

The Needs for Building Concept and Authorizing Implementation of Marine Cadastre in Indonesia

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Key words: Marine Cadastre, Coastal Zone Management, Coastal and Marine Resource Management, Land and Ocean Policy

SUMMARY

As an archipelagic state, Indonesia is wealthily surrounded by coastal and marine natural, biological, and botanical resources that spread out over 24.3 million hectares coastal areas along the waterlines of 17,508 islands, within 3.1 million kilometer squares territorial seas, and 2.7 million kilometer squares EEZ (Dahuri et al., 2001). Together with its great number of 223 million populations, most of big and capital cities and people reside and live in the coastal areas, make coastal and marine affairs become very important. In addition, the strategic of its geo-economics and geo-politics position as the main nautical traffics for international maritime in South China seas, Malacca and Singapore straits, and Northern and Southern Indian Ocean makes its coastal and marine affairs become even more important. These facts are only part of the main causes of conflicts upon coastal and sea areas. Cicin-Sain and Knecht (1998) identify there are at least 29 coastal and sea waters activities, and when each activity is put into a matrix, then are found 100 pairs of activities conflicting each other and 60 activities are endangering one to another. The concept of marine cadastre has been intensively developed in some countries, such Canada, Australia, U.S.A., New Zealand, Japan, and else where. This study will examine and learn from the concepts and experiences of these countries. After matching to the local characteristics and issues, this paper will discuss and suggest a concept of and the needs for authorizing the implementation of Indonesian marine cadastre. As a part of international community, the concept will remain working in the framework of UNCLOS. This benchmarking methodology has also been proposed to, the land cadastre, as it has been introduced by Steudler and Kaufmann (2002). This paper will also briefly discuss the role of marine cadastre in the management of sea-space use information management using Advanced ABC (Abiotic-Biotic-Culture) Resource Survey Method that was originally introduced by Grigoriew et al. (1985) and Theberge (1989), and modified by Scibicki (1995).

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1. BACKGROUND

During the three decades, Indonesian marine development has always been positioned as a peripheral sector. This is ironic, because almost 70% of its territory consists of seas with its enormous economic resources and important geopolitics position as a main gate between Pacific Ocean and Indian Ocean (Kusumastanto, 2003). As an archipelagic state, Indonesia has 24.3 million hectares coastal zones and 81,000 kilometers coastal lines together with all its precious natural resources (Dahuri et al., 2001). With all these values, the marine sector, which is defined as fisheries, marine tourisms, marine industries, sea transportations, sea mining, sea constructions, and sea services, is worthwhile become a mainstream in the national economic development policy (Kusumastanto, *ibid.*). On the other hand, based on the characteristics of the complexity of sea territory and marine resources, inherent conflicts upon them have occurred as long as human civilization. The number of conflicts has also gone up from day to day in conjunction with the increasing number of people and their activities on the seas.

Meanwhile, there has been a long debate between the schools of "*mare liberum*" and "*mare clausum*", that is the opinions that "*the sea is a common property, and therefore the ocean space as a common, available to all but owned by none*" and that of "*the sea is simply as the land, in certain limitations there have been inherently attached some (people's, society's, state's) rights and responsibilities*". In respects to the second opinion, there have been developed some concepts of marine cadastre during a recent decade. The marine cadastre is a new concept in Indonesia, it has not been known widely and not many researchers are interested in this issue. Some publications are nevertheless rendered the marine cadastre in Indonesia many good concepts, those are some papers written by Jacub Rais (Rais, 2002; 2002.a; and 2003) and a report submitted by Bandung Institute of Technology (BPN and LPPM-ITB, 2004).

2. ISSUES AND CONFLICTS ON THE MARINE SPACES AND RESOURCES

2.1 Conflict Grounds

In some studies conducted by, especially, Clark (1992), Cicin-Sain and Knecht (1998), and Kay and Alder (1999), there are stated that the root of the problems and causes of the deterioration of coastal zones and marine spaces and resources are mainly brought about by four major factors: (1) the increasing demands of natural resources and environmental-coastal services caused by the increasing number of population and its living quality; (2) the non-sustainable management practices; (3) the human behavior (ignorance, poor knowledge, poverty, and greedy); and (4) the three kind of failures: market and property right, policy, and information failures.

According to Cicin-Sain and Knecht (1998), there are 29 recognized activities on coastal waters and if each action is put orderly in an activity matrix, there will be found 100 pairs of activities are conflicting each other and 60 activities are endangering one to another. Those conflicts may or may not related to the conflict upon the coastal lands, such as the disputes on mangrove areas, the use and access to beach areas, the use and access to estuary regions, upland disposals, and other upland activities that have great impacts to the coastal areas. The intensity of conflicts in one hand, and the value of coastal and marine resources and services on the other hand, desperately need to be managed by sound spatial planning and guaranteed by legal certainty of property rights and leases. Among other things, within the framework of coastal and marine resource management, a marine cadastre offers some solutions that might not be seen or thought before.

2.2 Sea Tenure Rights

The concepts of a marine cadastre also acknowledge the existence of sea tenure rights of customary law communities. Based on researches done by LIPI (Indonesian Institute of Sciences), the sea tenure rights have been recognized by the customary people along way from Aceh to Irian Jaya or Papua (Polunin in Patji and Salipi, 1995). Marine tenure rights or sea tenure is a set of regulations and practices of the management of sea space and including the resources contained therein, concerning who possess the rights upon a sea region, kinds of resources could be caught, and means or technology to exploit allowable catch resources in a certain sea area. Based on the sea tenure researches by Ken-ichi Sudo (1983), Richard B. Pollnac (1983), Nicholas V.C. Polunin (1983), and Tomoya Akimichi (1991), Patji and Salipi (1995) conclude that a sea tenure is affected by two main variables, those are: sea conflict and sea value. The conflict variable is determined by the intensity of exploitation caused by the factors of ecology, demography, and means of subsistence, legal politics environment, technology change, and market distribution process. Whereas the sea value variable is determined by interests, productivity, and belief system factors (Figure 1).

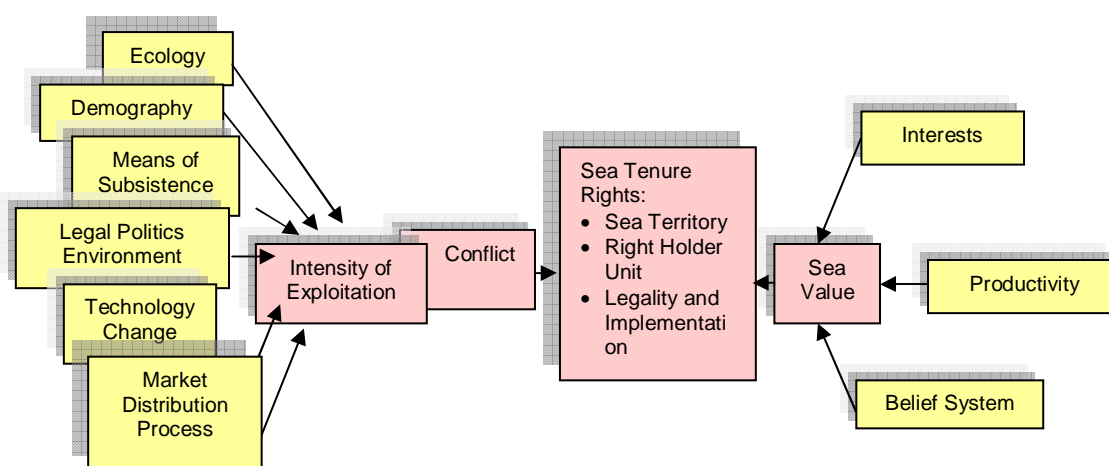


Figure 1. Factors Determining the Existence of a Sea Tenure Right (from Patji and Salipi, 1995: p. 16)

3. BUILDING AND PROPOSING AUTHORIZATION OF MARINE CADASTRE IN INDONESIA

Many today marine cadastres are usually still working in form of concepts or models. They have been intensively developed in some pioneer states such as Canada, Australia, New Zealand, and USA. In Canada, for instance, the implementation of the marine cadastre will become a part of the successful of a good governance indicator (Nichols, et al., 2001). One good way to develop a model is to learn to and compare with, or in another word to *benchmark* to, other systems or concepts. FIG (International Federation of Surveyors) has decided to use the benchmarking methodology: a) to create a framework to determine the progress and effectiveness of cadastral reforms; and b) to develop key criteria to determine the benefits of cadastral reforms (Stuedler and Kaufmann, 2002). As a ‘new subject’ or ‘the expansion’ of cadastre, then the marine cadastre should be a part of cadastral reforms although it is still in the concept stage. Following its meeting in Tsukuba, Japan 24–27 April 2001, Working Group 3 Permanent Committee of GIS Infrastructure for Asia-Pacific (WG3-PCGIAP) conducted a meeting in Penang, Malaysia, 11–12 September 2001 and agreed on a resolution No. 6 about Marine Cadastre.

There are at least three philosophical *raison d'être* why the marine cadastre is worthwhile to be discussed in this paper and presented to the readers, those are:

- The shifting paradigm from 2-D Cadastre towards 3-D Cadastre or Space Cadastre (Kaufmann and Stuedler, 1998; Hoogsteden and Robertson, 1999; Ng'ang'a et al., 2000), and from good (terrestrial) governance to good ocean governance (Nichols et al., 2001);
- The shifting epistemological under layer of marine development from Michael Redclif's sustainable development concept towards Feyereban, Friberg and Hettne's strengthening of local knowledge concept. With this epistemological development characterized by the local wisdom, the (communal) property rights upon marine resources are acknowledged, so that the increase of moral hazard caused by the open access regime of marine resources during the New Order era (Soeharto's) administration could be avoided (Kusumastanto, 2003);
- The shifting paradigm of social exclusion (centralistic authoritarian) towards social inclusion (citizens as the main stakeholder and indigenous knowledge are recognized) in coastal and marine resource development (Budiharsono, 2001);

In opening the discussion on the marine cadastre, let us begin with the definition of the concept by quoting some as follows:

- U.S. DOC: United States Department of Communication – NOAA: National Oceanic and Atmospheric Administration (2002):
“The U.S. Marine Cadastre is an information system, encompassing both nature and spatial extent of interests in property, value and use of marine areas. Marine or maritime boundaries share a common element with their land-based counterparts in that, in order to map a boundary, one must adequately interpret the relevant law and its spatial context. Marine boundaries are delimited, not demarcated, and generally there is no physical evidence of the boundary “.
- Jack Shih Yuan and Anna Tsui (2001):

- “A marine cadastre is a spatial extent of the interests and property rights, with respect to ownership, value, and use in the maritime perspective. The roles of the marine cadastre will be: allocation within society and among government organizations of rights of use; ownership and stewardship to marine resources; regulation of these rights of use, ownership, and stewardship; monitoring and enforcement of these regulations by the appropriate authorities; and provision of effective means to prevent and adjudicate disputes”.
- Ian P. Williamson and M. Sigit Widodo (2001):
 “A marine cadastre is a system to enable the boundaries of maritime rights and interests to be recorded, spatially managed and physically defined in relationship to the boundaries of other neighboring or underlying rights and interests. It is not about defining international boundary, but particularly about how a country administers marine resource in the context of UNCLOS”.
- Jacub Rais (2002.a, p. 2):
 “A marine cadastre is a system employing the principles of (land) cadastre in the sea regions through registering: the sea space uses by people and government activities, protected sea spaces, conserved sea regions, national sea parks, wildlife reserves and the use of sea space by the customary communities”.

Derived from those definitions, this paper will take up a definition of a marine cadastre in Indonesia as follows: A Marine Cadastre is a public information system concerning letters, registers, and both textual and spatial data and documents pertaining to the interests, rights and leases, responsibilities and restrictions, including the data on values, taxes, and legal relationships as well as legal actions associated to a sea parcel. It is conducted following the agenda of integrated coastal and marine resources management within the land policy and ocean policy framework. As well as in the land cadastre, the marine cadastre is also been built based on the three pillars or benchmarks, as follows: (a) the legal pillar (3R: rights, restrictions, and responsibilities); (b) the technical pillar (surveying, mapping, and spatial data infrastructure); and (c) the institutional pillar (formal and informal institutions and human resources).

3.1 Legal Benchmark

As a part of legal system (legal cadastre), the marine cadastre is also meant to guarantee legal certainty in sea-space development planning, sea-parcel rights and leases, and public access to and from the seas. There are at least three activities directly and indirectly related to a marine cadastre, those are:

- Upland activities: Contribute about 70% of pollution in the coastal and marine areas from nutrient run-off (soil erosion), household wastes to industrial disposals. Nevertheless these are not the domain of a marine cadastre
- Coastal activities: Meet land cadastre and marine cadastre into one complex and frail region called coastal areas, where the wetlands, shallow water regions, and beaches are the domain of a marine cadastre;
- Ocean activities: Give more complicated management where many government authorities and private companies perform their actions, together with the traditional

and modern fishermen. These will need careful and sound integrated arrangements, among other thing, by the help of a marine cadastre.

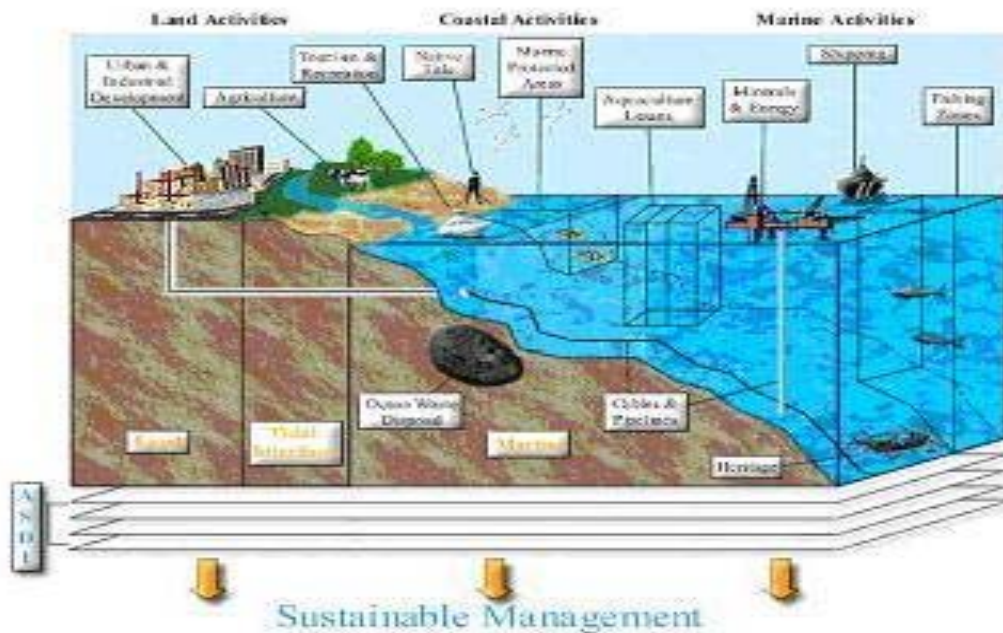


Figure 2. Diagram Concept of a Marine Cadastre (Copy-Rights ©The University of Melbourne 1994-2000).

3.2 Technical Benchmark

As an information system, the marine cadastre is designed as a tool and mechanism of providing data and information, simply from information as information, information as a resource for planning and decision making process, to the information as a legal evidence of a certain sea and marine right and lease. Among other technical aspects of a marine cadastre, the spatial data infrastructures take a very important role.

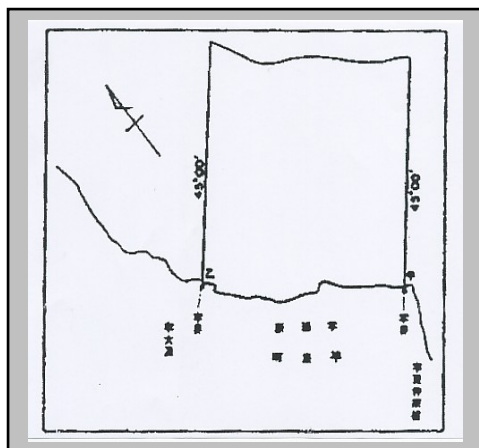
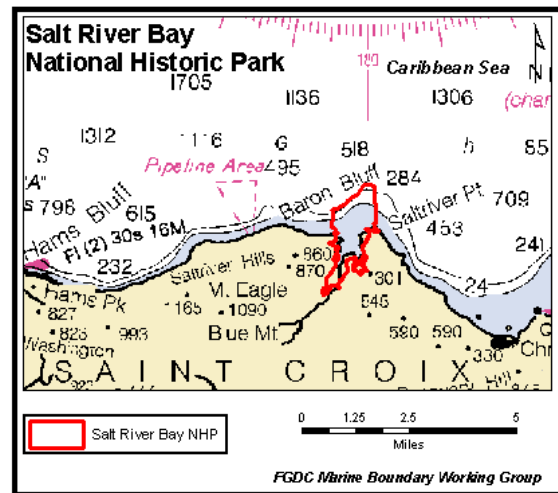


Figure 3. Attachment Map as a Registration Document for Fisheries Cooperative Associations (FCAs) License No. 5072, First Registered 27 March 1928 (Source: Ruddle, 1992: 20)

Surveying, mapping, and registration of sea properties are not new. In Japan for instance, the documents concerning sea tenure rights have been recognized since the feudal era (1603-1867). Formalization of marine tenure rights in the Edo era was believed based on the traditions that were applied before. After the Meiji restoration in 1868, in 1876 the Government of Japan took over all the ownerships on fishery businesses, and licenses or permits were issued to individuals with taxes. Figure 3 shows an example of an old map of a sea parcel. The boundary systems of the FCAs' sea tenure rights in Okinawa Islands have also been recognized and mapped during the First and Second Period (Ruddle, 1992)

Meanwhile, as shown in Figure 4 is an example of a modern sea parcel map of Salt River Bay National Historic Park in the U.S. marine cadastre (BPN and LPPM-ITB, 2004).

Figure 4. Example of U.S. Marine Cadastre Map (from FGDC MBWG, 2001 in BPN and LPPM-ITB, 2004: p. 23)



There are several point of references pursued in building spatial data infrastructures of a marine cadastre system. *Firstly*, since spatial information is defined as information represents a position in the surface of the earth in forms of coordinates of geographical objects, then it should have agreed on a certain national standard coordinate system as well as its map projection and geodetic datum chosen. In order to make all maps in Indonesia compatible, Rais (2003, p: 27-28) suggests that we better use geocentric coordinate system with Indonesian National Geodetic Datum DGNI 1995 and ellipsoid reference of WGS 1985 ($a = 6,378,137$ m and $f = 1/295.34$). *Secondly*, there should be clear legal definition of a base point, a reference point, and a maritime boundary point. It should also be legally defined what a base line is, and when to use normal and when to use straight base line, and also what methodology used for determining the boundary between administrative regions.

A base point is a clear position chosen in the shore at the lower sea level. A reference point is a permanent monument in the shore land that is used for benchmarking. A maritime boundary point, furthermore, is a seamless sea boundary obtained from base points, reference point, or directly through GPS survey. In Figure 5, it is shown that according to Act No. 22 Year 1999, a normal base line is defined as at the low tide shoreline. It is also used for establishing the territorial sea, EEZ, and continental shelf boundaries.

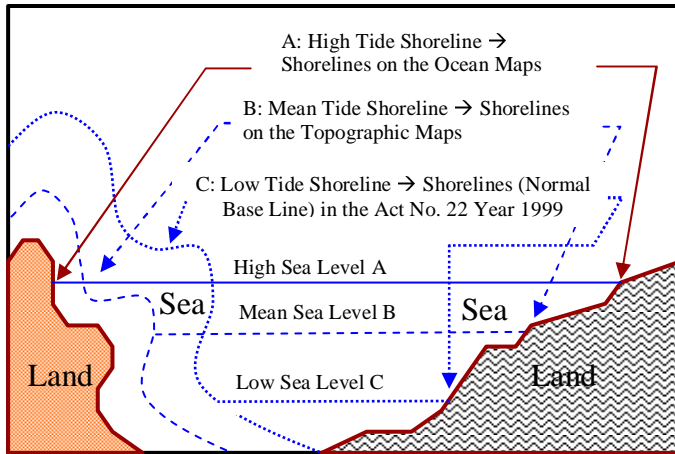
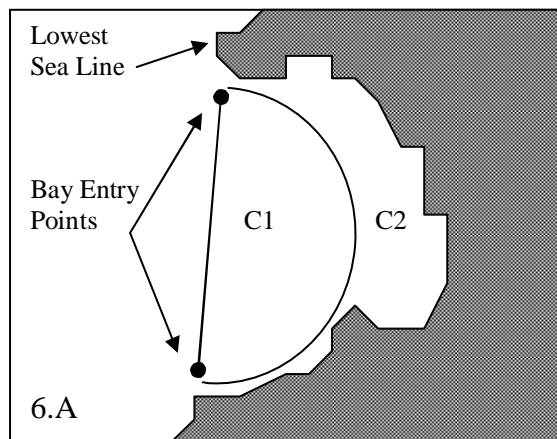


Figure 5. Some Typical Shorelines and Normal Base Line (modified from Rais, 2003: p. 13)

When particularly deal with international sea boundaries, it should also be legally clear in accordance with UNCLOS 1982 some definitions and techniques adopted. According to UNCLOS, a bay is defined as a sea curve towards the land where the water area covered by the land (C2) is the same or greater than the water area covered by the curve and its closing line (C1).



In this case, the definition of a bay is fulfilled and it is also called the juridical bay, as shown in Figure 6.A. In the situation shown in Figure 6.B. where $C2 < C1$ or $C1 > C2$, therefore it is called not a juridical bay. Next shown in the Figure 6.C. are some alternatives of drawing base lines. According to Act No. 22 Year 1999, a closing line of a bay that can be used as a base line shall be no more than 12 miles.

On the other hand, a base line applied for an archipelagic country agreed in the UNCLOS is for a maximum 24 miles. If the closing line 1 does not encounter the regulation, then use the closing line 2. Furthermore, if line 2 does not meet the rule, then choose the line 3 (Rais, 2003).

Thirdly, in choosing technology for developing a GIS system for a marine cadastre, it should be considered some aspects, such as: data standardization, interoperability among GIS systems, GIS capabilities or features whether or not it is facilitated with some advanced applications for example, a DSSS (Decision Support System) or an EWS (Early Warning System) in addition to capabilities that have already attached in most of GIS tools in the

market today. Due to the rapid development of information technology and the high maintenance costs, after sales service and maintenance have also been considered. Related to standardization in the information systems, a marine cadastre should adopt the NSDI (National Spatial

Data Infrastructure). Until today, there have been produced many geospatial data by different institutions, but the information generated still could not answer and or solve the problems arise.

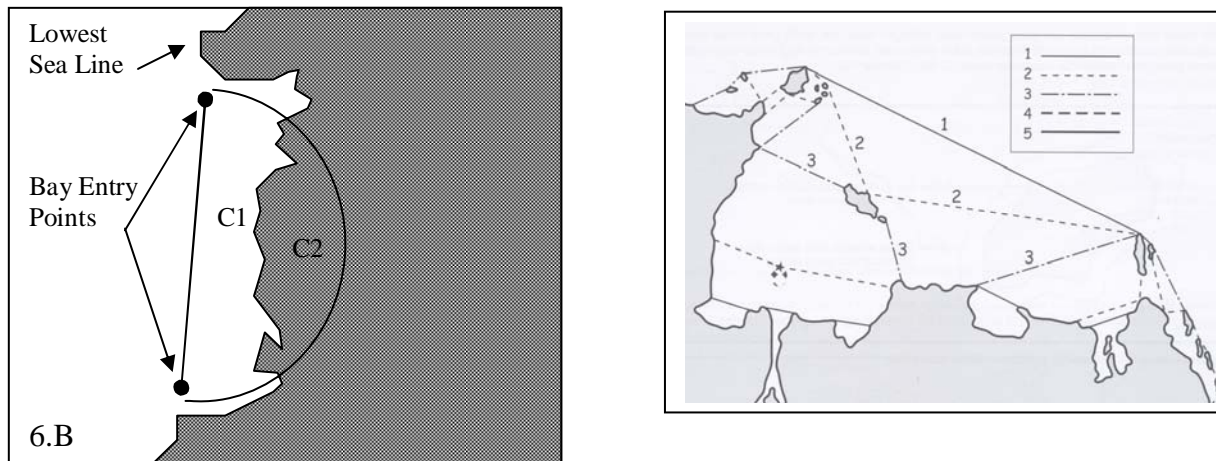


Figure 6. A, B. and C: Juridical Bay, Not a Juridical Bay, and Alternative Closed Base Line of a Bay (from Rais, *ibid.* p. 14-15)

3.3 Institutional Benchmark

As a part of a public administration system, the marine cadastre acts as a public service provider and sea-conflicts resolution. It is also running the agenda of developing four orders of coastal and marine management, those are: marine-legal order, marine-administrative order, sea use order, and marine-ecosystems protection order. How to do these? There must be: *Firstly*, clear and non-overlapping authorities and responsibilities for each government institutions and agencies in operating their governmental tasks. *Secondly*, there shall be sound coordination among the government institutions and agencies. *Thirdly*, there have to be real active public participation and real involvement of all the stakeholders.

Regarding the domain of a marine cadastre, as it is shown in Table 1, it could be drawn a scheme that among all related activities in the coastal and marine regions:

- As long as it is dealt with the coastal and marine resources, then a marine cadastre of those resources is held and maintained by DKP: the Ministry of Marine Affairs and Fisheries;
- As long as dealing with the property rights of the coastal and marine regions, then a marine cadastre of those property rights is held and maintained by BPN: the National Land Agency.

Activities	Authorities and Stakeholders		
	BPN	DKP	Others
Navigation		√	Ministry of Communications, Indonesian Navy Forces (Hydrographic Division), Coordination Board for Marine Security, national and international maritime communities
Tourism	√	√	Ministry of Tourism and Culture, Ministry of Home Affairs (Directorate of Regional Development), Ministry of Communications, the public (national and international)
Fishery		√	Ministry of Communications, privates and companies (national and international)
Mineral exploration and exploitation	√	√	Ministry of Energy and Mineral Resources, Ministry of Communications, the companies (national and international)
Military zone			Ministry of Defense, (Hydrographic Division), Coordination Board for Marine Security
Marine ecosystem protection (national park, marine sanctuary, etc.)	√	√	Ministry of Environment, Ministry of Forestry, the public
Sea tenure right	√	√	Customary law communities
Aquaculture	√	√	privates and companies (national and international)

Note: BPN is the National Land Agency

DKP is the Ministry of Marine Affairs and Fisheries

Table 1. Marine Stakeholders (modified from BPN and LPPM-ITB, 2004: p. 42)

- With this scenario, a marine cadastre of the coastal and marine resources will reside within the ocean policy, whereas a marine cadastre of the property rights of coastal and marine regions will fall into the land policy;
- Both ocean and land policy should meet in one point at the national grand policy.

4. MARINE CADASTRE AS A MODEL OF THE SEA-SPACE USE INFORMATION SYSTEM MANAGEMENT

A marine cadastre system, by its definition, roles, benefits and goals that have been mentioned before, has many capabilities of doing the governmental tasks in its field. One of them is that a marine cadastre could be used as a model for the management of sea-space use information systems. This study uses Advanced ABC (A biotic-Biotic-Culture) Resource Survey Method that was originally introduced by Grigoriev et al. (1985) and Theberge (1989), and modified by Scibicki (1995). The ABC method is a way to organized, overlay, and compare and compare structural and process information on (in this case) coastal and marine components. Following the methodology, there are four levels of tasks to go after:

4.1 Level of task 1

Collect, analyze, and synthesize information in terms of goals. Data for abiotic, biotic, and cultural components are presented on two sets of maps, one to display structural information and another one to display functional information;

4.2 Level of task 2

Determine significance and constraints in terms of goals. This level of task is used for interpretation of environmental socio-economics significance and environmental socio-economics constraints. The interpretations are poured into two sets of layers which are derived from a combination of ecological aspects (i.e. floral and faunal diversity, community diversity, ecological importance, and ecological hazardous), relative occurrence (i.e. abiotic uniqueness, species rarity, and abiotic rarity), and value to human beings (i.e. economic values and recreational values). Each data on a biotic, biotic, and culture of the coastal and marine regions are field-surveyed and mapped into zones, so we get several zones, for instance: mineral resources zones, marine hazardous zones, fish population zones, coral reef zones, mangrove zone, economic value zones, and sea tenure right zones (Figure 7).

4.3 Level of task 3

Summarize and or integrate in terms of goals. The maps produced are analyzed and interpreted to give a summary of environmental socio-economics significance and constraints. The interrelation of areas of abiotic, biotic, and cultural constraints and significance is used to point out key sea-space use and management issues.

4.4 Level of task 4

Propose goals or objective for a management proposition (Adopted from Scibicki, 1995: pp. 65-68).

What makes this study different from the previous works are:

- While the previous works used manual overlay, this study uses algorithm of topology relationships for each zone map layers, in order to obtain more objective analysis and results, then finally better policy and management propositions;
- When the previous works operated a preliminary and qualitative regional comparison and overview of the objects, this study uses quantitative comparison methods by quantifying objects on each zone layer.

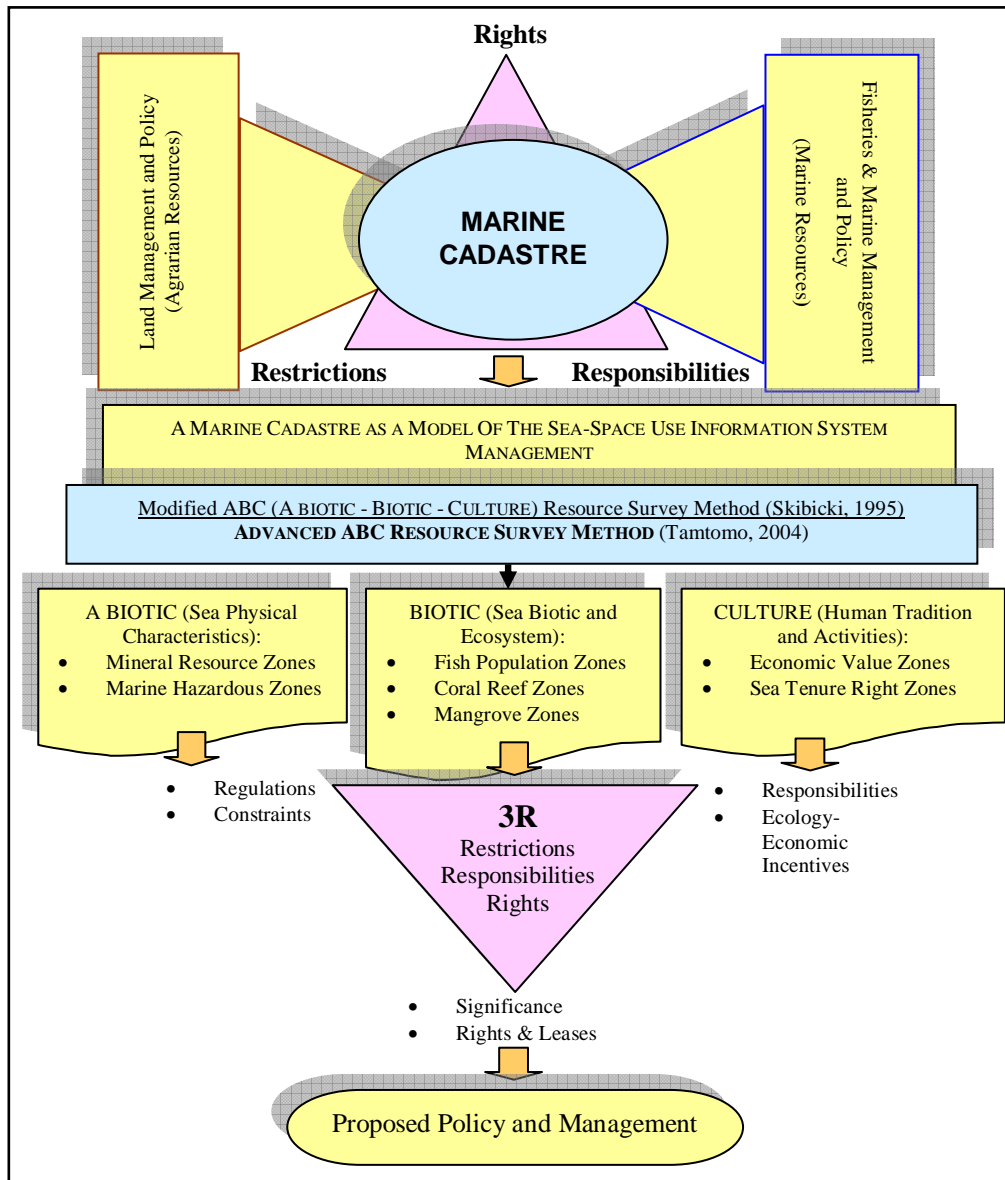


Figure 7. The Use of Advanced ABC Resource Survey Method in a Model of Sea-Space Use Information System Management in a Marine Cadastre.

5. CONCLUDING REMARKS

The atmosphere of the shifting paradigm in Indonesian politics scheme has changed many living styles and behaviors of the citizens. The demands for visible good governance escalate and look more and more transparent. The same thing goes to the demand for *good marine governance*, this is not only because of the largest part of Indonesian territories consist of seas, but also because of the shifting paradigm in the coastal and marine resource issues. The need for development of a sound marine cadastre system, and also the need for authorizing implementation of it, might be unquestionable; nevertheless, it will need some or many more

studies or researches and legal propositions in addition to this paper, which still has many limitations and weaknesses therein.

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BIOGRAPHICAL NOTES

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His present position within the organization: Head of Sub Directorate of Land Information Services and Land Valuation, National Land Agency (BPN), Republic of Indonesia, Jakarta. Years with the organization are from January 1978 to present. His present membership of professional bodies and professional experience record (mainly in one of the areas of activity), were: (a) Secretary for the Working Group 2: Land Management and Development Program, Grant Project from Government of Japan and under supervision by the World Bank, 2002 – 2003; (b) Head of Technical Team for Marine Cadastre Study, Land Management and Development Program, Grant Project from Government of Japan and under supervision by the World Bank, 2003 – 2004;

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