Marine Data Management in Indonesia

Aryo Hanggono & T. Rameyo Adi
Southeast Asia Center for Ocean Research and Monitoring (SEACORM)
E-mail: arfarhan@geologist.com - Fax.: (+62-21) 79180188
Jl. MT. Haryono Kav. 52-53 Jakarta 12770, Indonesia

Abstract

The Indonesian waters is a national asset that provides natural resources, energy sources, and food resources, and serves as transportation route between islands, trading area, and natural defense. In the effort to develop Indonesian marine areas, marine data are important for various activities and applications such as navigation, sea transportation, fishery, marine disaster mitigation, environment monitoring and marine resource production. Marine data management is beneficial in predicting marine climate/weather and environmental conditions, protecting marine life, mitigating marine environment changes due to human activities, and promoting advancement of marine science.

The end-to-end data management systems, implemented for integrated observing system, must have the flexibility to serve large variety of requirements. Data and information management (DIM) lies at the heart of GOOS (Global Ocean Observing System). DIM will address the issue of how the marine data flow to services and products. The DIM system is likely to be based on a distributed computer-linked network of data processing centers or nodes, and to include a Data Information Management service that provide coordination as well as advice to users on the practical aspects and to create products of local interest.

This paper presents a system design of marine data and information center in Indonesia. This system is developed by adopting the distributed database concept of the Infrastructure Data Spatial National (IDSN) program. Considering many institutions collecting marine data, a distributed model is very compatible to be applied in Indonesia. The system in the concept comprises of two systems, one system in the national data center and one system located in the nodes (data provider institutions). The National Data Center system is a gateway to the member nodes. The application of this national data center system may be in the form of web portals, where the portal supply various marine information, members nodes list, and equipped with a search engine that can perform information search for each member node.

Keywords: marine, data management, Indonesia

01. Strategic role of marine data and information

The Indonesian waters is a national asset that provides the natural resources, energy sources, and food resources, and serves as transportation route between islands, trading area, and natural defense. For these reasons, Indonesian waters are a medium to preserve the integrity of the region, support sea communication and transportation, as one of the sources for living and non-living resources with high economical values; and a region for defense purposes.

In the effort to develop Indonesian marine areas, marine data are important for various activities and applications, such as navigation, sea transportation, fishery, marine disaster mitigation, environment monitoring, and marine resource production. Marine data management is beneficial in predicting marine climate/weather and environmental conditions, protecting marine life, mitigating marine environment changes due to human activities, and to promoting advancement of marine science.

In Indonesia, Marine data and information that are distributed to various users may be categorized into 3 groups:

1. National research institutions, since one of their tasks or roles need marine data
2. Local institutions, mainly the ones with coastal and sea territories to support their development, namely coastal management and exploitation of marine resources
3. Private users, the industries that need marine data to support their activities.

The scientists will have a requirement for accurate, long term data sets for research on physical, biological, and chemical oceanographic processes; model development and testing; design criteria for ships, structures, and marine facilities; studies of the effects of climate change on economies and populations, etc. For these types of work, accuracy and completeness of the data sets are more important than having the data in real or near real time.

The operational users of the national and local institutions have a responsibility to their clients to analyze data collected and produce a prediction about weather or climate; issue a warning of an impending condition such as a severe storm at sea or a coastal storm surge; or implement a regulation such as the closure of a fishery for a specific health danger. These users will have time critical applications requiring data collection and distribution in an operational time frame.

For managers of the data collection programs, the information is more important rather than the data itself. The managers must be able to evaluate progress against plans on a continuous basis to ensure the program succeed in collecting its data. The managers must be able to identify gaps in observations, before they can determine the success of the program. They must know that the quality of the measurements meet the standards set for the program and that the analyses and data products are being produced and distributed and meet the needs of the clients.

The end-to-end data management systems that are implemented for integrated observing system (IOS) must have the flexibility to serve this large variety of requirements. The development of a sufficiently comprehensive strategy and plan to meet this variety of requirements begins with a study of the general characteristics of the applications to be served. An analysis of these general categories of applications and of the existing successful programs that will form the basis of the IOS was used to specify guideline principles and common characteristics of the IOS data and information systems of the future. The Plan and Strategy also discuss provision of access to data, data products, and services; cooperation with other relevant national and international data programs; archiving strategies and standards; capacity building; and the way forward for implementation of the IOS Data & Information Management Systems.

02. Concept of Marine Data Management

Marine Data Management in GOOS Framework

Data and information management (DIM) lies at the heart of GOOS, so the development of Marine Data and Information Center is a high priority for the immediate future. DIM will address the issue of how the marine data flow to services and products. The DIM system is likely to be based on a distributed computer-linked network of data-processing centers or nodes, and to include a Data and Information Management Service that provide coordination as well as advice to users on the practical aspects and to create products of local interest.

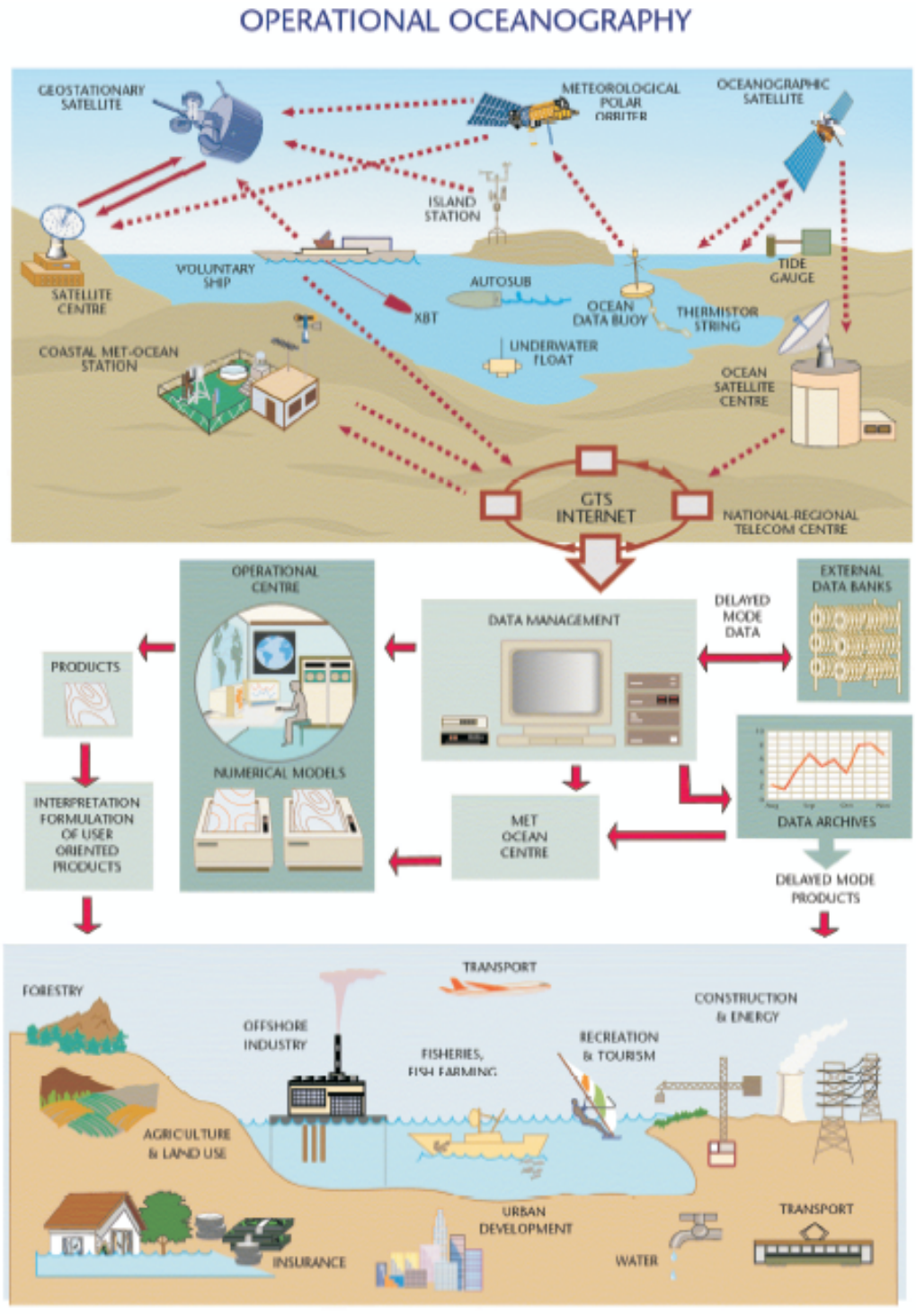

Figure 1 – Diagram of marine data flow to services and products

(Source: GOOS program IOC-UNESCO)

Function of Marine Data Management

Data management in its basic sense involves organizing and documenting of data in a manner which facilitates and maximizes its potential for re-use. In developing a data management strategy for the center, it was necessary to look at existing performance in six key constituent areas of data management. Those components are data management policy, data registration, archiving, processing, and dissemination as well as databases.

Based on these areas of data management above, four fundamental composite issues have been identified for priority attention and have been addressed in this strategy. These issues are metadata directories, data acquisition and data sharing, central archiving of digital data, and general dataset/database management, and coordination of national and international data exchange/provision.

03. Marine Data and Information Center System Design

Distributed Model of Marine Data Center

Marine Data and Information Center with the distributed model is very compatible to be applied in Indonesia considering the many institutions that collect marine data. This model is developed based on a research done by a technical team of SEACORM's data management by adopting the distributed database concept of the Infrastructure Data Spatial National (IDSN). IDSN is a program to manage national spatial data coordinated by BAKOSURTANAL (National Coordinating Agency for Survey and Mapping). The goal of this program is to develop a concept model to create a

standard system used by every data management institution, including marine data, that exchange of data will have a standard format and of good quality.

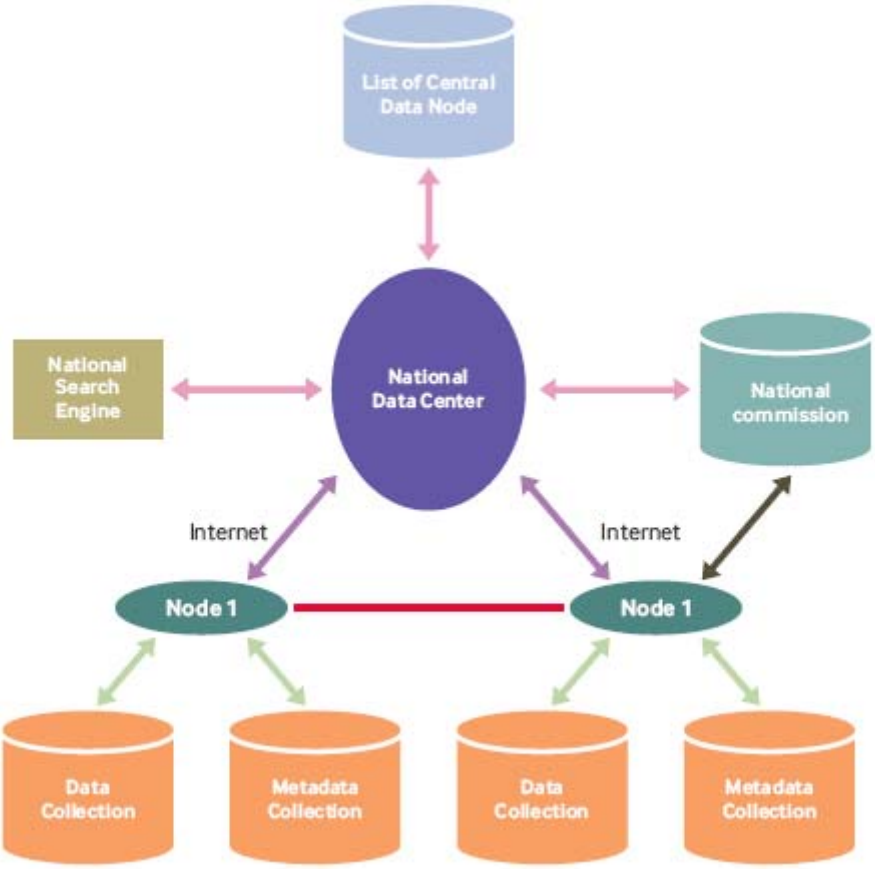

Figure 2 – Diagram of distributed model of marine data and information center

The system in the concept comprises of two systems, one system in the national data center and one system located in the nodes, the system organization will be a distributed organization format, where each node will have its own data server that can be merged with other node servers.

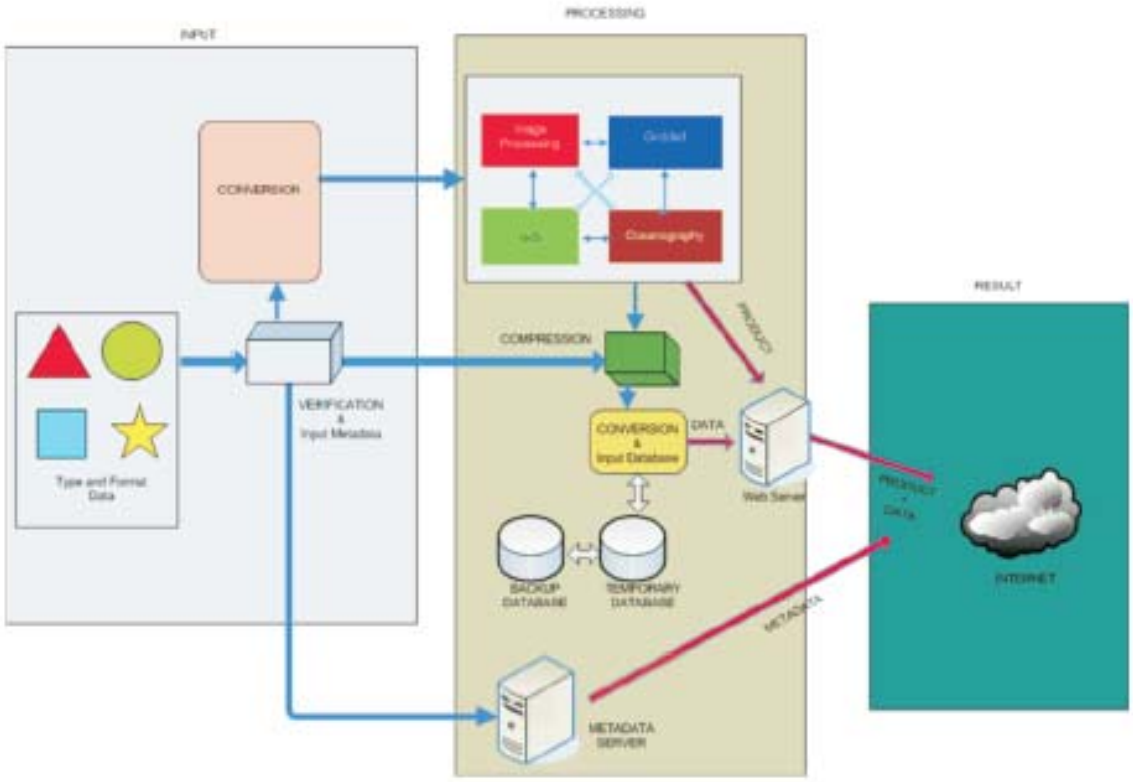

Figure 3 – The concept of proposed system for data exchange node is divided into 3 parts: input block, process block, and output block

National Data Center System

The National Data Center system is a gateway to the member nodes. The application of this national data center system may be in the form of web portals, where the portal supply various marine information, members nodes list, and equipped with a search engine that can perform information search for each member node.

Node System

The system in each node member is created to have the same capability in marine data management where ever it is located.

Concept of Proposed System

Based on the frame of IDSN concept described aforementioned, a design of system set up is implemented in data central system and node system as shown in the diagram on the previous page.

Metadata

Metadata may be defined as data about data; it consists of data characteristic information and is important in the data exchange mechanism. Metadata is used to document spatial data relating to the: who, what, where, and how the spatial data is generated.

In an online system (a clearinghouse), the metadata must be of the same type so the users may access and interpret, both in format and content. This is accomplished by using a metadata standard. The standard of metadata is based on a document titled Content Standard for Digital Geospatial Metadata (CSDGM) published by FGDC of USA (Federal Geo-Spatial Data Committee). Based on IDSN coordination meeting in Bali in 2005, the standard metadata is then called FGDC standard, which have been agreed by all Indonesian spatial data users.

The main aspect to realize in preparing the metadata is to understand the data itself and the FGDC standard and then decide on how to write the metadata. Usually this is done in one digital file for one type of data. To write the data information, the software used must conform to the FGDC standard.

The metadata need to be organized in groups according to the information it contained. This is important because the various needs of users on the information and map products. The metadata will be grouped into metadata organization, collection and inventory.

A clearinghouse is defined as a server system distributed on the internet that contains actual description about digital spatial data available. Implementation of IDSN clearinghouse will consider various conditions (facility and human resources) of the spatial data users in Indonesia. The local clearinghouse node is intended to be part of CSDN (*Clearinghouse Spatial Data National*) and to be the only institutional node in the national spatial data clearinghouse. In becoming part of the CDSN, every institution is expected to contribute information of spatial data, managed by the national spatial data community.

04. Legal and Institutional Arrangement

Furthermore, marine data are stored in several institutions according to the institutional function and they are in various formats. Oceanography data collected are also stored in each institution according to their functions and utilization of these data is mostly to support the task and function of each institution. Moreover, the data are in various formats, which make it one of the obstacles when the data have to be analyzed further by other institutions. Integrated management of marine data at the

moment does not yet exist, but as the result of routine activities of each institution, there are many marine data collected and produced.

Marine data stored in the various institutions have not been used optimally due to over protection, no clear guideline in the institutional regulations, bureaucracy, and data management and information system that are not yet well established. These factors also affect the utilization of marine data collected using modern technology that are not yet disseminated to the user communities, such as oil industries, shipping industries, fishery and traditional fishermen.

The conditions of marine data are very complex that it should be the responsibility of each institution on the quality, archive, and dissemination of the data. In order to guarantee the above responsibilities, each institution should create a marine data management system. Other than a management system, there is a need to develop a data exchange policy in the national level to maximize data utilization. This is important to achieve data integration efficiency and utilization by all users, where the data is accessible according to the government, institution, department, or agency's guidelines, and national and international agreement while still respecting data ownership.

Relating to the necessities mentioned above, Indonesia will need:

- A national marine data policy to control and manage data exchange that are both integrated and coordinated by institutions in the field of marine and fishery.

- An agency functioning as National Oceanography Data Center (NODC) or as a coordinator of National Oceanography Data Network (NODN).

Regarding the marine data policy, currently there are two concepts being proposed as an umbrella for legal data policy, they are: Academic manuscript on marine data exchange policy (*Naskah Akademik Kebijakan Pertukaran Data Kelautan*) and Institutional manuscript on national spatial data infrastructure (*Naskah Kelembagaan Infrastruktur Data Spasial Nasional, IDSN*). The marine data exchange policy manuscript is the result of an assessment by the IOC National Commission coordinated by LIPI (Indonesian Institute of Sciences). The national spatial data infrastructure manuscript is the result of IDSN coordination meeting with the SURTANAS (National Survey and Mapping) forum, coordinated by BAKOSURTANAL. Basically, the academic manuscript on marine data exchange policy may be deemed as a subset to the IDSN in the marine field only. One of the manuscripts is expected to be approved on a Presidential Decree.

Acknowledgement

This paper is also written in defining a Conceptual Design for Indonesia Ocean Observing System (INAGOOS). The INAGOOS is prepared through cooperation effort between Indonesia and the Delegation of European Commission in Jakarta, under the INDOO Project (Indonesia Operational Ocean Observing System) financed by the Small Project Facilities on Economic Cooperation program. The authors would like to acknowledge Head of EC Jakarta, SPF Program Manager, and BPPT INDOO team for their support and kind cooperation.