PCGIAP – Working Group on the Cadastre

Position Paper on Marine Cadastres

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> *"The spatial infrastructure supporting the administration (ed: of the Marine Cadastre) will need to be coherent, appropriate and affordable. It should enable the alignment of all systems and procedures of rights, usage and management so that the spatial referencing is consistent and readily interrelated for all users. There is now a great opportunity to develop a spatial information infrastructure theme as a component of the wider marine resources infrastructure."*
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> *Robertson, et al, 1999*

Aim of Working Group:

To investigate the issues involved in establishing a unified marine cadastre and the necessary spatial data infrastructure requirements to enable sustainable management of individual countries marine resources given the increased territorial responsibility under the United Nations Convention on the Law of the Sea (UNCLOS) in 2004.

Definition of a Marine Cadastre:

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 neighbouring or underlying rights and interests.

Discussion:

The upcoming ratification of the UNCLOS in 2004 will focus attention on the need to provide the administrative and infrastructure frame work to manage the areas claimed under this convention. Specifically it will be concerned with:

1. Demarcation of ocean territory to the limit of the continental shelf, along with establishment of a system for the definition and maintenance of existing and future rights
2. Demonstration of a commitment and capability to administer the ocean territory and manage marine resources in a sustainable manner

The focus of the PCGIAP is on the second requirement, not the demarcation of ocean territory.

The main uses of a marine cadastre include:

- Shipping Lanes
- Geophysical exploration
- Oil and gas extraction
- Defence issues
- Fisheries
- Conservation

Future needs of the marine cadastre include:

- Increased navigation capability (GPS)
- Declaration of marine reserves
- Move to "ranching" in some fisheries
- Intensive mariculture
- Increased understanding of the variable value of different parts of the sea floor
- Increased sea floor infrastructure

To date most of the effort in administering the marine resource has been on defining claim boundaries and establishing the basis for the claims. However, it is also ***important under the convention that claimant nations demonstrate a capability and an intent to administer the claimed areas***. This is particularly true when existing international commitments to sustainable development are considered. Currently, with the exception of a few special areas in Asian and Pacific countries, competing rights and responsibilities in Asian and Pacific countries are handled in a somewhat ad hoc manner with each responsible agency in the individual countries defining the spatial bounds of the given activity separately.

A more unified cadastral approach will provide the basis for the sustainable management of the marine environment in a time of increasing usage. *"Issues that need to be considered are the administrative governance, regulatory structures and service delivery mechanisms, marine resource planning and environment effects management, and the establishment of an appropriate spatial information infrastructure." Robertson, et al, 1999.*

In parallel with this administrative development, there are developments in fisheries technology and practise which require a management response. These include increased navigation capability (GPS), the declaration of marine reserves, the move in some benthic and demersal fisheries to a ranching rather than a wild catch approach, and the development of intensive mariculture.

The needs from an information management point of view include:

- A uniform and coherent administrative infrastructure to support marine resources management, especially in regard to rights, responsibilities and obligations
- A comprehensive spatial data infrastructure which should desirably be integrated with land-based information systems
- Clear demarcation of zones within the ocean territory, along with quantifiable estimates of boundary uncertainty
- Access to relevant spatial information

As well, research has shown that there are certain areas which are far more productive than others for demersal fisheries. All of these add a spatial dimension to an industry that has been traditionally been controlled mainly by non-spatial methods, such as total allowable catch. Some, such as ranching and mariculture, require property rights to allow for value adding.

The PCGIAP should restrict its concern to spatial definition and description:

- Administrative infrastructure
- Data structures & integration
- Spatial referencing

Specific issues for investigation

Administrative infrastructure issues

- Coordination between jurisdictions and agencies
- Provision of spatial data infrastructure to support sustainable development (economic exploitation versus conservation, etc.)
- Desirability of a single 'maritime resources' agency or ministry (must show under UNCLOS an intent and capability to administer the ocean territory)
- Central registration, recording and monitoring of maritime rights and responsibilities, again from a spatial information perspective
- Uniformity in future regulation and authorisation of rights and responsibilities (uniform definitions, etc.; try to discourage single purpose systems)
- Integration with on-shore administrative structures, especially at the shoreline region
- Notion of 'property rights' free of inconsistencies and ambiguities

Data Structures and Integration Issues:

- Integration of existing and new rights/leases/tenements into a uniform spatial information system
- Reconciliation of conflicts/ incompatibilities & management of spatial overlaps encountered in this integration (different reference systems, overlapping rights, conflicting rights issued by different agencies, etc.)
- Technological aspects of generating uniformity between the inherently 2D land-based information systems and the 3D maritime spatial data structures (especially at land-sea interface)
- Investigation of spatial data uncertainty associated with creation of a uniform system incorporating existing information

Spatial Referencing Needs and Issues:

- Design of the 'maritime resources database' (need to account for more than the seabed)
- Definition of all zones and zone boundaries within a uniform national (and/or global) reference system
- Information pertaining to spatial data uncertainties, principally with respect to zone boundaries, and potentially also involving uncertainties associated with existing rights and leases
- Topographic information (seafloor mapping) for both resource management and to aid in boundary demarcation
- Spatial referencing in 3D, desirably consistent with international systems, to account for 'vertical' distribution of marine rights and resource usage
- Dynamic positioning capabilities and infrastructure for real-time maritime positioning (digital boundary demarcation; real-time feed-back to operations)

The proposed workshop could consider:

- The impact of UNCLOS in 2004 in administering each nation's marine resource
- Land administration practices which may be applicable to the marine environment
- The basis on which particular property rights can be defined and the spatial data infrastructure requirements to manage the maritime cadastre

- possible problems in addressing UNCLOS in 2004 which may be better addressed by sharing information and experiences within the Asian and Pacific region

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APPENDIX: The importance of cross-national cooperation and the role of Spatial Data Infrastructures

We live in an age of information, and geographic information is one of the most critical elements underpinning decision making for many disciplines. In this regard, many of the things that different nations want to achieve together can only be achieved if good, consistent spatial data is available and readily accessible. This is especially important when planning for the future. Geographic data are still expensive and time consuming to produce. In recent years nations have made unprecedented investments in both information and the means to assemble, store, process, analyse, and disseminate it. Thousands of organisations and agencies (all levels of government, the private and non-profit sectors, and academia) throughout the world spend billions of dollars each year producing and using geographic data (FGDC 1997, Groot and McLaughlin 2000). This has been particularly enhanced by the rapid advancement in spatial data capture technologies, which has made the capture of digital spatial data a relatively quick and easy process. But, they still do not have the information they need to solve critical problems. There are several aspects to this problem:

- Most nations and organisations within a nation need more data than they can afford;
- Nations often need data outside their jurisdictions. In addition, information needed to solve cross-jurisdictional problems is often unavailable; and
- Data collected by different nations and organisations within a nation are often incompatible.

Under current circumstances governments of different nations, should reach agreement on what fundamental datasets are required to meet their common interests, to what standards they should be collected and maintained, and what the priorities are for their collection. This is because it is necessary to integrate a number of datasets that may have been produced by different agencies within different nations for specific purposes, to their own specifications and priorities, and with little regard to the needs of other users. This narrow focus, whilst understandable, leads to inefficiencies and duplication of effort. With this background, many countries believe they can benefit both economically and environmentally from better management of their spatial information by taking a perspective that starts at a local level and proceeds through state, national and regional levels to a global level. This has resulted in the development of the Spatial Data Infrastructure (SDI) concept at these levels.

Moreover, working together in a geographic area can also provide data coverage in a common form over a wider area. This aids cross-jurisdictional or cross-organisational analysis, decision making, and some types of operations. For example, adjoining jurisdictions may have a common interest in an environmental issue. A transit operator may serve a region, rather than stopping at country boundaries (FGDC 1997). Also, sharing geographic data of common interest enable nations to defray some of the costs of producing and maintaining the data. But mechanisms to facilitate the use and exchange of spatial data are a major justification for developing and expanding any type of SDI.

Regional Cooperation

The need for regional cooperation is a good practical example of why spatial data is a critical policy issue for all nations. Regional cooperation will create enormous opportunities and challenges for nations. The main rationale for regional cooperation rests on the exploitation of complementarities among a group of countries, which will support the efficient use of natural and human resources beyond national borders. Regional cooperation also enhances economies of scale by enlarging regional markets and increasing competition. In addition, there are other positive effects such as increases in the rate of technological transfer, improvement in the investment climate and other consumer demand dynamics. In general there are substantial benefits from regional cooperation in the area of infrastructure, environmental protection, technology, trade, investment, and natural and human resource development.

The scope of regional cooperation can be expanded on critical regional matters such as environmental, social and cultural protection. There are great demands in some trans-border environmental issues such as global warming, ozone layer depletion and fisheries management. Moreover, it is well accepted that improvement of regional infrastructure linkages including transportation, communication and power supply are important for the success of regional cooperation.

Generally, regional cooperation has been accepted as imperative for development in third world countries. This is evident in the conspicuous place the concept occupies in national development plans and foreign policies as well as in the rhetoric of political leaders and statesmen. The other reasons for cooperation are those based on economic factors, cultural similarities, shared historical experiences and geographical contiguity. The benefits from regional cooperation mainly come from projects and work programs, which are defined at their meetings. In most case, regional organisations need to access and use spatial data as a primary input to plan and execute these projects and programs. The importance of easy access to spatial data for decision-making is currently one of the important factors on many government strategies. This is particularly apparent in the mission statement of the British National Geospatial Data Framework which seeks:
"*To provide a framework to unlock geospatial information for the benefit of the citizen, business growth and good government through enabling viable, comprehensive, demand-led and easily accessed services.*" (NGDF 1998).

Also, these views are echoed in the final report of the pilot study carried out on the Canadian Geospatial Data Infrastructure. It formulated its mission in the following terms:

1. *To provide easy, consistent and effective access to geographic information maintained by public agencies throughout Canada;*
2. *Promote the use of spatial information in support of political, economic, social and personal development by all Canadians*

(Turnbull and Loukes 1997)

But, due to some reasons like the concept of security on spatial data and lack of availability of a proper dataset, usually regional organisations in different regions are faced with some difficulties.

Summarising objectives of regional organisations and based on the same reviews on the Asia-Pacific regional cooperative organisations, showed that in general the main objectives of the regional organisations include:

- Acceleration of economic growth, social progress and cultural development in the region;
- Promotion of regional peace and stability;
- Promotion of active collaboration and mutual assistance on matters of common interest in the economic, social, cultural, technical, scientific and administrative field;
- Provision of assistance to each other in the form of training and research facilities in the educational, professional, technical and administrative spheres;

- To collaborate more effectively to improve the agricultural, industrial, trading, transport and communications sectors of the economy;
- Promotion of regional cooperation for ecological and environmental protection;
- Promoting regional studies;
- The close and beneficial cooperation with existing international and regional organisations with similar aims and purposes.

To achieve these objectives, all regional organisations need to access accurate, consistent and up-to-date regional spatial data resources to make informed decisions and to implement resulting regional initiatives. Moreover, national governments are very sensitive in any cross-national boundaries including maritime boundary activities. All efforts by regional organisations, including the effort of the PCGIAP regarding development of the Asia-Pacific Spatial Data Infrastructure, are faced by some difficulties.

Due to the used lack of availability of reliable regional data sets, each common regional project requires recollection of data of the respective region. This requires a vast amount of time, duplication of efforts and resources of all involved nations and organisations. Spatial data collection especially is a very expensive and time-consuming part of any project. This issue is more important from the economic point of view. Moreover, these kinds of problems will always happen to the nations, with most pressured resources.

This situation is more exacerbated when the national mapping and spatial data activities are the responsibility of a nation's military organisation because there may exist a perception that sharing geographic information will affect national security.

Regional SDI: a facilitating initiative

The Regional Spatial Data Infrastructure (Regional SDI) is an initiative intended to create an environment in which a wide variety of users who require regional coverage, will be able to access and retrieve complete and consistent data sets in an easy and secure way. Its roots are in the regional governments and their cooperation.

Regional SDI can provide the institutional, political and technical basis to ensure the regional consistency of content to meet regional needs in the context of sustainable development. Within this regional framework, the fundamental data sets can be collected and maintained through partnerships. This data set will includes all data necessary to understand the region, in both spatial and non-spatial forms.

The regional infrastructure should ensure that national efforts are focused and coordinated, thereby maximising the benefit from investment in data collection and maintenance from both a regional perspective and that of the individual members.

A Regional SDI ideally should provide benefits for all member nations. In particular the needs of the cooperating member nations must be met but there must exist provision for joining by previously non-participating nations. As the membership grows the data pool widens and there are further economies and benefits realised.

Much geographic data development effort is based on the developer learning from the experience of others. The Regional SDI and its fundamental data sets represent the combined results of such experience. Further benefits of a Regional SDI additional to those already outlined are:

- Reduced costs of data production and elimination of duplication of effort;
- Developing applications more quickly and easily by using existing data and data development standards;
- Provide better data for decision making;

- Save development effort by using fundamental and standardised data, guidelines, and tools;
- Perform analysis, decision making, and operations in cross-jurisdictional areas;
- Expanding market potential and program funding through recognition and credibility as a Regional SDI participant;
- Providing consolidated directions to vendors regarding required technical features.

References

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