GIS training held at the NGTC on 05-10 May 2014

GPS observation activity for Advanced GIS Training held at the NGTC on 02-06 June 2014

GIS for Executives session held at Leyte Park Hotel, Tacloban City on 24-29 August 2014

NEWS

Unified Mapping Project focused on Typhoon Yolanda-Affected LGUs

by Nicandro P. Parayno[1] and Leo B. Grafil[2]

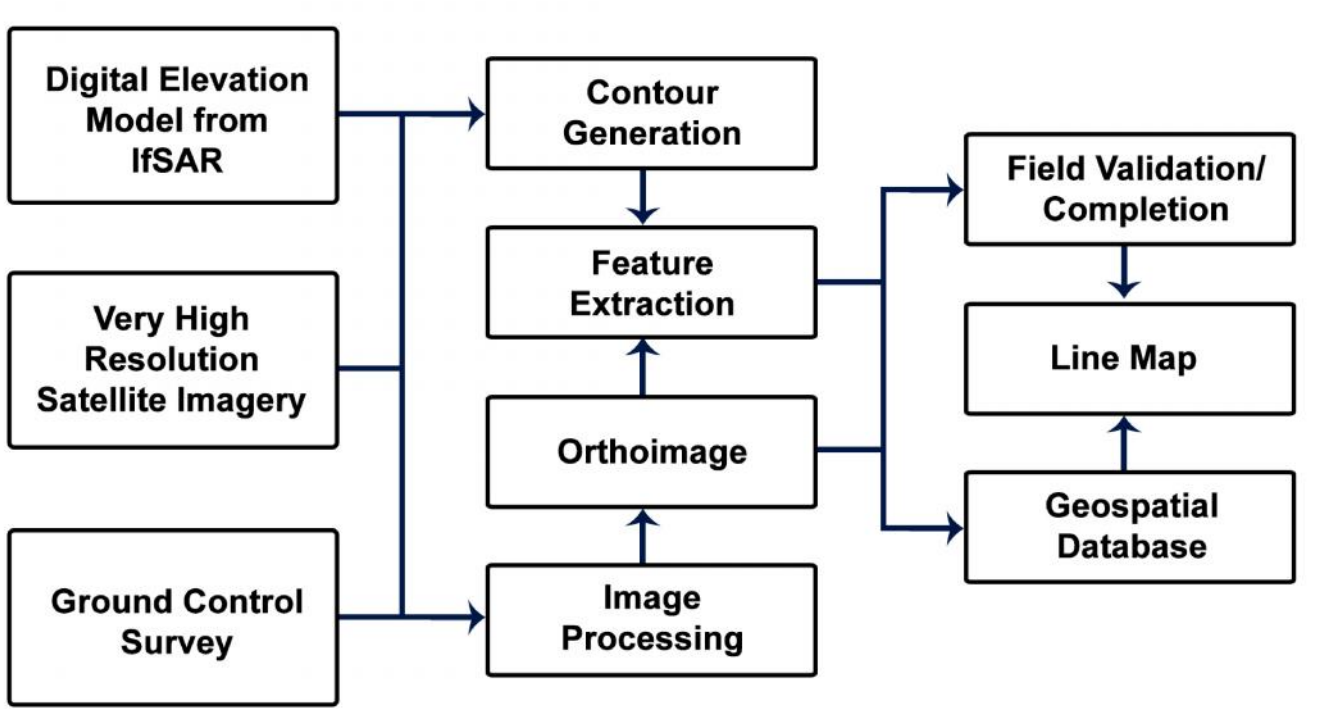


Figure 1: Unified Mapping Project Workflow

In 2013, NAMRIA started implementing the Unified Mapping Project to provide updated and accurate nationwide geospatial information at scale 1:10,000 that will serve the requirements of different government agencies for their thematic mapping activities. A major component of the project was the acquisition of National DEM using IfSAR technology and very-high-resolution satellite imageries with a sub-meter resolution. These voluminous data were utilized in image processing, orthorectification, and feature extraction of geospatial information for the production of 1:10,000 large-scale orthoimage and topographic maps. Figure 1 shows the workflow diagram of the project.

An airborne IfSAR mission was successfully conducted from 19 March to 01 July 2013 produced homogeneous, seamless, and high-resolution DEM covering approximately 300,000 square kilometers *[please see related article on page 12]*. An extended license to use the raw VHRSI consisting of Digital Globe's WorldView 2 and GeoEye 1 imageries was also acquired in December 2014 from the Unified and Enterprise Geospatial Information System project of the Department of Agriculture through the Department of Budget and Management-Procurement Service.

The Office of the Presidential Assistant for Rehabilitation and Recovery (OPARR) was created pursuant to Memorandum Order No. 62, series of 2013. This is owing to the widespread loss of life and property in several areas caused by Super Typhoon "Yolanda," also known internationally as "Haiyan." OPARR aimed to unify the efforts of the government and other agencies involved in rehabilitation and recovery. Through a Memorandum of Agreement with OPARR, NAMRIA prioritized the

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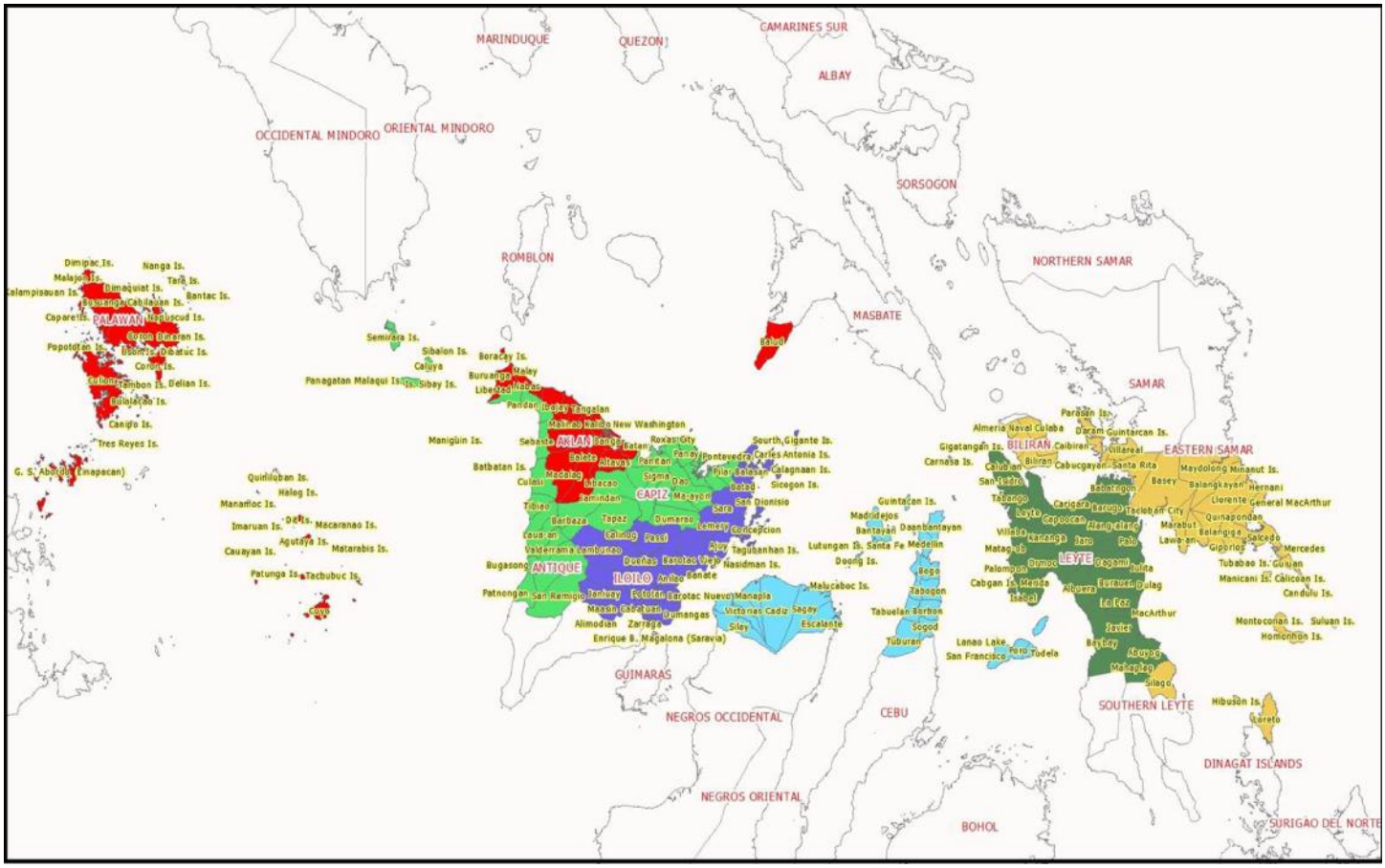


Figure 2: Yolanda Corridor

production of large-scale topographic and orthoimage base maps covering the Yolanda corridor (Figure 2) consisting of 171 cities/municipalities with an estimated land area of 2.4 million hectares. Reputable survey and mapping contractors were tapped to expedite time of completion and delivery of mapping outputs to be used in the rehabilitation, recovery, and reconstruction efforts of the national government, local government units (LGUs), non-government units, and other stakeholders in the affected areas.

The contractors were tasked to survey and establish Image Control Points/Check Points (ICPs/CPs) using survey-grade and dual-frequency Global Navigational Satellite System receivers that will be used as reference in orientation and rectification of the VHRSI to their ground coordinates, particularly in areas with mountainous terrain. Additionally, post-Yolanda imageries provided by the Department of Science and Technology and the Japan International Cooperation Agency were orthorectified using the ICPs/CPs and the IfSAR-derived DEM.

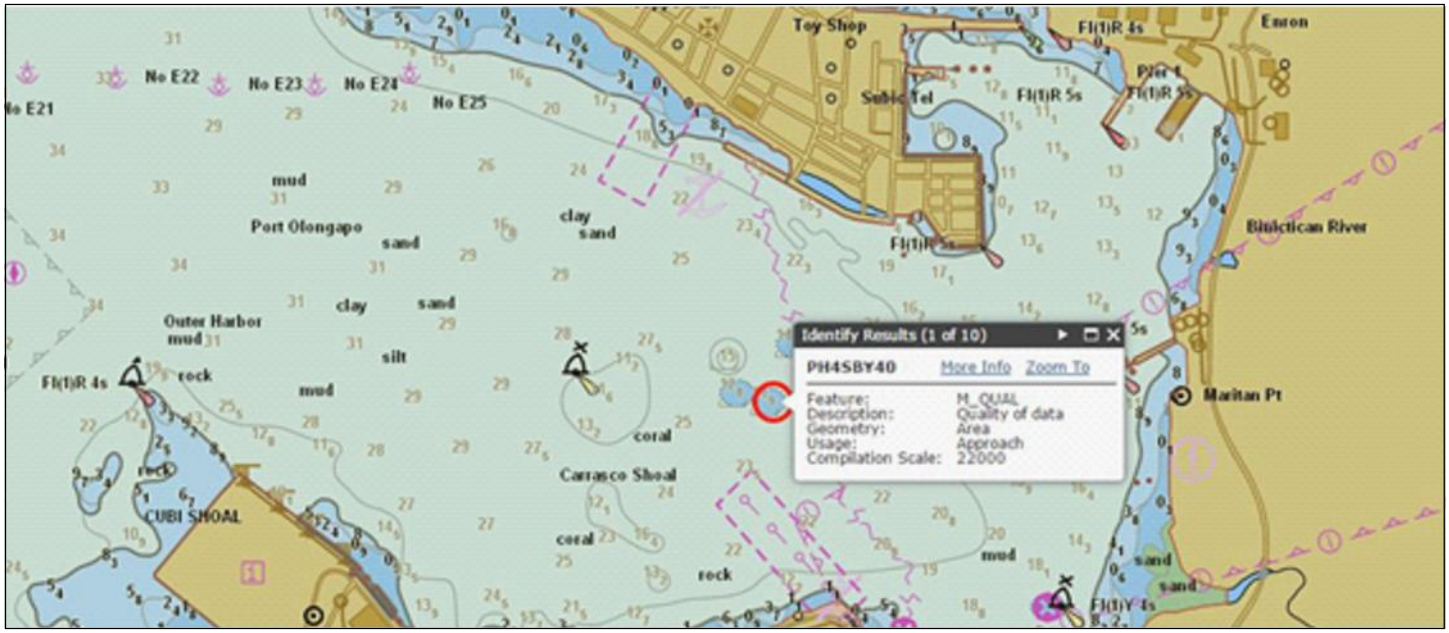
Planimetric features identifiable in the orthoimages were digitized to produce the line map. Field verification, identification, and completion survey were conducted to verify the correctness of the compiled spatial features. Moreover, additional information like administrative names, road names, names of prominent buildings, and other field information not readily obtainable from the orthoimages were also gathered.

With these methodologies, around 800 map sheets of orthoimages and topographic maps at 1:10,000-scale have been completed for the Yolanda-affected areas. Large-scale orthoimage and topographic base maps will be produced covering the entire country, through continuous implementation of the Unified Mapping Project.•

NEWS

Enhancing NAMRIA's nautical charting capabilities with GIS for the Philippine Geoportal

by Ltjg. Bai Dyanna G. Sinsuat[1]



A portion of PH4SBY40 (Subic Bay ENC) loaded into the Maritime Chart Server with the Philippine Geoportal base map

In the map gallery of the Esri User Conference held at the EDSA Shangri-La Hotel Manila on 24-25 September 2014 was featured nautical chart 4256-A (Batangas Bay and Vicinity). This chart was compiled using ArcGIS for Maritime Charting. The milestone use in NAMRIA of a GIS software for the compilation of the nautical charts produced in its Hydrography Branch (HB) has its roots in the previous year.

Mr. Rafael A. Ponce, Global Maritime Business Development Manager of the geographic information system company Esri, visited NAMRIA HB office in San Nicolas, Manila on 03-05 July 2013 to officially introduce ArcGIS for Maritime Charting (formerly Nautical Solution). Mr. Ponce served the Mexican Navy for 24 years and was the former Deputy Director of Hydrography and Cartography of the Mexican Hydrographic Office. During the kickoff meeting he said, "I'm so excited for you guys to use ArcGIS. ENC [Electronic Navigational Chart] compilation will be easy and convenient."

A series of HB trainings followed which were facilitated by Geodata Systems Technologies Inc., with participants from the Nautical Charting Division (NCD). Mr. Geoffrey Gomez, Esri GIS Technical Specialist for ENC and Ms. Andrea Lindblad, Esri GIS Technical Specialist for Charting, were the primary resource persons for the capacity-building program that lasted almost two months and consisted of lectures and workshops. Mr. Gomez was the instructor for the lecture on *Introduction to ArcGIS for Maritime Charting* and workshops on *Data Migration and Desktop Production of ENC* and *Enterprise Production of ENC.* Ms. Lindblad was the instructor for the lecture on *Cartography with ArcGIS for Maritime* and the workshop on *Paper Nautical Chart Configuration and Production Support.*

The NCD aims to compile all new charts using ArcGIS and integrate them in a single nautical database, referred to as the Nautical Information System (NIS). Moreover, ENC data will be loaded in the Maritime Chart Server, which was presented by Esri Global Project Manager, Mr.Tom De Puyt on 05 September 2013. Currently, five ENCs (Central Visayas, Luzon, Manila Harbor, Port of Dumaguete, and Subic Bay) are in the Maritime Chart Server together with the Philippine Geoportal base map. This web application can be accessed within NAMRIA, which allows the user to get information on the features depicted on the ENCs such as aids to navigation and depth values. It is mainly intended for

[*] *Chief of the ENC Section, NCD-NAMRIA HB*

information dissemination and not for navigational use. The rest of the published ENCs as well as the nautical chart index will also be loaded to complete the Maritime Chart Server. For 2015, the NCD is targeting a total of eight nautical charts to be compiled using ArcGIS. ENCs and the corresponding paper charts of Port of Caticlan, Port of Loon, Port of Tubigon, and Romblon Harbor will be the pilot projects.

ArcGIS for Maritime Charting is a relatively new software in nautical chart compilation. The ArcGIS platform, however, has itself been among the pioneers in the GIS industry. The conventional chart compilation workflow implemented in NCD begins with paper chart compilation, and then conversion to ENC format and compilation. In the ArcGIS setup though, ENCs are created first from which paper charts will be derived. This is a significant transition because it will not only require adaptability in the use of the new software, but will also serve as an opportunity to raise the competencies of NAMRIA's nautical chart compilers. ENC compilation is different from paper chart compilation and it complies with a separate International Hydrographic Organization (IHO) Standard (S-57 Transfer Standard for Digital Hydrographic Data). This is because the primary use of an ENC is for the Electronic Chart Display Information System (ECDIS) for navigation. Therefore it is necessary for all of NAMRIA's chart compilers in order to be capable of ENC compilation to become efficient in this new setup. It may seem challenging, but it can actually be a means of giving importance and recognition to the proficiency of the agency's cartographers.

With the ArcGIS framework, it is anticipated that nautical chart production will become seamless and expedited. The Philippine Geoportal is indeed right on track as the maritime industry advances to cutting-edge navigational technology.•

Present in the GIS forums during the 2014 Philippine Esri User Conference were, from left to right: NCD-NAMRIA HB Officer In Charge, Engr. Tita P. Cruz; Geodata GIS Specialist, Mr. Leonard L. Luz; and Ltjg Bai Dyanna G. Sinsuat and PO3 Raquel F. Hiponia also of NCD.

Mr. Gomez demonstrates ArcGIS for Maritime Charting production tools to the NCD trainees at the NAMRIA-HB office

Ms. Lindblad (in white also in photo inset) with the NCD and Geodata staff during the paper chart production workshop at the NAMRIA-HB office

SN2 Ruel B. Macayan (NCD staff) compiled chart 4256-A Batangas Bay and Vicinity using ArcGIS for Maritime Charting.

NEWS

NAMRIA takes part in Emergency Warning Broadcasting System Project

*by Leus C. Cortez**

Emergency Warning Broadcasting System (EWBS) is a digital system used by the Japanese government to warn people in case of possible natural calamities such as typhoon, tsunami, hurricane, cyclone, and earthquake and even an unnatural calamity such as an economic crisis. EWBS was developed by Japan to help people prepare on the possible calamities that will occur. The United States developed a system similar to EWBS and named it *Emergency Alert System* (EAS) with the same function as EWBS. As a support to the Philippines, the Japanese government sponsored and conducted training and proved initial equipment on Digital Terrestrial Transmission equipped with cloud-based system and EWBS.

The main agencies involved in the project are People's Television 4 Network, Inc. (PTV4), Office of Civil Defense-Department of National Defense, DOST, and Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA)-DOST. They invited other government agencies including NAMRIA to participate in the project. Selected staff of the Geospatial Information and Communications Technology Division (GICTD)-GISMB participated in the training on the project held at the PTV4 office in Visayas Avenue, Quezon City on 28-31 October 2014.

The main function of using EWBS is to gather and deliver critical information of an impending disaster to help prepare for emergencies. Broadcasting is the fitting medium for delivering information since it is not congested and a higher frequency bandwidth may be used. Digital transmission is also known for its reliability when it comes to communication. This is because of noise reduction and other interference cannot easily interrupt the information signal.

EWBS operates by collecting data from various government agencies after an emergency bulletin is issued from a specific agency. In the Philippines, it would be the National Disaster Risk Reduction and Management Council (NDRRMC). EWBS will then process the data on cloud system and generate an alert for the news center to broadcast. The news center for the Philippines is PTV-4. EWBS will send a signal to the television station to broadcast the information, which will be received by a set-up box to decode the signal for compatibility and trigger the devices that are adapted to the system, which will automatically turn on as the message or warning for broadcast. An alarm will sound to catch the people's attention, followed by an emergency bulletin of the disaster.

As digital broadcasting is gradually implemented, EWBS signals are multiplexed with the broadcast signals. Digital telecasts are sent to mobile phones and other mobile devices thru the cloud system by means of the internet to warn for impending disasters or emergencies. The EWBS project will continue its development in accordance with the project timeframe presented during the training. The next technical training will be held in January 2015.•

Usec. Alexander P. Pama of NDRRMC (7th from left) with the Japanese representatives of the Ministry of Internal Affairs and Communication and NEC Corporation to introduce the pilot EWBS Project on Digital Terrestrial Televisions at the PTV4 office in Quezon City

*Engineer II, GICTD-NAMRIA GISMB

NAMRIA Zimbra Mail

by Rico P. Mendoza[1]

One of the information cascading sessions for the NAMRIA Zimbra Mail—the writer is shown here presenting at the NAMRIA Lecture Hall the basic concepts of email and the use of NAMRIA Zimbra Mail

Electronic mail (email or e-mail) allows us to quickly share information. With its use, internal communication and external communication are streamlined. Transmitting important information and disseminating them are made faster and easier and almost real-time status updates are enabled.

Zimbra Mail is a collaborative open-source email application that includes an email server and web client. NAMRIA's information technology consultants from the Advanced Science and Technology Institute (ASTI)-DOST initiated the adaptation in the agency of Zimbra Mail as the agency's official email application. NAMRIA Zimbra Mail can be accessed via internet thru https://mail.namria.gov.ph. In case internet service is not available, it can still be accessed in local network via https://192.168.8.33 .

The final configuration of the Zimbra mail server took place in January 2014. Email accounts were specifically linked to the NAMRIA Active Directory server where all NAMRIA employee credentials were created. Staff of the GICTD-GISMB, in coordination with the technical staff of ASTI-DOST, also initiated testing through sending and receiving messages.

NAMRIA Zimbra Mail was made fully operational and its use started by key personnel of the agency in February 2014. From this date onwards, the GICTD-GISMB has been exerting efforts to encourage all employees to officially use the NAMRIA Zimbra Mail as their official agency email. To further maximize its usage, a user orientation was included in three information cascading sessions organized by the NAMRIA Human Resource Development Section, Administrative Division-SSB to update all employees on a number of new systems and processes. The sessions were held in the last quarter of 2014. As of December 2014, there are already 500 active users of Zimbra mail in NAMRIA

The basic settings for each NAMRIA Zimbra Mail user account are as follows: 10 gigabytes of disk space for email usage quota and 150 megabytes for email attachment limit. The password to be created should be at least eight characters and contain alphanumeric characters (combination of numbers and letters) and at least one uppercase character. It can also contain symbols or special characters and should not be equivalent to the email account username.

The following are the authorized personnel who can assist in resetting the email password: Roberto L. Callorina, this writer, John Francis M. Gorospe, and John Richard R. Bongalos of the GICTD-GISMB Network Group; and the following NAMRIA branch network administrators: Fatima A. Santos (GISMB), Romel M. Correa (HB), Ferdinand C. Ratum (MGB), and Maria Cecilia G. Espiritu (RDAB). SSB is covered by the GICTD-GISMB Network Group. As in the case of Zimbra Mail accounts, every user credential is dealt with utmost confidentiality. •

[*]*Engineer III, Electronics and Communication Engineer, GICTD-NAMRIA GISMB*

IfSAR...
from page 13

Ground Control Point and Verification Control Point Survey

Pre-positioned Ground Control Points (GCPs) and Verification Control Points (VCPs) were planned, installed, and surveyed using dual frequency, geodetic-survey grade Global Navigation Satellite System receivers. Corner reflectors in the form of trihedral with aluminum sheets were mounted on these locations prior to flight mission. The GCPs were used as reference to orient the IfSAR data to the ground system. The VCPs are independent controls for the verification of horizontal and vertical accuracy of both the ORI and DEM.

Problems such as logistics, access, poor quality site, permits, and security were encountered during the control point survey. A total of 182 single-look and 12 dual-look reflectors as GCPs were installed, while 29 VCPs were surveyed. In the end, only 23 VCPs were used because six reflectors were stolen prior to the data acquisition/flight mission.

Geoid Modification and Datum Transformation

The Philippine local geoid is defined by the local correction table of the established GPS leveling network with respect to EGM2008 provided by NAMRIA. During the IfSAR data acquisition, there was an ongoing development of the Philippine geoid model. With the UMP project, a correction was made to the EGM2008 geoid using GPS leveling benchmarks by fitting a surface model to the GPS leveling benchmarks using the least-squares collocation technique. A total of 154 first-order level points or benchmarks, irregularly distributed with neighboring distance between points of 20 kilometers to 100 kilometers, were used for the modification of the geoid.

Three-dimensional adjustment was done with all the processing in ITRF2008 and with the application of a modified EGM2008 geoid. A two-step 3D datum adjustment using the seven-parameter Helmert technique was developed to convert from ITRF2008 to WGS84 (local) and from WGS84 (local) to PRS92. All of the transformations were performed using a proprietary Universal Projector processing system.

Interferometric Processing

The data processing or Interferometric Processing (IP) component converts the raw radar together with the navigation data into DSM, ORI, and correlation (COR) file. Figure 2 shows the IP workflow.

IP and phase unwrapping software was used to automatically process the raw radar data using navigational data, ancillary calibration files, and pre-defined product-type specific processing parameters. The raw data are divided into smaller segments for ease of data handling before processing. The IP is based on the creation of two single-look images from the two antennas. A complex conjugate image is created to produce the interferogram that facilitates the calculation of the correlation or the variance in phase between the images. The DSM is created based on the measured phase difference and the basic geometry of the radar system. The DSM is then utilized to orthorectify the radar image.

The mountainous areas on the west side of the island presented processing challenges due to the secondary, orthogonal-look coverage, and dense vegetation on steep slopes. The placement, however, of the tie lines in flat terrain and over bare ground controlled the data to well within specification.

Mosaicking of the image data in the coastal lines was also a challenge as the coastal lines are off cardinal and contain a varying percentage of oceans. This mixture of land and water makes the radiometric balancing very difficult. Accordingly, a considerable amount of manual effort went into the strip-to-strip and block-to-block radiometric balancing in order to produce consistent tone over the land areas.

DEM Editing

DEM editing is an interactive process to remove noise and radar artefacts, hydro-enforcement (i.e., "flatten" water surfaces) of rivers, and transform DSM to DTM or remove vegetation and structures from the DSM. Intermap used its own stereo DEM editing software called *Interferometric Editing System* (IES), a fully integrated DEM editing system. The major components of IES are the interactive editing tools, and a geospatial database that tracks all map sheets, editors, and quality matrices throughout the editing process.

The process involves *occluded areas mask formation* that differentiates the bare earth area from the occluded areas which are typically vegetative cover and urban areas. The elevation points in the occluded areas are substituted with those derived from ancillary DTM data that have been horizontally rectified and vertically adjusted to match the surrounding radar data. In case ancillary data are not available, a combination of manual editing through the compilation of form lines and interpolation is applied to the occluded areas. The ORI, DSM, and COR files were analyzed to establish a water mask. The water mask is then fine-tuned by an operator and utilized to flatten water surfaces to ensure that rivers are monotonic within the elevation products, and to ensure that no shoreline posts are lower than the adjacent water surface elevation. The data are edited at 3D workstations equipped with high-resolution stereo-viewing

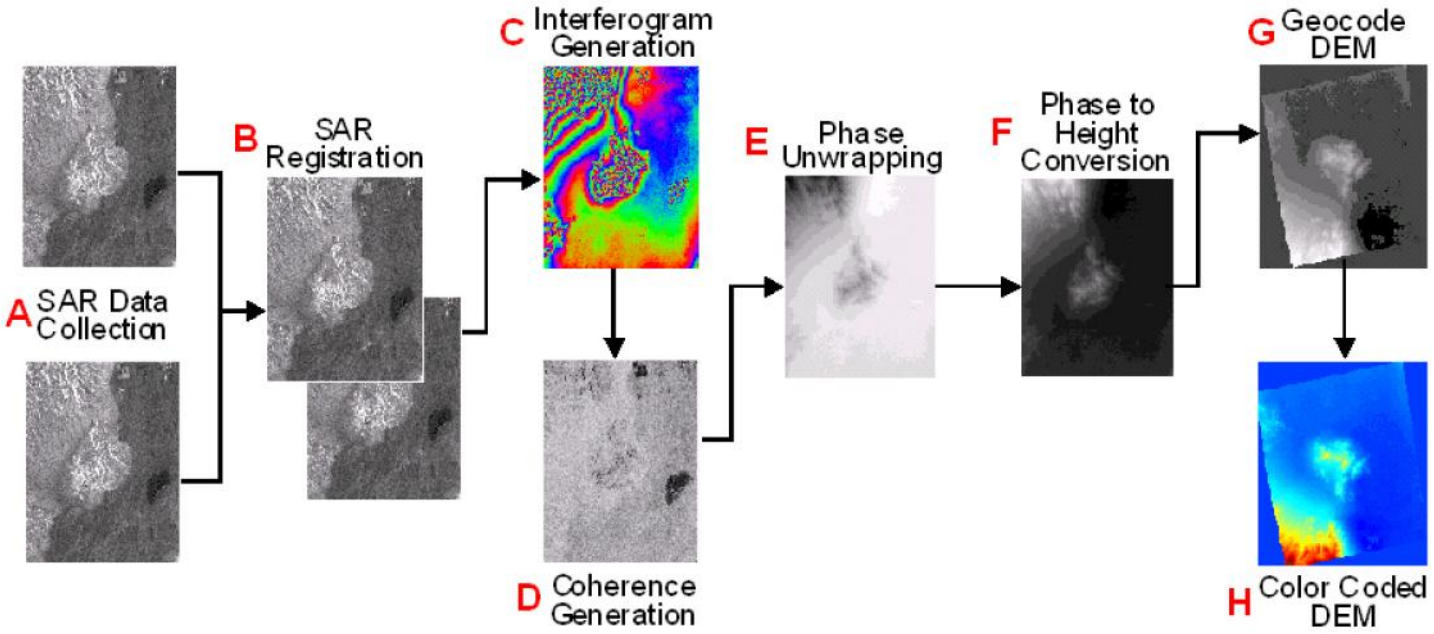


Figure 2: Interferometric Processing Workflow

capability based on liquid-crystal-display shutters. The degree of editing is based on the product specification. The edits are necessarily different between the DSM and the DTM but the hydrographic features are transferred from the DTM to the DSM so that the products are consistent. The difference in the DTM edit is that artificial features are removed to facilitate the network flow. Single-line drains are classified in a manner similar to roads and they are edited to flow. An independent team reviewed the final DSMs and DTMs for accuracy and consistency.

The main issues experienced in the editing phase were the rice paddies, fish farms, and ocean shorelines which were time-consuming and required manual editing. Extensive deforestation due to agriculture, oil palm plantations, etc., caused the level of effort to increase relative to previous experience. The deforestation took place in patches which meant that the Shift Edit tool could not be used to produce the DTM to the extent that is normally done. Since there were no real ancillary DEM data to use as a guide, the editors had to use completely manual edit solution. The vegetated mountains contained deeply incised valleys and sharp ridges which meant that many manual vectors were needed to produce the DTM.

Quality Control

Intermap, a company certified under ISO 9001:2008 QMS, has developed an extensive array of acceptance-testing procedures and parameters associated with each stage of production. All of the production processes with detailed work instructions, testing procedures, and parameters are fully documented.

A comprehensive quality control (QC) procedure was performed on interim IP products. The five stages of QC are outlined in Figure 3. They are performed on segments which are cut from the flight strips. Rejection criteria have been defined inside each QC step to ensure that the final data meet product specifications before being merged together into map tiles.

Independent of the production processes, a validation and verification group performed extensive checks and reviews of the data such as redundant re-processing of the GPS data and the navigation solution, and redundant processing of the ground control data using Australian Online GPS Processing Service and the Precise Point Positioning method. Comparison of the data to establishment-surveyed check points, an independent review of the editing of the tiles to ensure that the stipulated rules were followed and that the editing was done consistently, and thorough comparison with existing ancillary maps were done.

Accuracy verification is performed by comparing the VCP areas against the IfSAR data. Only 23 of the 29 surveyed VCPs were visible in the ORI and tested for accuracy. The results of the assessment are shown in Table 1.

Available large-scale maps of NAMRIA and additional survey checkpoints were also used and collected, covering selected areas to verify the accuracy of IfSAR data. The results proved that the IfSAR data were well within the accuracy requirements stated in the TOR.

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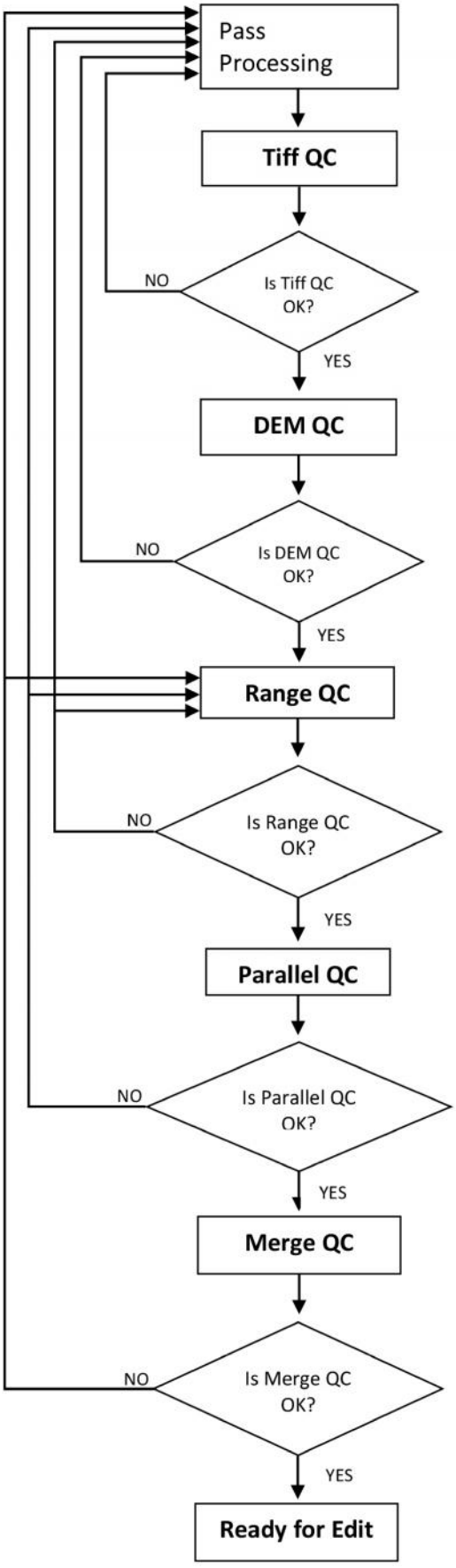

-Set up and process tie lines using primary lines and GCPs as reference.

-View the image to ensure that there are no obvious visible ambiguities, missing data, and other visible anomalies.

- Assess the elevation data for phase unwrapping errors which create height errors within large areas of the segment

-Examine range profiles of orthogonally overlapping radar data segments to check for vertical agreement and to model and correct for slight differences.

-View height difference profiles taken along track in the lateral overlap between passes.

-Verify that merged segments have produced a final product that is free from seam lines and other anomalies.

Figure 3: *Interferometric Processing and Quality Control*

	HORIZONTAL ERROR (in meters)		Vertical Error (in meters)
	X	Y	Z
Minimum	-1.4	-0.82	-0.99
Maximum	0.99	0.51	1.14
Mean	-0.12	-0.08	-0.06
Standard Deviation	0.6	0.4	0.45
Root Mean Square Error	0.61	0.41	0.46
CE95/LE95 (The circular standard error at the 95% confidence level: linear error at the 95% confidence level)	1.1		0.97

Table 1: Accuracy verification results

Actions Summed Up and To Date

Under the UMP of NAMRIA, homogeneous, seamless, and high-resolution DSM, DTM, and ORI were produced for the Philippines. A successful airborne IfSAR mission was conducted from 19 March to 01 July 2013 which covered approximately 300,000 square kilometers. Despite operational difficulties in securing civil aviation permits and aircraft import/export security permits, the assignment of security personnel, problems on logistics and access for the ground surveys, and aircraft mechanical problems, the entire project was completed within the prescribed period of 11 months. It was achieved through close collaboration among Intermap, Certeza, and NAMRIA in the provision of access to information and in the immediate making of crucial decisions during the implementation of the project.

The IfSAR-derived DEM and ORI are now being used in the orthorectification of very high-resolution satellite imagery to produce seamless orthoimages and line maps at 1:10,000-scale accuracy level for the entire country. These products have been distributed and are now being utilized by different government agencies like DENR and its bureaus and attached agencies—Ecosystems Research Development Bureau, Forest Management Bureau, Laguna Lake Development Authority, Mines and Geosciences Bureau, and National Water Resources Board; DOST and its attached agencies—PAGASA and PHIVOLCS; and Project NOAH (Nationwide Operational Assessment of Hazards) of DOST for applications relating to climate change mitigation, disaster-risk reduction and management, and environmental protection. Some LGUs were also provided for use as reference in the preparation of land-use plans and development planning activities. Likewise, the academe conducts various researches using IfSAR DEM as basic reference data. The availability of high- quality DEM must be exploited to address the urgent demanding needs of a wide range of geospatial applications for the country.•

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Land-Use Mapping...
from page 19

Level 1	Level 2
Area of Interest	Developable land areas
Area of Interest	Non-developable land areas
Area of Interest	Water areas

Table 1: Level 1 and Level 2

Level 3	Level 4	Level 5	HLURB
Urban Settlement	Formal Settlements	Mixed Residential and Small Commercial	General Residential Zone
Urban Settlement	Formal Settlements	Subdivisions/Villages	Residential – 1 (R-1) Zone
Urban Settlement	Formal Settlements	Medium Density Residential	Residential Maximum – 2 (R-2) Zone
Urban Settlement	Informal Settlements	Mixed Informal Settlements – Class A	Residential Basic – 3 (R-3) Zone
Urban Settlement	Informal Settlements	Mixed Informal Settlements – Class B	Residential Basic – 3 (R-3) Zone
Business Areas	Small Commercial	Retail	Commercial – 1 (C-1) Zone
Business Areas	Major Commercial	Mixed Major Commercial	Commercial – 2/3 (C-2/3) Zone
Business Areas	Major Commercial	Major Markets	Commercial – 2/3 (C-2/3) Zone

Table 2: Example of Level 3-Level 5 Land Uses and Equivalent HLURB Land Use

imageries. Online and crowd-sourced maps are also great sources of supplementary information.

Land-use mapping is hardly an automated process. The goal of this process is to be able to delineate the boundary of a particular parcel or group of parcels based on the actual land use and provide the correct attribution based on the defined exposure information database schema.

Land-Use Editing

Updating the land-use map involves editing of both spatial- and non-spatial data, and executing quality checks to ensure the integrity, consistency, and accuracy of exposure information database. In the Bridging Project, data available from GMMA RAP were used to carry out spatial- and non-spatial enhancements in the land-use map of the City of Muntinlupa.

Spatial Data Updating

In order to facilitate editing, the whole City of Muntinlupa was divided into 26 editing zones. This allows manageable handling of data among several operators. The editing zones were created in such a way that the borders of each zone runs along the center lines of well-defined roads and waterways. This is to avoid cutting across buildings and land-use polygons, therefore avoiding possible issues during the merging of land-use polygons.

Using the 2011 aerial imagery as backdrop, land-use editing was done by further splitting the land-use polygons along the boundaries between different land uses. Land-use editing was done in ArcGIS by both PHIVOLCS and NAMRIA, while the LGU, being more familiar with the area, provided guidance in validating the actual land use. The actual presence of the LGU also provided valuable information in the delineation of the barangay boundaries in the City.

Several issues were pointed out in GMMA RAP data which were given due attention in the process of land-use editing. Some of those identified were missing polygons, roads that have not been delineated, and internal roads which have been regarded as non-developable land areas (see Figure 3).

Non-Spatial Data Updating

Land use and other attributes were also updated while editing the spatial data. The following are the field/attributes that should be supplied in the process:

Level 5 and Level 4 land-use attributes – This dropdown list of land uses facilitates the selection of the actual land use.

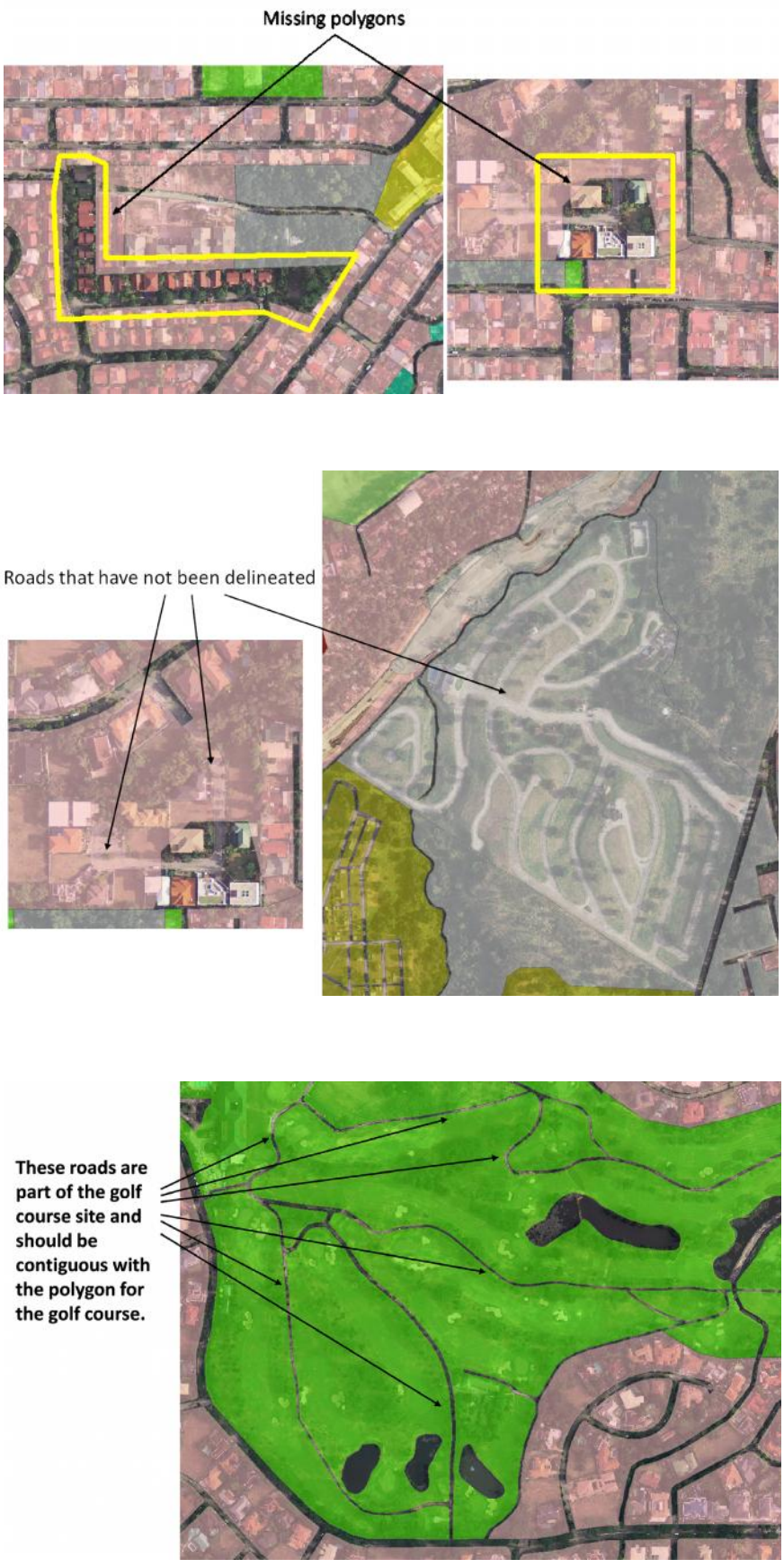

Figure 3: Examples of Spatial Data Issues in Land-Use Editing

Name – If applicable, the name of the facility, school or institution associated with the delineated land use is provided.

Source of Information – This indicates the sources of information for a particular land use. This includes the Metro Manila imagery of 2011 which was used as backdrop for the land-use mapping; and any other sources for the name field/attribute which may include online mapping sources.

Quality Checking of Spatial Data

Using one of the data management tools developed, topology check was undertaken to ensure the integrity of the land-use dataset. This includes checking for polygon overlaps, polygon gaps, slivers, and irregularly shaped polygons. Manual enhancement was also done to correct these errors.

Validating Land Use against Population Data

The correctness of the land-use mapping was further confirmed using the population data from the 2010 Census of Population and Housing from the National Statistics Office (now Philippine Statistics Authority [PSA]). On a per-barangay basis, the distribution of population was cross-checked across land uses in the area. This helps further refine the land-use classification in order to come up with a land-use map that is reflective of the population size per land-use area in each barangay.

Data Management Modules

Data management tools were created, as part of the enhancement of the Bridging Project, to facilitate the workflow in land-use mapping. The following tools were developed in the ArcGIS environment using Model Builder.

Create Master File Geodatabase and Add Domain Tables – It is a tool that (a) creates the master file geodatabase that will contain the land-use shapefile; (b) copies the land-use classification excel worksheets into the geodatabase and stores them as file geodatabase; and (c) creates domain tables.

...continued on next page

Import Existing Land-Use Shapefile and Prepare for Updating – It is a tool that prepares the land-use shapefiles for editing. It initially creates a feature dataset that will contain the following: (a) land-use feature class where the land-use classification attributes/fields (e.g., L4_L5_COMB, HLURB, HLURB_EQ, L3_USE, L2_USE, and L1_USE) are appended; and (b) topology which holds topology checks on the land-use shape files based on defined topology "must not overlap" rule. The land-use shape files are validated for the occurrence of overlapping polygons.

Split Repaired Land-Use Polygons into Editing Zones – It is a tool used to facilitate editing of the land-use polygons. Based on pre-defined editing zones, the area of interest is split into manageable chunks of data which are delegated to several editors.

Create Feature Dataset to Store Merged Land-Use Polygons – It is a tool that creates a new feature dataset that will contain the updated land-use polygons and its topology. The cluster tolerance value is set to 0.5 to eventually check areas where vertices do not snap or where slivers are present.

Add Feature Class to Topology and Validate – It is a tool that requires the topology created in the previous step as input together with the updated land-use polygons. It runs the validation/topology check based on defined topology "must not overlap" rule. The results of this validation can be viewed, examined, and edited in ArcMap.

Create Non-Developable Land and Water Area Polygons – It is a tool that creates the non-developable land and water area polygons by taking the symmetrical difference between the area of interest (dissolved editing zones feature class) and the land-use polygons.

Convert Land-Use Feature Class to Shapefile and Translate Codes – It is a tool that translates the land-use codes into their long names and converts the land-use feature class into a shapefile.

Way Forward

Existing national laws such as the Philippine Disaster Risk Reduction and Management Act of 2010 (RA 10121) and the Climate Change Act of 2009 (RA 9729), and regional and global agreements recognize the importance of information systems such as geographic information in support of disaster risk reduction and management. The laws provide an opportunity to develop a nationally consistent and current exposure information system that will help locate, characterize, and quantify what is at risk across areas transcending political boundaries in the event of a disaster.

The advantage of developing a national exposure information system is that it provides a single point of access, thus resulting in reliable and consistent information for the responsible authorities who need them. The idea is to integrate the current efforts of various national and local government agencies by establishing a governance framework that will clarify the roles and responsibilities of the various stakeholders. These roles and responsibilities may be in the form of data provision, technical skills, coordinating abilities, subject matter expertise, and policy insights, among others. These will also help eliminate fragmentation and duplication of effort.

At present, a number of exposure databases geared towards supporting risk analysis and climate change vulnerability assessment have been developed. Among these are the Rapid Earthquake Damage Assessment System, a seismic hazard and risk assessment tool of PHIVOLCS-DOST; Climate and Exposure Database (ClimEx.db) records population, economic data, education, infrastructure, environment, and health with the end view of understanding disaster risk in a changing climate; Climate Change and Disaster Risk Information System Project, a regional GIS Network to integrate and facilitate data exchange in local development planning and support decision making for Climate Change and DRRM issues; and the GMMA RAP Exposure Database for 17 LGUs in Metro Manila and portions of the Rizal Province. Potential rich sources of data are the PSA for population and housing, the LGUs for the real property and building tax assessment and community-based monitoring system, and the Philippine Geoportal which can provide a platform for uploading and sharing a nationally consistent exposure information.

Learning from the lessons of previous exposure information initiatives, the development of a national exposure information system can be implemented in different approaches:

Top-down approach – Here, the development of the national exposure information system and buildup of database shall be the responsibility of the national government.

Bottom-up exposure information – This leaves the development of the system and buildup of information to the LGUs. The national government agencies concerned with disaster risk reduction and climate change adaptation shall provide the framework for the development of the exposure information system which includes technical and data requirements.

Combined top-down and bottom-up exposure information development – This envisions the development of the system and exposure database as the responsibility of the national government while the population of the database is a combined effort of the national, provincial, and local governments as well as the private sector.

Exposure information by crowd sourcing – This totally relies on the contributions of volunteer sources for the characterization of exposure information.

The combined top-down and bottom-up approach seems to be the practical option in setting up a national system. This however does not come without facing challenges such as differences in understanding of terms and concepts, existence of overlapping efforts in the collection and management of exposure data, access and sharing of information, responsibility for data production, and legislative and structural barriers. On the other hand, these challenges open up opportunities for strengthening existing agency roles and mandates, enhancing existing and developing new agency capabilities, recognizing existing capabilities in exposure information, harmonizing current exposure activities, and underlining the importance of building foundation spatial data.

The complex nature of this multiagency/multisectoral system should be spearheaded by an individual or an agency with the critical function of advocating its establishment, leading its development, and articulating the benefits of the availability of a national exposure information system.

In summary

As a country highly exposed to natural disasters, there is a need for Filipinos to understand the potential risks we are facing even before a disaster strikes. Thus, there is also a need to understand hazards, the elements exposed to the hazard, and the vulnerability of the exposed elements. The Enhancing Risk Analysis Capacities for Flood, Tropical Cyclone, Severe Wind, and Earthquake Hazards for GMMA-RAP and the GMMA Risk Analysis (Phase II) Bridging Project provided a learning experience for the CSCAND agencies in conducting evidence-based disaster-risk analysis and vulnerability assessments. These paved the way for the development of a spatially-enabled repository of exposure information containing population information, and building information on formal and informal settlements, and commercial, industrial, and other critical facilities in the GMMA area.

Exposure information development can be undertaken through the feature-based approach or the area-based approach. Although the feature-based approach is seen as an ideal model for exposure information development, the current situation does not seem to fully support this. Besides the deficiency in appropriate and complete detailed information at the feature level, recording each element as point, line, or polygon is deemed as an extensive and arduous task. Thus, the area-based approach is viewed as more achievable and practical to maintain. In a highly urbanized and complex area like GMMA, the area-based approach demonstrated an efficient means of building exposure data on buildings and population.

The framework of an area-based approach exposure information is in the development of an accurate, consistent, and reliable land-use map. The land-use map, in this context, refers to the current and actual use of a portion of land. This should not be confused with the land-use plan, which is a document dealing with the appropriate uses of land in a given area where a single land use may have in actuality different activities.

Exposure information development potentially has other uses outside its initial intended use as input to risk analysis calculations. Depending on the level of detail, exposure information databases are rich sources of information that could be used in other GIS-based activities at the local level such as the development of a comprehensive land-use plan, monitoring compliance with zoning ordinance, law enforcement, environmental planning and management, economic development, and development of community safety programs, among others. On one hand, national government agencies can take advantage of such information sources in the delivery of basic social and other essential services.•

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