Inf mapper

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Delineation of Municipal Waters

There Should Be *No* Doubt about *DAO 17*

by Enrique A. Macaspac

The boundaries of Philippine municipal waters will now be known by Filipinos because they are being delineated for the first time nationwide, through Department of Environment and Natural Resources (DENR) Administrative Order number (No.) 2001-17. Relative to the effective implementation of Republic Act (RA) No. 8550, otherwise known as the Philippine Fisheries Code of 1998, the importance of delineating municipal waters can be gauged from direct reference to "municipal waters" in 23 sections of RA 8550. Pursuant to Section 123, DENR promulgated the guidelines for delineating and delimiting municipal waters embodied in what is now popularly known as *DAO 17*.

A year after it was issued in June 2001 by DENR, DAO 17 still makes waves, reaching even the august halls of Congress and Malacañang. Attempts to stop the implementation of DAO 17 continue. *Who is afraid of DAO 17?* Commercial fishers want DAO 17 nullified, other sectors want it reviewed. Immediately after its issuance, the legality of DAO 17 was questioned in July 2001 before the Regional Trial Court of Malabon City by commercial fishers who withdrew their case, however, before the Court could decide. The Committee on Appropriations of the House of Representatives had DAO 17 sent to the Department of Justice (DOJ) for an opinion, also on questions of its legality. Even the Bureau of Fisheries and

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Configuration of a Municipality

1 - Municipality without islands
2 - Municipality with islands
3 - Municipality composed of islands
4 - Island municipality

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Contributions

The ***Infomapper*** is accepting contributions for its forthcoming issues. Manuscripts should be typed and double-spaced. Please include the author's name, position, and office. Photographs and illustrations with captions are also welcome. The editors reserve the right to edit materials submitted.

Editorial

DAO 17: A Battle at Sea

DAO 17 has tested the waters! After it roughly sailed through a sea of protests, it finally saw itself breaking the wild waves and cruising toward the calm horizon. Now fervently received by the local government community, DAO 17, through NAMRIA, has delineated 45 provinces. Complete delineation is expected in July 2002.

DAO 17 contains the guidelines in delineating and delimiting municipal waters. It was issued in June 2001 pursuant to RA 8550, otherwise known as the Philippine Fisheries Code of 1998. Issues, concerns, and apprehensions ran high during the introduction of DAO 17. They variably ranged from, among others, technical to emotional, national interest to personal, economic to environmental, and, well, serious to trivial. However, these did not stop DENR-NAMRIA from implementing the guidelines.

On the one hand, commercial fishers and some of their powerful allies in both the legislative and local government sectors took the "antagonist" stance. Their mounting opposition to DAO 17 arose from the allegedly (mis)interpretation of the law by NAMRIA and their understanding of some of its provisions. The protest revolved around the 15-km limit of municipal waters set by the Fisheries Code. Adding fire to the controversy was the application of the archipelagic principle in defining the boundary of municipalities with offshore islands, which reckons the 15-km boundary from the coastline of the municipality's farthermost island (*NAMRIA Newsletter, January-March 2002*). So what is left with them, for them?

On the other hand, taking the "protagonist" position are the community fishers who found in the DENR their staunchest ally. While it is true that DAO 17 restricts commercial fishers and gives preferential use of municipal waters to community fishers, it is equally true that the coastal resources are protected (*Newscoop, 23 May 2002*). Protected from what, from whom?

The responsibility of protection now rests on the shoulders of the local government officials and the local fisher folk. They become protectors by virtue of the law. It therefore follows that the main issue now is the real implementation of DAO 17. While the community fishers enjoy the bounty within their territorial limit, the commercial fishers drool in envy. In order to operate within the protected territory, commercial fishers have to secure permit from the local government. Any poacher for that matter becomes a violator. And it goes without saying that any violation has to be dealt with accordingly.

DAO 17 has drawn out a two-cornered fight, a "battle at sea" between the protectors and the poachers. The protectors can claim readiness anytime, but are they prepared? The protectors can be extra aggressive, but for how long? The poachers generally have the resources, will our protectors give in?•

Editors' Note: Due to space constraints, we cannot publish the references consulted for the articles for this issue. Interested individuals may avail of the lists from the authors or the editors of this publication.

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From Analog, to Digital Chart, to ENC: A Major Challenge

by Lt. (sg) Rosalino C. delos Reyes[1]

With the increasing demand for accurate, reliable, and updated chart data, new technologies were developed to supplement the tools used by mariners during navigation. The requirement for digital data thereby increased dramatically. Standards and specifications became the common language of users and producers of these products. The introduction of the Electronic Navigational Chart (ENC) and the Electronic Chart Display and Information System (ECDIS) elicited varied reactions and arguments from users and hydrographic offices around the world. Issues and questions were asked by different sectors, some of which are still unanswered at this time. The International Hydrographic Organization (IHO) created several committees and working groups, developed standards and specifications, as well as sponsored meetings and conferences to address the issues.

The International Maritime Organization (IMO) developed the performance standards for ECDIS. The ECDIS is a navigation information system which, with adequate backup arrangements, can be accepted as complying with the up-to-date chart required by Regulation No. V, Chapter 20 of the 1974 Safety of Life at Sea Convention. The ENC, on the other hand, means the database (standardized as to the content, structure, and format) issued for use with ECDIS on the authority of government-authorized hydrographic offices. The ENC contains all chart information necessary for safe navigation, and may contain supplementary information such as sailing directions, in addition to that contained in the paper chart.

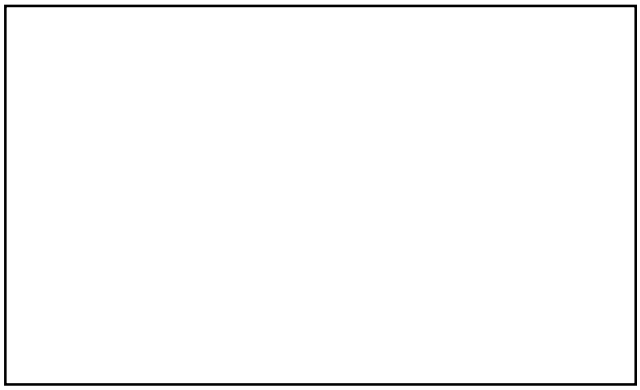
In 1996, the Coast and Geodetic Survey Department (CGSD) of NAMRIA acquired an initial batch of hardware and software for use in the conversion from analog to digital format of 178 paper charts maintained by the agency. Training was provided to 12 members of the department staff in the different software modules of the Computer-Aided Resource Information System. A year after the introduction of digital cartography, the digitization of paper charts was already at full swing. To date, about 65 percent of the total number of paper charts has been converted into digital format.

Issues and Challenges

The present challenge to CGSD of NAMRIA, which represents the country in the IHO, and the rest of the hydrographic communities worldwide, is to produce digital data products that support the ECDIS and other electronic chart systems. Shifting from digital paper chart to ENC is not an easy task. Even countries in Europe, the United States, Canada, and Japan struggled to develop and produce their ENCs. The Philippines is no exception.

The IHO, in conjunction with the IMO performance standards, formulated technical standards for digital-data format and display to set a common standard for ENCs. IHO Special Publication No. 52 (IHO S-52) contains the IHO specifications for chart content and display of ECDIS. It includes appendices describing the process for updating, color, and symbol specifications and a glossary of ECDIS-related terms. IHO Special Publication No. 57 (IHO S-57) is the IHO transfer standard for digital hydrographic data. It includes an ENC product specification, theoretical data model, data structure, object class, object catalog, and ENC updating profile. These two standards (IHO S-52 and S-57) are specified in the IMO performance standards for ECDIS.

CGSD eventually realized the great difficulty for its ENC production. Even if ENC was already a byword at the time of its introduction in the Philippines, through the department, it still was not clear among the organization's technical people how ENC works, its functionalities, and how it is produced. Finally, after efforts spanning several years, CGSD succeeded in getting a grant-in-aid from the Japanese government thru the Japan International Cooperation Agency (JICA) for the research and development of ENC in the country.



Sample ENC loaded in ECDIS

With the signing of the memorandum of agreement (MOA) between NAMRIA and JICA in June 2000, the task of producing the first ENC for the country became a reality. The CGSD management selected from among its technical personnel and composed a core group to become part of the project. The initial ENC production of a small-scale chart and a large-scale chart would respectively cover, as the selected pilot areas, the northwestern part of the country (from Manila Bay up to the northern limit as specified under the Treaty of Paris) and Manila Harbor.

File Preparation and Conversion

The initial training stage conducted by a Japanese ENC expert focused on, among others, the familiarization with the Linux operating system and the SevenC's software. The first step undertaken in ENC production is the preparation and coding of paper charts. The resulting digital file, an interchange *ntx* file, is then converted to a format readable to the SevenC's software utilized in the CGSD. Data interpretation of certain features on the paper chart or in the *ntx* file may be difficult in some instances. The reason can be due to the limited amount of information about an object visibly displayed on a paper chart that can be portrayed on an electronic chart using feature codes. Since the data used in the ENC compilation comes from the digitized paper chart, others might get the impression that the accuracy and the amount of infor-

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[1] *Senior Hydrographic Engineer and Officer-in-Charge, ENC Development Unit, Hydrographic Survey Division, NAMRIA CGSD*

There Should Be...
from page 1

Aquatic Resources (BFAR) of the Department of Agriculture (DA), the lead implementor of RA 8550, earlier endorsed the guidelines, organized and sponsored a number of workshops for its fishery resources management projects, but later objected to the delineation procedures.

At the Commission on Appointments, DAO 17 has become an issue against the confirmation as DENR head of Secretary Heherson T. Alvarez. He, however, appears unshaken in his position to continue the implementation of DAO 17.

To date, there exists no legal impediment in implementing DAO 17. DA-BFAR which was at first not in agreement with DAO 17 is now behind it. DAO 17 had already previously gained the support of other government agencies concerned, including the Department of Interior and Local Government (DILG), the League of Municipalities of the Philippines (LMP) and other local government units (LGUs), non-governmental organizations (NGOs), people's organizations (POs), and the academe.

But what is this DAO 17 that had Indonesian Minister of Marine Affairs Rokhmin Dahuri congratulating Secretary Alvarez for signing it?

Development of DAO 17

Signed on 11 June 2001 by Secretary Alvarez, DAO 17 is the implementing tool in delineating municipal waters in accordance with Section 4, subsection 58 of RA 8550. Published on 21 June 2001, it took effect on 06 July 2001 for municipalities with no island and 06 January 2002 for municipalities with island/s (Section 9, DAO 17).

DAO 17 was reviewed and revised by a group including NAMRIA, DENR, DA-BFAR, the Maritime Group of the Philippine National Police, LMP, and the Philippine Center for Marine Affairs, Inc. DAO 17 was pilot-tested and prior to its approval, presented to government agencies concerned, LGUs, NGOs, and POs.

The DENR Coastal Environment Project-Coastal Resources Management Project workshop in Cebu City in May 1999 spurred the drafting of the guidelines. At that time, requests for delineation of municipal waters from LGUs were already starting to pour into NAMRIA. Before it came into force, DAO 17 spanned three DENR and three NAMRIA administrations from 1999 to 2002. Among the past DENR Secretaries who gave the guidelines their strong support were Secretary Antonio H. Cerilles and Acting Secretary Joemari D. Gerochi. Former NAMRIA Administrators Liberato A. Manuel and Isidro S. Fajardo rallied behind DAO 17 even at the risk of earning the ire of opposing groups. New Administrator Diony A. Ventura, who assumed his post in the thick of the controversy and implementation of DAO 17, has also expressed his full support to the administrative order.

The development of the guidelines into an administrative order snowballed after the holding of a seminar-workshop organized by BFAR Regional Office No. 11 on delineation of municipal waters in the Davao Gulf in September 1999. The Davao Gulf experience, where the LGUs themselves delineated their municipal waters with the technical assistance of NAMRIA, was used as a model for the succeeding seminar-workshops. It was also after this exercise that the methods of delineation were refined with the introduction of the *Enrique A. Macaspac Concentric Circles Method of Determining an Equidistance Line in Maritime Boundary Delimitation*, with its first application on delimiting municipal waters between adjacent or opposite municipalities.

Methods of Delineation

The configurations of municipalities and the shapes of coastlines (Figure 1) in the country were important considerations when the guidelines were being prepared. The perpendicularity of the lines drawn from the general coastline of a municipality and the

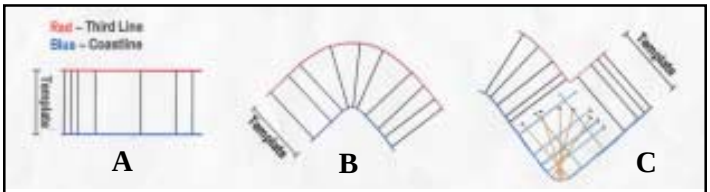


Figure 1. Shapes of Coastlines and Procedures in Delineating Municipal Waters

A. On a straight coastline, the third line can be determined from just two ends of the general coastline.

B. On a protruding coastline, the third line will be determined from more than two points on the general coastline. Every perpendicular line drawn will be considered in the delineation.

C. On an indented coastline, the third line will be determined from more than two points on the general coastline. Perpendicular lines drawn from points on the dent do not contribute to the delineation.

General Procedures:

1. *On points along the general coastline, position the template in such a way that its coastline-end coincides with a segment of the general coastline.*
2. *Prick the offshore end of the 15-km (perpendicular) line on the chart/map being used for delineation.*
3. *Join the (pricked) points. The line connecting these points becomes the offshore limit (third line) of the municipal waters.*

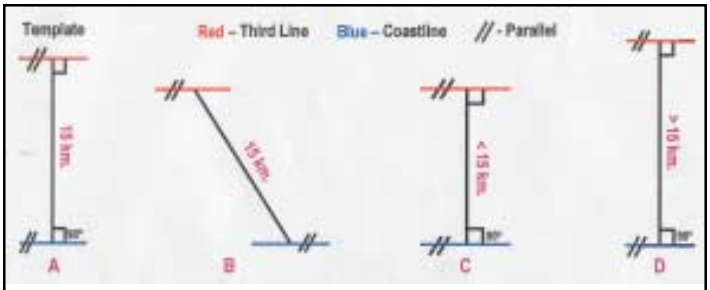


Figure 2. Basic Principle on Parallelism and Perpendicularity of Lines in Sec. 4(58) of RA 8550

The general coastline and the third line should be viewed as consisting of segments of straight lines. Two points determine a straight line. A straight line can be very short.

The third line will be parallel with the general coastline including offshore islands and 15 km from such coastline only if the 15-km line is perpendicular to both the general coastline and the third line. Sec. 4(58) RA 8550 will be satisfied under this condition only (A).

Sec. 4(58) RA 8550 will not be satisfied under the following conditions:
(B) The third line and the general coastline are parallel but the 15-km line is not perpendicular to both lines.
(C) The third line and the general coastline are parallel but the perpendicular line is less than 15 km.
(D) The third line and the general coastline are parallel but the perpendicular line is more than 15 km.

parallelism of the third line with that coastline were ensured to conform with Section 4(58) (Figure 2).

Municipal waters can be delineated using one or a combination of three methods using baselines: (a) using normal baselines in relatively smooth coastlines, (b) using straight baselines in deeply indented coastlines, and (c) using archipelagic baselines when a municipality has island/s. The use of the normal baselines has never been questioned. The use of straight baselines and archipelagic baselines as a mapping technique is meant to simplify delineation using the normal baselines. Archipelagic baselines are used in archipelagic municipalities. The use of archipelagic baselines is not without basis or precedent, even locally. Similar methods of delineation in DAO 17 have been promulgated by BFAR and institutionalized in the Fisheries Administrative Orders with Nos. 156 and 163, pursuant to Letter of Instructions (LOI) No. 1328 of 1985.

The concentric circles method was developed to draw an equidistant line pursuant to the last provision of Section 4(58) — easily, fast, and also accurately. Concentric circles are circles with a common center. The method works on the theory that points on the circumference of a circle are equidistant from the center of that circle. To determine the equidistant line, at least a point on the coastline of each of the municipalities concerned, adjoining or opposite, is tangent to the circumference of a circle and no point on either coastline is inside that circle. The equidistant line is a locus of the center of the concentric circles (Figure 3).

In delineating municipal waters, note that the limits of municipal waters from the general coastline is maximum at 15 km. The limit becomes less than 15 km if the marine waters between opposite municipalities is less than 30 km [last sentence of Section 4(58), RA 8550]. The limit also becomes less than 15 km when the lateral boundary of the municipal waters of one municipality cuts short that of an adjoining municipality. This is especially true when the coastal terminal points of said municipalities are located in indented coastlines as in bays.

Status of Implementation

To meet its commitment to LGUs, particularly LMP, NAMRIA CGSD created a Task Force for the Delineation of Municipal Waters. Its legality upheld by DOJ, DAO 17 is being fully implemented to date. The delineation (mapping of the boundaries) of municipal waters in 65 coastal provinces was targeted for completion this year. As of 31 May 2002, delineation of municipal waters has been completed of municipalities and cities in 44 provinces; while not all municipalities of 11 other provinces have been covered yet. Validation has been conducted of delineated municipal waters in 24 provinces, Manila, and Zamboanga City. It will continue for the other provinces. NAMRIA CGSD director, Commodore Renato B. Feir, is spearheading the full implementation of DAO 17.

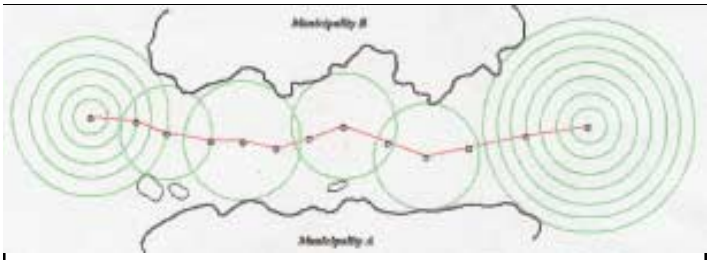


Figure 3. E. A. Macaspac Concentric Circles Method – Opposite Municipalities

1. *Move the concentric circles to a point where the circumference of a circle touches at least one point each on both coastlines of the opposite municipalities. No other points on the coastlines should be within that circle. Mark the center of the circle on the chart or map. This point on the chart or map is now equidistant from those two or more point on the coastlines of the two municipalities.*
2. *Repeat this step progressively, using the varying radii, until the other end of the common waters is reached.*
3. *Connect the marked points. The lines represent the delimited offshore boundary of the municipal waters of the opposite municipalities.*

Issues on DAO 17

The following discussion focuses on the more contentious issues against DAO 17, which are given for the appreciation and understanding of the reader.

Municipal waters have been in our laws since 1916 when the limit was three marine leagues. Subsequently, that limit was fixed to three nautical miles or approximately 5.56 km under Presidential Decree No. 704 (Fisheries Code of 1975); to 7 km under LOI No. 1328 of 1985; to 15 km under RA 7160 (Local Government Code of 1991). The limit of 15 km was reiterated under the present fisheries law, RA 8550.

The opposition to DAO 17 is centered on the interpretation of the phrase "including offshore islands" (highlighted below) which is found only in RA 8550 under Section 4(58), to wit:

Municipal waters — include not only streams, lakes, inland bodies of water and tidal waters within the municipality which are not included within the protected areas as defined under Republic Act No. 7586 (The NIPAS Law[2]), public forest, timber lands, forest reserves or fishery reserves, but also marine waters included between two (2) lines drawn perpendicular to the general coastline from points where the boundary lines of the municipality touch the sea at low tide and a third line parallel with the general coastline including offshore islands and fifteen (15) kilometers from such coastline. Where two (2) municipalities are so situated on opposite shores that there is less than thirty (30) kilometers of marine waters between them, the third line shall be equally distant from opposite shore of the respective municipalities.

The Mother of All Issues against DAO 17

This refers to the adoption of the archipelagic principle in delineating municipal waters under RA 8550 which finds its defense in the phrase "including offshore islands" and on the definition of *coastline* in Rule 4.1(a) of the Implementing Rules and Regulations (IRR) of RA 8550. It is alleged that DAO 17 erred in interpreting Section 4(58), and by using the archipelagic principle, it is unduly extending the 15-km limit, thereby substantially increasing the area of municipal waters from its original area of 15 km from the shoreline. This to the detriment of commercial fishers who have been complaining that they have been unjustly deprived of rich fishing grounds. BFAR argued that *the phrase "including offshore islands" implies that offshore islands are considered to be within the 15 kilometers from the shoreline, thus dropping the applicability of the archipelagic doctrine*; and that *the coastline should be the "outline of the mainland shore touching the sea at mean lower low tide" as defined in Rule 4.1[a]*.

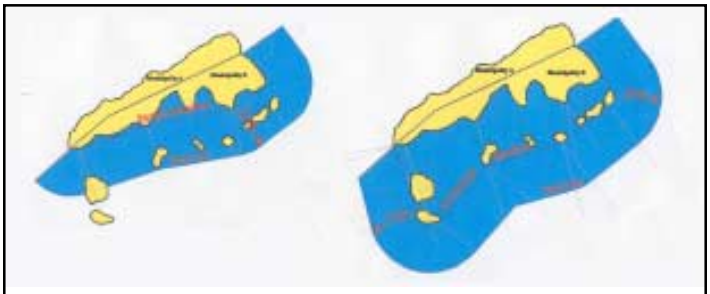
Is DAO 17 really incorrect as alleged? The technical interpretation of DAO 17 in Section 4(58) of RA 8550 is very sound. It has not been proven to the contrary. Provisions of other laws including the 1987 Philippine Constitution back the soundness of

...continued on next page

[2] *The National Integrated Protected Areas System*

such interpretation. A clear understanding of the terms and phrases in the definition of municipal waters is critical in the interpretation of Section 4(58).

Let us examine and validate the bases of the arguments against the applicability of the archipelagic principle. Section 4(58) specifies the very reference of the measurements for municipal waters, which is "boundary lines of the municipality." Such boundary lines should therefore be determined before delineating the municipal waters of that municipality. They dictate what the "general coastline of a municipality" should be. The "boundary lines of the municipality" in Section 4(58) refer to the terrestrial boundaries of a municipality. In Sections 386(b), 442(b), and 450(b) of RA 7160, we find that a municipality may have island/s or be composed of



Sec. 4(58) RA 8550 (archipelagic principle not applicable)
Validation: The coastlines of the islands are not considered as part of the general coastline; hence, the 15 km are measured from the wrong reference coastline. Even the argument that the islands are included (meaning enclosed) by the third line fails to prove that the phrase "including offshore islands" refers to the third line rather than to the general coastline.
Conditions not satisfied.

Sec. 4(58) RA 8550 in DAO 2001-17 and RA 7160 (archipelagic principle applicable)
Validation: Conditions satisfied

Figure 4. Validating the Interpretation of the Third Line in the Definition of Municipal Waters
Conditions to be satisfied: The third line is (1) parallel with the general coastline including offshore islands and (2) 15 km from such coastline.

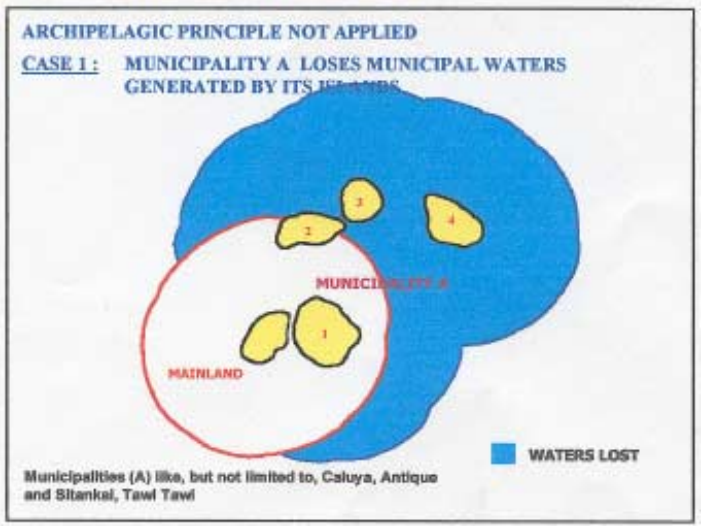
islands. From these same sections, we know that some municipalities are archipelagic (#s 2 & 3 in cover illustration). Therefore, islands also generate municipal waters 15 km from their coastlines. An *archipelago* is defined as a group of islands. Consequently, the "general coastline of a municipality" will consist of the coastline of the mainland (where the seat of the municipal government is) and the coastline/s of the island/s, if any, of that municipality. This interpretation follows from the definition of the boundary lines of a municipality. It is important that we correctly identify the general coastline of a municipality because the limits of the municipal waters are measured from the general coastline at low tide. Rule 4.1(a) considers only the coastline of the mainland (of a municipality) from which the municipal waters shall be reckoned. It is clear that this rule contravenes RA 8550 when delineating the municipal waters of archipelagic municipalities. Note that RA 8550 cannot be contradicted by any of its IRRs. It should be remembered that the law also did not specify only "mainland."

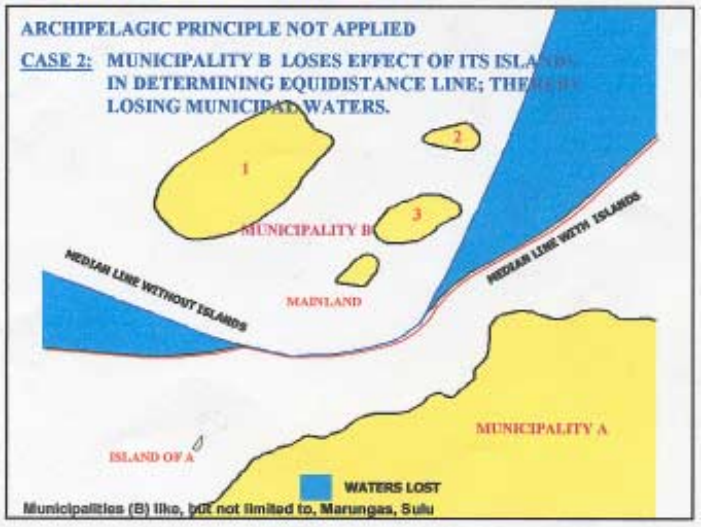
Another argument on the side of DAO 17 is its interpretation of the third line vis-à-vis the phrase "including offshore islands." The third line is specifically described as being parallel to the general coastline and distant 15 km from such coastline. Except as provided for in Section 4(58), both conditions must be satisfied in determining the third line. The phrase can only refer to either the general coastline of the municipality or to the third line. DAO 17 correctly interpreted technically the legal provision of RA 8550 with respect to the phrase. Clearly, the phrase qualifies the general coastline rather than the third line (Figure 4).

Not to be forgotten is the last sentence of Section 4 (58) of RA 8550 which is very important in interpreting Section 4(58). Consider cases 1-4 and their serious implications — legal, economic, political, social, and security — when the archipelagic principle is not applied. Again, clearly, the applicability of the archipelagic principle cannot be done away with.

DENR Authority to Issue DAO 17

DENR did not overstep its mandate in issuing DAO 17. NAMRIA's mandate in delineating municipal waters is clearly defined in Section 123 of RA 8550. NAMRIA is under DENR, hence, the issuance of the DAO. It is mentioned that even DA agreed that the guidelines shall be issued by DENR when DA transmitted to DENR on 04 June 2001 a revised draft order on the guidelines in delineating municipal waters for consideration and signature of the DENR Secretary. NAMRIA has been requested by LGUs and





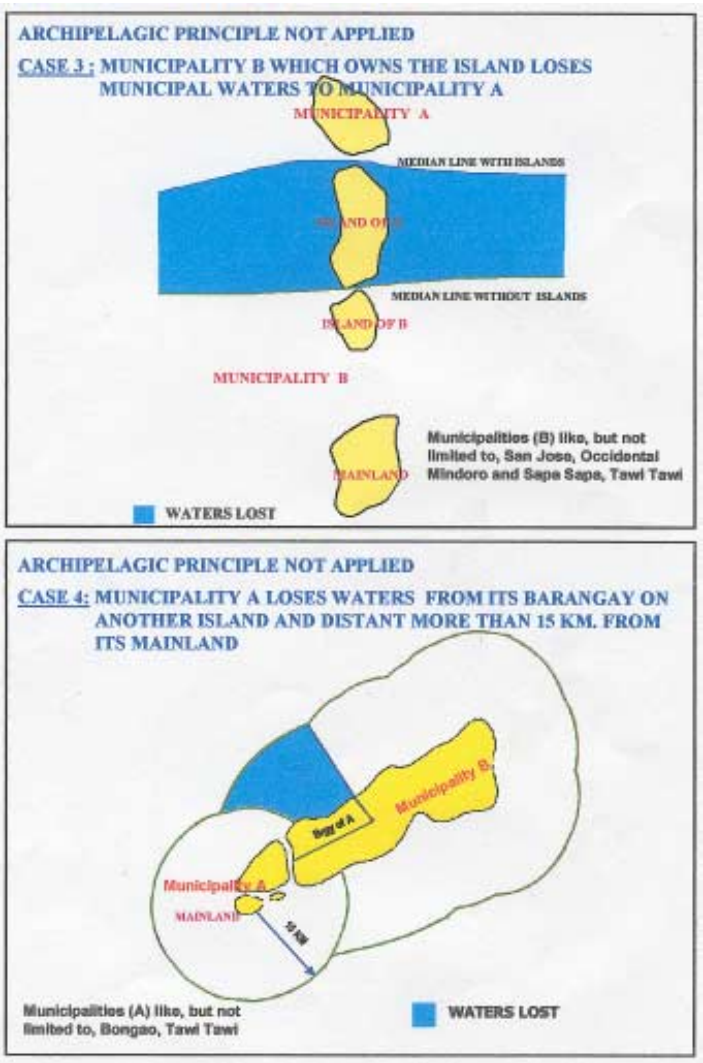
BFAR to delineate municipal waters. Moreover, to date, BFAR continues to recognize NAMRIA as the agency in charge of delineation of municipal waters. For NAMRIA to be able to execute its mandate under Section 123 of RA 8550, it has to have the guidelines — *DAO 17*.

Expertise of the Proponents

DOJ opined that the technical aspect of the delineation in DAO 17 is best left to the technical experts like surveyors and geodetic engineers. NAMRIA is a technical agency, the central mapping agency of the government; in its employ are surveyors and geodetic engineers. Over and above its technical qualifications, NAMRIA is mandated under Section 123 of RA 8550 to do the delineation.

Recommendation of DA-BFAR

This recommendation suggested a 3-km distance or the seven-fathom depth curve as the limits of municipal waters around islands. First, RA 8550 did not specify both as the limits of municipal waters. Second, the 3-km limit is retrogressive. Islands already have a 7-km strip of marine waters in 1985, RA 8550 extended that distance to 15 km. Even prior to RA 8550, that distance was already 15 km (RA 7160, 1991). The seven-fathom depth curve is a condition in Section 18 of RA 8550 to allow commercial fishing in the 10.1 to 15 km area of the municipal waters (Figure 5).

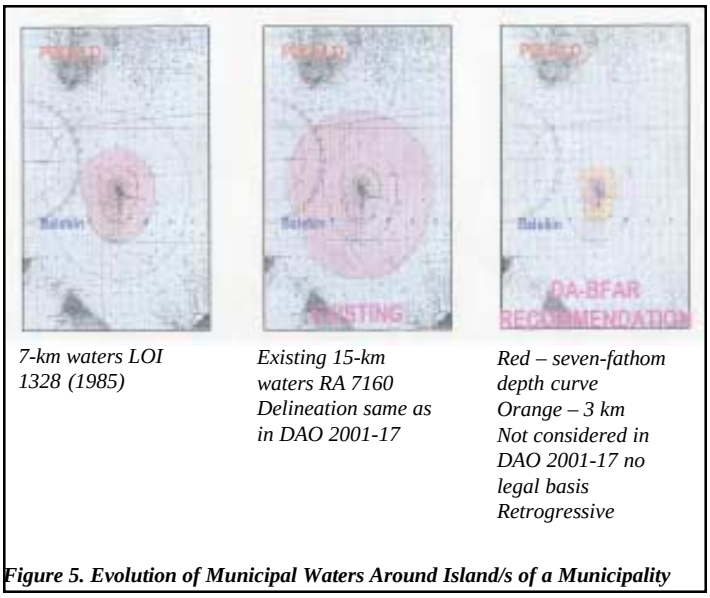


Fees for Collection for Delineation (Section 6, DAO 17)

The amount to be collected will be used for the development and maintenance of a computerized database for municipal waters. This will enable NAMRIA to restore, retrieve, and issue a certification on municipal waters upon the request of an LGU and other users of such information.

Neglect as Pertaining to International Sea-lanes

This refers to the supposed DAO 17 non-consideration of the impact of establishing municipal waters using archipelagic baselines on international sea-lanes. The designation of navigational sea-lanes in fishery areas is mandated even by RA 8550 under Section 123. Municipal waters and sea-lanes have different



7-km waters LOI 1328 (1985)

Existing 15-km waters RA 7160 Delineation same as in DAO 2001-17

Red – seven-fathom depth curve
Orange – 3 km
Not considered in DAO 2001-17 no legal basis
Retrogressive

Figure 5. Evolution of Municipal Waters Around Island/s of a Municipality

criteria for mapping. Municipal waters are now being delineated following the guidelines based on Section 4(58) as embodied in DAO 17. Sea-lanes are to be designated following other guidelines. They are mainly for navigational purpose and may pass through municipal waters. They are not, however, a factor to be considered in delineating municipal waters so they need not be addressed in DAO 17.

A Sound DAO 17

It has been noted that DAO 17 is being faulted for whatever flaws, if any, of RA 8550. It is being made as an excuse to stop the effective implementation of RA 8550 in municipal waters. Perhaps the earlier published statement of a member of the Alliance of Philippine Fishing Federations, Inc., that the ideal fishing ground is 7 km from the coastline will tell it all. If that is the case, why blame DAO 17? Obviously, opponents of DAO 17 are barking up the wrong tree.

NAMRIA saw to it that the guidelines will withstand scrutiny — legal and technical. There should be no more doubt about it. *Arya* [Go] DAO 17!!!

The writer is a geodetic engineer and the principal author of the DAO 17 guidelines. He is also the NAMRIA Task Force Leader, Delineation of Municipal Waters and chief of the Geodesy and Geophysics Division, NAMRIA CGSD.

ILOCOS SUR

ILOCOS NORTE

PANGASINAN

POLILLO

MANILA

MERCEDES

ANTIQUE

BOHOL

DAO 17 turned one on June 11. Amid the tide of protests and controversies, DENR-NAMRIA relentlessly pursues its mandated job. To date, all municipal waters in 45 provinces have been delineated. DENR-NAMRIA will overcome every tough wave until all municipal waters have been completely delineated.

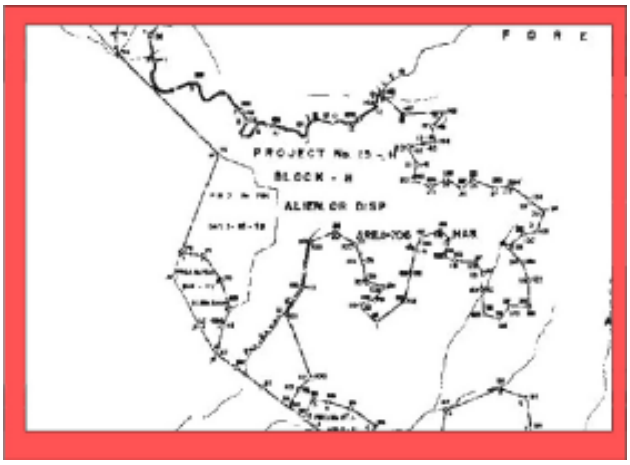
News

Survey of proposed A & D lands

by Virgilio F. Basa[1]

NAMRIA is launching a new project on the survey and demarcation of proposed Alienable and Disposable (A & D) lands. The project, which covers the entire country, primarily aims to survey, map, and evaluate the present status of about 100,000 hectares of unclassified public lands, as to slope, soil characteristics, vegetation, land use, and others. If found to be under the category of A & D lands, these will be certified as such by the government through the issuance by the DENR Secretary of a DAO, and will be processed for distribution to the respective claimants and occupants. This project is in consonance with the pledge made by President Gloria Macapagal-Arroyo in her State of the Nation Address, of the distribution of 300,000 hectares of land in a span of three years, which shall come in the form of certificates of land titles and free patents. It is also the NAMRIA's answer to the present administration's call for efforts in poverty alleviation, food stability, and countryside development.

For current year 2002, the project targets to accomplish a total of 112,027 hectares distributed nationwide as follows: (a) 8,722 hectares for Sorsogon; (b) 7,316 hectares for Pampanga; (c) 3,594 hectares for Nueva Ecija; (d) a total of 21, 699 hectares for Palawan, specifically Coron, Puerto Princesa, Taytay, El Nido, Narra, and Culion; (e) 8,370 hectares for Cagayan; (f) 1,429 hectares for Quirino; (g) 2,526 hectares for La Union; (h) 3,612 hectares for the Mountain Province; (i) 3,884 hectares for Camarines Norte; (j) 3,292 hectares for Iloilo; (k) 13,126 hectares for Negros Oriental; (l) 4,597 hectares for Capiz; (m) 16,082 hectares for Sulu; and (n) 13,778 hectares for Sultan Kudarat. Being contiguous areas, the provinces of Nueva Ecija, Palawan, Pampanga, Sorsogon, and the island of Sulu have, however, been declared as priority areas.



Map showing a portion of the proposed A &D land in Pampanga

The 30 million-peso total project cost, which will come from the national government budget, will be used for the acquisition of high-resolution satellite data (IKONOS), vehicle, survey equipment, monumentation materials, office supplies, and other materials. Laborers' fees and other incidental expenses in the field will also come from this allocation.

The activities in this project involve: (a) identification of project areas, (b) gathering of preliminary data and map references, (c) interpretation and analysis of data gathered, (d) compilation of base maps, (e) field validation, and (f) map and report preparation.•

Maternal GIS Project User's Training

by Ernestine B. Gayban[2]

A five-day comprehensive geographic information system (GIS) training was conducted last 11-15 March at the Information Management Service Training Center of the Department of Health (DOH). The training is part of the technology-transfer component for the Maternal GIS Project being implemented by NAMRIA. It was attended by 20 staff members from the different units of the DOH Central Office, namely: Center for Family and Environmental Health, Information Management Service, National Epidemiology Center, Center for Environmental and Occupational Health, Health Policy Development and Planning Bureau, Bureau of International Health Cooperation, Bureau of Quarantine and International Health Surveillance, and Health Emergency Management Staff.

The user's training focused on the use of the ArcView GIS software and customization using Avenue programming to ensure that the participants are well-equipped in the use and maintenance of the Maternal GIS modules.

Another batch of training was conducted for the DOH Regional Center for Health Development Offices. This was an additional requirement of the funding agency as an initiative towards making the Maternal GIS available on the regional level. This would also allow the regional staff members to be introduced to the concept of GIS and be able to use the system for other health applications in the future.

A total of 32 participants attended the Maternal GIS Project-Regional User's Training held on 15-19 April 2002 at Lotus Garden Hotel, Manila.

The regional participants were provided with installation compact discs (network and server version) and system documentation upon completion of the training. In addition, regional health facility maps showing the locations of the rural health units and hospitals were also given to the participants.•

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[1]*Director, NAMRIA Remote Sensing and Resource Data Analysis Department*
[2]*Information Technology Officer II, Database Management Division, NAMRIA Information Management Department*

Tending the DENR *LAMP*

by Nicandro P. Parayno[1]

NAMRIA is currently involved in the implementation of the Land Administration and Management Project (LAMP) of DENR for prototype project areas. The MOA for the implementation of the project was signed on 25 September 2001. The MOA stipulates that NAMRIA will provide services for geodetic control survey and digital orthophoto mapping for DENR.

The project is the first step in the implementation of a proposed long-term (15-20 years) Land Administration and Management *Program* of the Philippine government. The overall goal of the program is to alleviate poverty and enhance economic growth by improving the security of land tenure and fostering efficient land markets in rural and urban areas, through the development of an efficient system of land titling and administration based on clear, coherent, and consistent policies and laws and supported by an appropriate institutional structure.

DENR is spearheading LAMP and is responsible for the overall coordination with other implementing agencies, within the framework of the Inter-Agency Coordinating Committee created by virtue of Executive Order No. 129 dated 24 July 1999. Completion of the project is expected within a period of three years upon its effectiveness. The three development partners for the project are the World Bank, for financial assistance under the Learning and Innovation Loan; the Australian Agency for International Development, for grant in a form of technical assistance; and the Philippine government, for a range of resources such as local, counterpart-funds and technical specialists.

LAMP comprises four components. The first deals with the land policy and key issues studies. The second is centered on two prototype areas that seek to improve the efficiency of the administrative processes and to accelerate the registration and issuance of titles to people. It is also focused on improving the management of land records. The third deals with institutional development and the last with the preparation of the subsequent phases of the program.

The output of LAMP will benefit the general public, particularly those situated in the two prototype areas. The prototypes would generate benefits through increased investment and land productivity associated with increased land tenure security and access to credit. It would contribute to the improvements in the valuation framework that would enhance fairness and equity in taxation and compensation systems for land.

Methodology and Other Related Activities for NAMRIA

NAMRIA, through the Mapping Department (MD) and CGSD will be involved in the second aspect LAMP, i.e., the development of the two prototypes (prototype 1 in parts of Leyte province and prototype 2 in parts of Quezon City). The geodetic control strategy for the prototypes will support the production of orthophoto maps and will provide connection of future cadastral surveys to the Philippine Reference System 1992 to enable plotting onto the Cadastral Index Maps (CIMs). In the prototypes selected will be determined the best procedures for large-scale sustainable replication in the projected long-term program.

Sample of digital orthophoto mosaic at four meter-resolution

PCP-Establishment by GPS Surveys[2]

A total of 74 photo control points (PCPs) will be established using Global Positioning System (GPS). These PCPs will serve as reference points for the densification of control by aerial triangulation necessary to correct the distortions of the aerial photographs. For Quezon City, which consists of five *barangays* (Holy Spirit, Payatas, Batasan Hills, Bagong Silangan, and Commonwealth), 36 PCPs will be surveyed and processed using the available GPS equipment and adjustment software. Another set of 38 PCPs will also be established in Alang-alang, Leyte.

NAMRIA CGSD has dispatched field teams and is currently surveying PCPs in both areas. The required accuracy for the established positions of said control points will be proportionate with the orthophoto map scales that will be produced.

High-Resolution Image Scanning

NAMRIA MD will employ a fully digital method in the orthophoto production starting from image scanning. The process converts the photographic images into a digital image file in raster format with the use of a high-resolution image scanner. Said scanner is precisely guided by a camera with a charge-coupled device installed in the film or image plane which traverses over the entire 230 x 230 mm image format. The selection of an appropriate scanning resolution is important in this part of the project, since the corresponding pixel size will have a great influence on the quality of the end product.

For the Quezon City area, 475 aerial photo frames at scale of 1:8,000 and for the Leyte area, 153 aerial photo frames at scale of 1:10,000, will be scanned at 15 μm pixel resolution.

...continued on page 15

[1] *Engineer IV, Photogrammetry Division, NAMRIA Mapping Department*

[2] *The process of determining and establishing positions of control points marked on the ground by simultaneously observing a minimum of four satellites that are used as references.*

Technical Paper

The Aggravating Effects on Poverty of the Undesirable Environmental Consequences Brought about by Land-Use Conversion[1]

by Engr. Randolf S. Vicente[2]

I. Introduction

Land is a limited natural resource. In developing countries like the Philippines, the human population continually grows. As a result, the land-to-man ratio steadily shrinks. Such a ratio is a critical factor in maintaining the viability of land as a platform of human activities, i.e., settlements and urban uses, and as man's essential life-support system. Where land is a direct input in the production process as in agriculture, the land-to-man ratio is of utmost importance for there is a theoretically irreducible minimum size of land a person needs to survive.

The country's land resources could cause grave implications in the regional and national growth and development if not properly conserved and managed. Conversion of land uses, specifically prime agricultural lands, into urban uses is most evident at the fringes of metropolitan areas, cities and fast-growing municipalities. This conversion is basically an inevitable response to the pressures brought about by industrial development and urban expansion. It poses both desirable and undesirable environmental consequences and adversely affects the land-resource base of a locality or a region.

There is, therefore, a need to identify and understand the aggravating effects on poverty of the environmental consequences of land conversion. In doing so can be drawn sound, environmental management strategies/alternatives vis-à-vis land use; and promoted the judicious use of land and other physical resources, based on the principles of sustainable development.

II. Conceptual Framework

The conceptual framework shown in Figure 1 illustrates that at least three major land-use determinants, economic and socially rooted determinants, and public interest influence land-use conversion. If these factors are not properly considered during land-use planning and land-administration/management processes, undesirable environmental consequences, both in urban and non-urban areas, are to be expected.

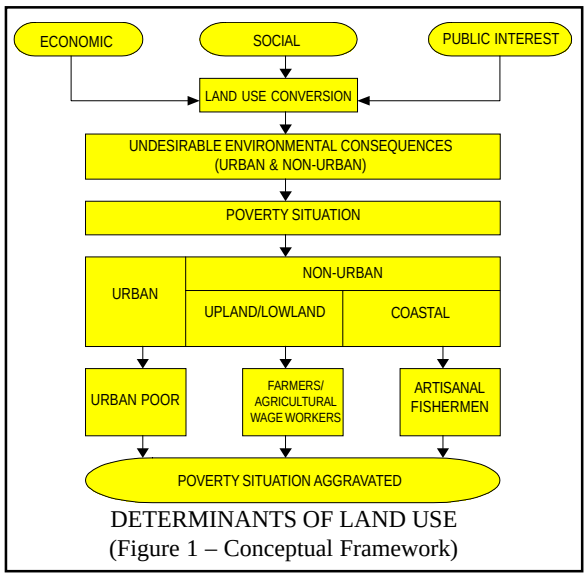
The poverty situation is worsening based on the poverty index. With this situation steadily aggravated, more and more people are exposed or affected by the repercussions of unabated land-use conversion. These include those below the poverty threshold, particularly the urban poor, upland and lowland farmers, and artisanal fishermen.

III. Scope and Objectives

This paper seeks to discuss the aggravating effects on poverty of the undesirable "environmental" consequences of land-use conversion both in the urban and non-urban areas. It also aims to present the impact of land-use conversion especially on the urban poor, upland/lowland farmers, and artisanal fishermen. It highlights the mammoth problems that have to be addressed if we are determined to break the cycle of poverty for our people.

As such, this paper encompasses land-use determinants, undesirable environmental consequences of land-use conversion, aggravating effects on poverty of such consequences, conclusion and recommendations.

The study was based on the analyses of secondary data from related published and unpublished papers, interviews with key persons in authority, minutes of meetings, and proceedings of conferences.



DETERMINANTS OF LAND USE
(Figure 1 – Conceptual Framework)

IV. Land-Use Determinants

There could be other factors that influence land-use conversion, but we shall focus only on the three major determinants, which will be presented and briefly elaborated in this section.

A. Economic Determinants

The economic explanation of land-use patterns begins with forces extending far beyond the immediate environs of any area of interest, and involves considerations of the structure and functioning of the local economy as it fits into the larger economy of the region and the country as well. Approaching the economic basis of land use is a rationale that both regional and localized forces interact to shape the land-use pattern. Specifically, external forces effecting the makeup and the vitality of the economy act upon internally focused processes of the land market to determine the location of urban functions on the land. These forces influence how much and at what rate land goes into development.

This determinant involves: (a) the use of the individual land parcel, (b) the total land-use pattern, and (c) space organization concepts.

B. Socially Rooted Determinants

Another series of factors, those with social origins, are affecting the location and arrange-

[1]*This is a condensed and modified version of the paper, with the same title, presented by the author during the 14th Annual Regional Convention and Election of Officers of the Geodetic Engineers of the Philippines (GEP), Inc., held in May 2002 in Manila, Philippines. The paper is part of the convention proceedings. Permission for its use was granted by the GEP, Inc.*

[2]*Chief, Plans and Operations Division (currently on special assignment at the National Commission on Indigenous Peoples), NAMRIA Staff Services Department; President, GEP, Inc.-National Capital Region; Public Relations Officer, Geodetic Engineering Centennial Commission*

ment of land use. Social scientists are increasingly directing attention to the slighted role that social values and ideals play in the determination of land-use patterns in the local levels. The sociologist usually views the city partly in the context of urban ecology with the concern for the physical, spatial, and material aspects of urban life; and partly in the context of social structure with the concern for human values, behavior, and interaction as reflected in such social institutions as the family, the church, government, business, and so on. Socially rooted factors of land use, thus, can be explained in terms of "ecological processes," with their physical context; and "organizational processes," with their social structural context. In recognition of the need for a fully rounded perspective, one takes into account social as well as economic factors influencing land-use patterns.

C. Public Interest Determinant

While guided by the tenets of man's economic and social behavior in the economy, the planner must also view land use in the context of "the health, safety, and general welfare"—what is termed here as "the public interest." Basically, our concern is with the public interest in land development, more particularly with public action that seeks to assure livability and sound development as land is put into use.

The significance of this behavioral concept to the technical land-use planning process indicates a need for a balanced consideration of economic, socially rooted, and public-interest factors throughout the land-use planning process. This means that land-use planning analyses must go beyond the customary emphasis on such public-interest considerations as health, safety, convenience, economy, and amenity. More focused attention should instead be given to the way in which the urban-land market factors tend to site and arrange land uses; and to the way by which culture-bound considerations such as customs, traditions, and beliefs influence the pattern of land use. Beyond these considerations is the need for recognizing the role that attitudes can play in technical studies in fitting the land development plan into the realities of behavior.

V. The Undesirable Environmental Consequences of Land-Use Conversion

Conversion is the act of changing the current use of a piece of land into some other use. Per Department of Agrarian Reform (DAR) definition, "land-use conversion" refers to the change from agricultural to non-agricultural use (residential, commercial, industrial, etc.). From a more technical perspective, "conversion" is defined as the act of authorizing the change of the current use of a piece of land into some other use.

Our concern here is primarily on understanding the land-use determinants which influence land-use conversion. There is a need for a balanced consideration of these factors throughout the land-use planning and land-administration/management processes. Without understanding and due consideration of these factors, we will be surprised that future land-use patterns result in negative effects on the environment. More importantly, the uncontrolled shifts in land-use patterns do not only pose threats to the sources of livelihood of the urban poor, and upland or lowland farmers/agricultural wage workers and artisanal fishermen, but they also result in serious environmental consequences, both in the urban and non-urban areas.

A. Urban Areas

The 1990 census figures indicate that the Philippines is now 48.6% urban, which is significantly higher than the expected increase of 42.6%. More importantly, urban households in "other urban areas" outside the National Capital Region increased by 90.67% over the last ten years—an astounding figure. Urban areas grew at a rate of 15 times faster than rural areas, and this trend shows no sign of weakening. Population growth and expanded urbanization, aside from conflicting land utilization, are among the causes of on-site environmental problems in the urban environment. As a result, housing developers and the government are in constant search of land for housing/settlements development due to increased urban migration, urban squatting, and the continuing rise of land prices.

B. Non-Urban Areas

With the population steadily increasing and given the finite character of land, it is unfortunate that the country's land resources, specifically in non-urban areas of the country, are fast becoming entangled in conflicting demands, abuses, and misuses from various groups or sectors. Available data from the National Statistical Coordination Board indicates that of the total Philippine land area of 30 million hectares, about 10.2 million hectares or 34% are devoted to agricultural uses, 8.99 million hectares or 30% are woodlands, around 0.54 million hectares or 2% are utilized for establishments (residential and commercial uses), and 389 hectares or 0.01% for industrial estates. The Philippine forests have been steadily decreasing at an average rate of 2% per annum, from 7.4 million hectares in 1980 to 5.4 million hectares left in 1997.

The conversion of agricultural lands to non-agricultural uses has been accelerating in all regions of the country at an alarming rate. According to the DA, for ricelands alone, the 3.8 million hectares planted 30 years ago have dropped by 16% to 3.2 million hectares.

The country depends on prime agricultural lands for the supply of food and as source of livelihood for millions of farmers and their families. These lands have been legally converted to other uses more than eight times, from 4,500 hectares in 1991 to 42,000 hectares in 1996. On the other hand, it is estimated that about 200,000 hectares of agricultural lands have been illegally converted at an alarming rate, meaning, without the necessary approval from the DAR.

There are a number of negative consequences that land-use conversion, which is caused by pressure from industrial and economic activities, can bring about in the non-urban areas. Generally, this is manifested by the fast, natural-resource depletion in the uplands and diminution of the already limited farmlands. Agricultural lands are sacrificed for urban expansion and industrial development.

Coastal-fishing activities account for between 40% and 60% of the total fish catch. All told, the fisheries sector comprises about 4% of the country's gross national product and directly employs over a million Filipinos, more than half of whom are engaged in small-scale fishing. Fish and other marine products supply up to 70% of the total animal protein intake and 30% of the total protein intake of Filipinos. With the growth of tourism in the coastal areas, moreover, Philippine coastal resources are predicted to become even more economically valuable over time.

The rapid migration/population growth and resource-use conflicts mainly contribute to the unwanted conditions in the coastal areas. Such undesirable conditions encompass changes in coastal geomorphology because of erosion, destruction of marine habitats (coral reefs, seagrass meadows, mangrove trees, etc.), among others.

VI. Aggravating Effects on Poverty

The 1999-2004 Medium-Term Philippine Development Plan explicitly states that

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the ultimate aim of development efforts is the eradication of poverty and the attainment of a better life for each and every Filipino in an equitable society. The fight against poverty rests on the fundamental right of every person to a decent life.

In the country, a large segment of the population continues to want in the basic necessities of life. In 1985, around 6 million or 59% of the total number of families were considered poor compared to 49% in 1971. Relatively, studies have revealed that the distribution of income has been very unequal. In 1985, the lowest 20% received shares of 5.2%, the next 60% a mere 27.3% while the top 10% of families cornered a total of 37% share.

Discussions on how the undesirable environmental consequences of land-use conversion affect the major social groups are presented in the following subsections. The elaboration revolves around the major social groups in poverty: the urban poor, farmers/agricultural wage workers, and artisanal fishermen.

A. Urban Poor

Environmental degradation can effectively remove the main sources of livelihood for the vast majority of the people, thus creating even greater urban poverty. Irrational land-use allocation and utilization causes the forced settlement of the urban poor on tons of garbage, where they are constantly exposed to health hazards (diseases) and natural disasters. The uncontrolled conversion of urban lands to commercial and industrial uses results in the lack of land for population expansion.

Urban congestion, with the increase in population, causes more people to be exposed to smoke from factories and smog, noise, and exhaust pollution from vehicles. Because of the unabated urban transformation (renewal), more and more informal settlers are deprived of the basic services (housing, water, health, etc.), entailing widespread malnutrition, high infant mortality rate, and inadequate health, sanitation facilities. Relatively, there is a considerable reduction of services available to the already poor host population due to increase in population density.

B. Farmers and Agricultural Wage Workers

The industrial or economic pressure in the agricultural lands pushes farmers to settle in the uplands. The tendency is for the dislocated farmers/communities to earn for a living, thus, resorting to forest-clearing practices such as the slash-and-burn farming or the *kaingin* method. Such harmful agricultural practices greatly affect the biophysical nature of the uplands and the already shrinking productive lowland farm lots. Even greater poverty is created with changes in the biophysical nature of the area which effectively remove the sources of livelihood for the vast majority of the people.

The continuous decline in both the area and the capacity of remaining agricultural lands will have profound productivity implications. The relocation of displaced farmers to marginal lands increases the cost of making the poor-grade lands more productive. Low level of production is closely tied with low level of income. Farmers are not able to produce more since they lack the resources to purchase the necessary implements: fertilizer, good quality seeds, and all other inputs that will ensure better yields.

Economically productive rural areas could be prematurely compromised, creating unemployment and encouraging further in-migration to congested cities. With minimal skills and being in poor physical (health) condition, they will be unable to find jobs that will provide enough income for decent food, shelter, and services.

In the non-urban areas, the lack of basic physical-support systems such as transport systems, limited infrastructure projects, inadequate water-supply systems, flood-control measures, etc., complicate the poverty situation.

C. Artisanal Fishermen

Because of the undesirable consequences and the risk from all kinds of unmanaged and potentially harmful human activities, similar situations will be or are being experienced by the artisanal fishermen. These encompass the following: (a) overfishing and illegal/destructive fishing; (b) increase in cost of illness caused by water pollution due to effluents; (c) reduced fish-catch because of the destruction of marine habitats and depletion of oxygen-buildup in water; and (d) reduced access regime in coastal fisheries, which results in over-fishing.

Coastal pollution is a critical element especially for fishermen. The dumping of waste materials, which causes damage in our ecological system, and the practice of dynamite-fishing result in the reduction of harvest from the seas. Such a reduction in harvest contributes to the persistence of mass poverty in the coastal population.

VII. Conclusion and Recommendations

The poverty situation in the country can be truly addressed if we have a deeper understanding of the various factors that affect poverty. These include: (a) low level of living; (b) low level of production; (c) lack of sources of income/unemployment, underemployment; (d) poor health condition; (e) low level of education; and (f) limited or lack of support facilities and services for development. These basically comprise the impact on poverty of the undesirable environmental consequences of land-use conversion. If land-use conversion will continue to be unchecked or uncontrolled, then the plight of the major social groups cited earlier will get even worse.

The implications for rapidly urbanizing cities and municipalities who need to provide basic services and meet the employment needs of these migrants deserve the attention of policy planners and decision makers at all levels of the government, leaders in business and industry, and the citizenry. The steady decline in prime agricultural lands has adverse effects on the capacity of the country to sustain agricultural food supply and other material requirements. The strong pitch for environmental sustainability is a matter of great urgency. Indiscriminate use of lands without due regard to its adverse effect on society and the environment must be regulated in the interest of the general welfare.

There should be improvement of the land-use conversion mechanism and measures to ensure positive economic, social and public interest. A comprehensive land-use plan should incorporate the desire/s of the community and a program for farmers, agricultural wage workers, artisanal fishermen, and the urban poor. Let it be emphasized that for there to be meaningful development, the poor should have greater access to assets and a larger share in the fruits of economic progress. What is needed then is to ensure that the poor are transformed into self-reliant and productive citizens who are capable of actively participating in the total development effort.

In order to achieve national development goals, the proper management of land resources must be integrated. For land resource to be continually available in the future, their uses must be planned to avert severe and progressive deterioration. Land resources should be put into their most beneficial use for the people, and at the same time conserved and managed for future generations.•

From Analog, to Digital Chart...
from page 3

mation found in the paper chart are no different from those of the ENC. ENC users can say that ENC goes beyond and does much more in terms of safety, accuracy, and reliability when it is loaded in an ECDIS.

Data Encoding and Attribution of Real-World Objects

Another thing is the correctness based on the judgment of the encoders in the entry of mandatory, attribute information found in the paper chart. A typical example is a buoy expressed as an international symbol in the paper chart. This buoy can be encoded in ENC with the wrong attribute information such as in terms of color or name. Things like this can happen because it is only the symbol of the buoy without its name and actual color that is depicted in the paper chart. Field survey verification to determine the actual condition would solve this problem.

Quality Control

Quality control is another crucial factor in ENC production. It is very important for the S-57 ENC quality control personnel to keep abreast of evolving issues and procedures, to be updated of the latest developments and issuances prescribed by the IHO. In ENC production, it will not be right to assume that everything is correct and in order after running the software tools to automatically check the errors. The use of a reliable third-party software can add to the credibility of the data set produced as to the completeness of the required S-57 ENC objects and attributes. The combination of automated checking and manual-visual checking (in hard copy) should also be undertaken. Unfortunately, there can be cases of errors from the original file like datum shifts, inaccuracy in file-merging, error in the original survey, etc.

Updating of ENC Data Sets

Providing reliable and up-to-date ENC data sets to users is another major challenge faced by ENC producers. Information for updating in an area covered by the ENC data set means all changes that occurred after its distribution. These include changes in light characteristics, installation/loss of aids to navigation, additional survey data in an area if available, changes in coastlines, and all other information that are relevant for safe navigation which should be incorporated and provided to users as early as possible. The timely issuance of ENC updates would enhance navigational safety and confidence in mariners. This is a big task considering the meager resources of the department/ agency.

Distribution of ENC Data Sets

Among other major concerns that should be looked into in the future are the following items: pricing, distribution and packaging of the ENC data sets to suit the end users' coverage needs; tracking, distribution of updates, and providing new editions to users; and system management and maintenance.

It should be kept in mind that user-groups have different perspectives and requirements as to what constitutes an ENC. It must also be remembered that even if the ENC's format is IHO S-57, the level of content must conform to the IHO S-57, edition 3.1 ENC product specification before it can indeed be considered an electronic navigational chart.

Management of the System

In the operational and managerial aspects of ENCs, there are standards that should be followed. Some of these are: clear delineation of duties and responsibilities of each personnel; established classification and management of information; priority given to equipment maintenance; proper backing up of data; proper recording of activities; and most importantly, training.

ENC for RP, Now and in the Future

The Philippines still has to see the potentials of the requisite tools to be able to take advantage of the opportunities in S-57 ENC production, distribution and updating. NAMRIA CGSD is faced with the gargantuan task of producing the first ENC of the country. The challenge will not stop there but it will only be the beginning of another chapter in this digital age. It will be likely that in the coming years we will see a dramatic increase in the amount of exposure that the ENC will get from end users. The Philippines should expect to receive a great deal of feedback from end users as what happened in Singapore, Japan and other countries upon the release of their respective ENCs. What NAMRIA CGSD has envisioned for the meantime is to provide the international and local market with reliable, accurate and updated ENC in the future. To quote one of the JICA experts, *"it is not important how the ENC is produced, what is important is to keep on updating the ENC until the seawater disappears."*•

Tending the...
from page 11

Aerial-Triangulation Measurement and Adjustment

By definition, aerial-triangulation is the photogrammetric method of determining and establishing the position of control points in a block of aerial photography, using only a few surveyed ground control points, a cheap solution for control densification. Automated aerial-triangulation measurement of additional controls will be undertaken using digital photogrammetric workstations (DPWs).

In digital aerial-triangulation, the technique is to perform measurements on the digital images. The software will determine the *x* and *y* photo coordinates of proposed points using the image pixel grey value. By a more complicated algorithm based on the geometry of the scanned photographs, the pixel locations of these points are transformed to its ground position. The re-creation of the stereo model and their connections are done automatically.

Generation of Digital Elevation Models (DEMs)

An orthophoto is an image in the form of a photograph having the geometric properties of a map, wherein the image displacement caused by source image projection, camera tilt, and relief of terrain are removed. DEMs are required as inputs to differentially ortho-rectify all the aerial photographs covering the two sites to be able to eliminate the said distortions.

By using the same DPW, DEMs will be automatically generated by image correlation. Interactive editing is still necessary to be able to ensure data quality DEMs are elevation data of surface points at regular grid intervals. In addition, geomorphic features forming "break lines" such as drainage, road edges, sides, and bottoms of ditches, and others will be digitized to have an accurate model of the terrain.

Ortho Rectification and Mosaicking

DEMs were generated on a per stereo model (pair of overlapping photographs) basis. DEM data merging to form a *per map sheet* surface file, ortho-rectification, and

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NAMRIA in surveying, mapping of ancestral lands

by Virgilio F. Basa

The surveying and mapping of the ancestral domains of indigenous cultural communities/indigenous peoples (ICCs/IPs) is under way. The national government, through the initiative of Senator Juan C. Flavier, Committee Chairman on Indigenous Peoples and Poverty Alleviation, has allotted a 40-million peso budget under the General Appropriations Act for Fiscal Year 2002 for the purpose. This is in recognition of the rights of ICCs/IPs to their ancestral domains, and in consonance with the legislative agenda of the present administration as regards effective and efficient management of land and other physical resources. The National Commission on Indigenous Peoples (NCIP), the primary government agency mandated to protect and promote the interest of the ICCs/IPs, and NAMRIA, the central mapping agency that caters to all surveying and mapping needs of the country, are the responsible agencies to operate this undertaking. The NCIP and NAMRIA has executed a MOA to this effect.

The project is pursuant to Section 1 of RA 8371, otherwise known as "The Indigenous Peoples Rights Act of 1997" or the IPRA Law, that provides to recognize, protect, and promote the rights of ICCs/IPs to their ancestral lands to ensure their economic, social, and cultural well-being. Under the MOA, NAMRIA shall undertake the official delineation and mapping of ancestral domains, based on pre-identified areas in compliance with DAO No. 02, series of 1993, otherwise known as "Rules and Regulations for the Identification, Delineation, and Recognition of Ancestral Land and Domain Claims."

In addition, selected NCIP personnel will undergo training to be conducted by NAMRIA on surveying and mapping operations which they can apply later in other unsurveyed Certified Ancestral Domain Claims (CADC). The training includes surveying, basic GPS, GIS, cartography, and basic computer operations.

NAMRIA targets to survey a total of 28,610 hectares consisting of seven CADC areas from different parts of the country, namely: (a) 20,419 hectares, Kiangan; (b) 2,822 hectares, Kasibu; (c) 1,165 hectares, Iriga; (d) 1,226 hectares, Dumarao; (e) 1,007 hectares, Camiguin; (f) 432 hectares, Manubo; and (g) 1,539 hectares, La Paz. Of these seven CADC areas, Kiangan which has the largest area, was chosen as the model site.

The following major activities are envisioned for the project: procurement of needed equipment, research and acquisition of secondary data, base mapping, remote sensing data interpretation and analysis, and ground truth/validation survey of land use/cover.

Part of field activities is coordination at national, regional, and local levels. Similarly during the coordination process, there will be an ocular inspection of the project site. The Information Education Campaign (IEC) on the benefits of the project to IPs will be done prior to the conduct of ground survey. The NCIP will lead the conduct of IEC while NAMRIA will provide technical support through production of information materials. GPS and total station instruments will be used in the survey of ancestral domain claims.

A census of community members/occupants will also be undertaken by a team of NAMRIA personnel for Kiangan. The updated statistical record of, for example, population and household distribution of ICCs/IPs within the model site, will be used in the development of a proto-type GIS for the area.

After the field activities, mapping of CADC areas follows. The final maps targeted for preparation are the perimeter map, the land use map, and the watershed divide map. The project terminal report will be submitted to the NCIP and the DENR Secretary for approval.•

Tending the...
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mosaicking will follow. The cadastral map sheet format of the Land Management Bureau will be adopted.

Actual measurement of distances and directions can now be carried out in the orthophoto. It has also the advantage over the traditional line map of showing the actual image of the features on the ground. The orthophotos are strong incentives for further investigation of property declarations, owing to the fact that they can be generated to form an excellent backdrop for a GIS.

Layout and Printing of Orthophoto Maps

The layout and printing of the orthophoto maps will be undertaken at 1:1,000 scale for Quezon City and 1:4,000 scale for Leyte, both in the Philippine Transverse Mercator projection. A total of 130 orthophoto maps will be printed for the Quezon City area and 50 sheets for the Leyte area.

The Advent of an Efficient Land Management System

Orthophoto maps produced from the various photogrammetric processes will be used as backdrops and will form part of the CIM for the development of a Land Information System. The system will identify, test, and introduce alternative techniques for the existing land records management in order to provide long-term solutions that will ensure a sustainable, integrated, and reliable records system for field survey, parcel-based mapping, and land title registration. The system will also provide answers to queries, cross-check, verify, and validate information on the land titles so that all existing anomalies are identified and properly addressed.•

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