THE ROLE OF SEAWATCH INDONESIA DATA IN SUPPORTING DISHIDROS ACTIVITIES

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Abstract

Dinas Hidro-Oseanografi abbreviated as Dishidros or The Hydro-Oceanographic Service is subordinate to Navy Headquarters. The mission is to carry out the function of the Hydro –oceanographic service covering survey, research, nautical chart, marine environment, safety navigation and publish of the marine information books to support Indonesian Navy/ Armed Forces and public users

To carry out those activities, Dishidros has implemented for collecting and analyzing and marine information of Indonesian waters by themselves. Beside that, Dishidros collecting the data through other resources, such as relating marine institutions to support Navy/Armed Forces operations interest or National Development. The data or information have to accurate as possible and always updating any time.One of the data resources for this needs come from 10 buoys that can be accessed directly to Dishidros from the Indonesian Assessment and Application of Technology.

I. BACKGROUND

Oceanographic data collection in Indonesian waters was started during the Dutch colonization period. On July 9, 1874, a hydrographic survey was made by the Hydrographic Bureau, which formed part of the Royal Marine Department of the Netherlands. Hydrographic surveys during this period were focused on safe navigation for Dutch ships. During the Japanese colonization period, hydrographic surveys and charting were more focused on the needs of war and military defense of the Japanese army in Indonesia. From 1945 until 1950, surveys were again made by the Dutch Hydrographic Bureau. Chiefs and field personnel were all from the Netherlands, because there were as yet few Indonesians who were skilled or experts in Hydro-graphics.

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In 1951, Government Regulation No. 23 split the Hydrographic survey in Indonesia into two divisions, namely: the Navy's Hydrographic Department, under control of the Headquarters of the Indonesian Navy, and the Hydrographic Division of the Merchant Marine Department, who was responsible for making, and updating sea maps, books and other hydrographic publications on Indonesian waters and work on scientific and commercial maps. The Navy's Hydrographic Department was responsible for making sea maps, Hydrographic books of the seas outside Indonesia, and publish books in connection with military interests. Since 1951, Indonesia became a member of the International Hydrographic Organization (IHO) which is based in Monaco and in for this, Indonesia is represented by Dishidros-AL, The Navy's Hydrographic Department.

Due to the consideration that basically these two Hydrographic departments were performing the same tasks and to improve efficiency, Indonesian Presidential Decree No. 146 of 1980 dated August 1, merged the Hydrographic Division of the Merchant Marine Department and the Navy's Hydrographic Department, and this body also represented Indonesia at the International Hydrographic Organization (IHO).

In line with the adjustment of the functional role of a bureau becoming a Directorate, Janhidral or Hydrographic Bureau became Dithidral or Hydrographic Directorate, and after further developments in the Navy organization, by decree of the Minister for Defense/General of the Armed Forces No. Kep/A/39/VII/1971 dated July 23 1971, it was reorganized into JanHidros (Hydro-Oceanographic Bureau). By General of the Armed Forces' Decree No. Kep/09/P/II/84 dated March 31 1984, JanHidros was once again changed to Hydro-Oceanographic Agency (Dishidros).

With the advent of UNCLOS'82, Indonesia was acknowledged as an Archipelago State. This means that the Indonesian national jurisdiction over its seas has increased dramatically, offering great opportunities but also greater challenges, particularly the need for modern technology and nautical data and information. Nautical Manpower, the ability to safeguard and utilize the natural resources contained in the sea and on the bottom of the sea. The Hydro-Oceanographic Agency, as the executive body at Naval headquarter level and also being specifically appointed by Presidential Decree Number 164 of 1980 and Presidential Regulation Number 23 of 1951, has made planned and integrated Hydro-oceanic surveys, researched and mapped the jurisdictional national waters to meet these challenges, whether to meet the stipulations of UNCLOS'82 as well as to accommodate the need for data and information in line with the advance of national development in the marine sector.

Hydro-oceanographic surveys and charting is an interlocking series of collecting, processing, analysis and presentation of data/information activities through field measurements, sea bottom and sea surface physical image and also of terrain bordering the sea and investigation of the processes taking place at this boundary, including physical borders, physical and chemical characteristics of the sea water, biological presence and the geological and geophysical aspects of the sea, which are required by the shipping industry and other marine activities. Therefore, a Hydro-Oceanic Survey and Charting effort would cover the various Hydrographic, oceanographic, marine meteorology, marine geography, and marine geology and sea

geophysical aspects. These aspects will also contribute to marine research in order to accommodate the interests of National Development in the marine sector and the needs of National Security and Defense (Hankamneg) at sea. To gain a better insight into the role of Hydro-Oceanographic data, survey and charting activities, these will be detailed in the following explanation, which will cover the collection, processing, analysis and usage of Hydro-Oceanographic data to meet the requirements of users.

II. ROLE OF HYDRO-OCEANOGRAPHIC DATA

a. In supporting requirements of the Indonesian Navy / Armed Forces.

1) Hydrographic data processing to support surface warfare plays a vital role in ship-based artillery shots, which can be affected by the waves, wind, navigational condition, coastal topology and source of light (moon, sun and stars). While homing missile deployment using electromagnetic control equipment, requires data on atmospheric surface layer density, height of waves, gravitational anomalies and the local geo-magnetic strength. In submarine warfare, sonar is of utmost importance, but in actual application its use will be heavily influenced by sea water temperature, salinity, sea depth, type of sea bottom and other factors which might cause hydro-acoustic waves to propagate in a straight or curved line. Sonar operation can be confused by false echo's caused by schools of fish or masses of plankton. Sea animals also emit sounds which confuses the results of sonar. Bio-luminescence of sea biota could illuminate surface ships, submarines, and mine fields, so they become visible from the air. Therefore the geographical distribution, kinds and season of growth of these sea biota could become important information for naval operations planning.

2) For mine deployment, placement of the mines requires knowledge of sea bottom characteristics, its depth, existing currents, tidal height, gravitational anomalies, earth magnetic strength, sedimentation, and also knowledge of organisms which could cause the mine to become undetectable. Information on these marine conditions can be obtained from a hydro-oceanic survey or charting. In an amphibious assault, determining the landing site depends very much on knowledge of hydro-oceanographic conditions, coastal configuration and the hinterland area. Besides these, date and hour of landing is dependent on weather conditions within the operating zone, and also on local currents, tides and height of waves, lunar aspect and other hydro-oceanographic information, also duration of dawn, time of sunrise/sunset and moon rise/set at the location.

3) Basically, the air power function at sea, besides to protect ships from enemy air attacks, is also to destroy submarines and mine fields and to support landings. Air cover success is very much influenced by meteorological conditions above the battle zone, and so, indirectly, hydro-oceanographic data contributes toward the success of an air battle and its role in electronic communication is also important, where smooth electronic communication depends on meteorological conditions above the surface of the earth. During

special coastal operations, hydrographic, oceanographic, meteorological and maritime geography knowledge will also support its successful completion, since the data mentioned above will complement the Operational Area Analysis made before the special task force is mounted.

4) To support the research and development of the Indonesian Navy in the field of education and development/utilization of its capabilities, hydro-oceanographic data resulting from hydro-oceanographic surveys and charting will help support these requirements. Therefore, in broad outline, data and information resulting from hydro-oceanographic surveys and charting is needed to support the need for nautical data for national defense and security in the broader framework of reaching the goal and aim of national security and defense at sea.

b. In supporting public requirements, whether national or international.

1) The role of hydro-oceanographic data besides supporting military requirements also supports public requirements to help ensure safety at sea for ships, and therefore it is an absolute requirement to provide navigational maps, nautical tables, documentation and nautical news, all of which form part of the final results of a hydro-oceanographic survey and charting effort. Besides which, to support exploration of and support for exploitation of mineral and biological resources in the sea or beneath the sea bottom (marine resources), hydro-oceanic information is required such as depth of sea, sea bottom topography, marine biology, sea bottom structure and other oceanographic data.

2) Hydro-oceanographic surveys and charting is absolutely required to determine the base line, sea borders, exclusive economic zone and the continental base, not only for national interests, but also for international recognition of these factors. In building various energy centers on the coast, and in construction of harbors and utilization of marine energy as well as in containing sea pollution, hydro-oceanographic data and other marine environment data is absolutely required.

3) Regarding other national interests, hydro-oceanographic surveys and charting is also important to discover the potentials of the resources contained in Indonesian waters so the national development program can make use of this information in developing their economic programs which in turn will affect other aspects of society, such as the political, social, cultural as well as the security aspects, which will eventually result in national stability and prosperity.

III. PRESENTATION OF HYDRO-OCEANOGRAPHIC DATA FROM SURVEYS AND CHARTING.

a. Presentation of Data in Map form

1) **Nautical/navigational maps.** Navigational maps are published using the Mercator projection, Bessel 1841 spheroid projection, WGS (World

Geodetic System) 72, WGS 84, scaled at 1 : 7500 until 1 : 1.000.000. Information is provided in the form of landmarks (objects on land), warning signs, buoys, lighthouses and sea depth characteristics according to internationally accepted standards. These maps are intended for safe navigation of ships.

2) Bathymetric Maps. A Bathymetric map is printed using the Mercator projection, Bessel 1841 spheroid projection scaled at 1 : 250.000 for classified distribution. Main information provided is sea depth (undersea topology) and landmarks, buoys, and lighthouses according to international standards. These maps can be used to navigate, beside its main use for scientific purposes.

3) Magnetic Maps. The magnetic map is printed using the Mercator projection, Bessel 1841 spheroid projection scaled at 1 : 250.000 for classified distribution. Main information provided is magnetic field strength, total magnetic field strength, geo-magnetic strength. Intended for exploration activities, submarine location search and minesweeping purposes.

4) Joint Battle Map (JBM) A Joint Battle Map is a combination of land maps (topographical map/earth contour map) and sea maps published in Universal Transverse Mercator (UTM) and Transverse Mercator (™), 1967 GRS spheroid projection at 1 : 50.000 scale, secret classification. Its use is for joint military operations.

5) Submarine Map This underwater map, scaled at 1 : 250.000 is basically almost the same as the bathymetric map, and is classified secret, because along with sea depth data, it also contains data and information regarding military submarine activities. Used by submarines for their operations.

6) Amphibious Operation Map. Amphibious Operations Maps are made in the Mercator Projection, Bessel 1841 spheroid projection, at a 1 : 10.000 to 1 : 15.000 scale, classified secret. Contains data and information about coastal morphology, sea depth and coastal gradient, wind direction, rainfall data, time of sunrise and sunset, time of moonrise and set. Used for amphibious operations and to support this type of operation, additional tide tables and current flow information is also required.

7) War Preparation Map. War Preparation Maps are made in the Mercator Projection, Bessel 1841 spheroid projection, at a 1 : 2.000.000 scale, classified secret. Contains data on marine bases; various military command zones for the Army, Navy and Air Force; wind direction and rainfall data. Used in operations planning and training and also for plotting of ship positions.

8) GEBCO (General Bathymetric Chart of The Ocean) map.
GEBCO maps are presented in Mercator Projection, Bessel 1841 spheroid projection, at a 1 : 1.000.000 scale, classified general use. Data provided is in the form of sea depth.

9) Exclusive Economic Zone (EEZ) Chart and Base Line Chart.

EEZ charts are made at a 1 : 1.000.000 scale and Base Line Chart at a scale of 1 : 200.000, presented in Mercator Projection, Bessel 1841 spheroid projection (EEZ map), and WSG 84 Spheroid Projection (Base Line Map), classified general use. Contains data in the form of sea maps, base line point, territorial sea limits, and exclusive economic zone limits. Used as guide in enforcing law at sea and for navigational purposes.

10) Engineering Chart. A technical chart presented in Mercator, Bessel 1841 spheroid and WGS 84 projection scaled at 1 : 2.000 to 1 : 25.000 classified general use. Information provided depends on technical function required. It could be for engineering purposes, special harbor chart, undersea cable chart or others of similar use.

11) Sea Tourist Map. Sea tourist map is presented in Mercator, Bessel 1841 spheroid projection scaled at 1 : 10.000 to 1 : 25.000, classified general use. Data, besides those required for navigational needs, include tourist information such as ambient temperature, rainfall, wind speed and direction, current speed and direction, diving locations and other information. Useful for navigation of small vessels and sea tours.

12) Indonesian Sea Lanes Map - ALKI. ALKI map could be made from hydro-oceanographic surveys and charting. This map contains information about sea lanes among the Indonesian islands and is useful for navigation of foreign ships.

b. <u>Presentation of data in book format.</u> Besides the chart and maps mentioned above, data and information are also provided in the form of nautical books to complement the sea charts and meet the navigational needs for sailors and for renewal of data of sea charts. Nautical books are: Notices to Marines, Nautical Almanac, Tidal Stream Table, Indonesia Pilot, List of Nautical Education, Indonesian List of Light, Indonesian Port Information, Mine Areas, List of Buoys and Marine Environmental Information.

IV. ROLE OF SEAWATCH INDONESIA DATA IN SUPPORTING NATIONAL MARINE DEFENSE SECURITY.

Basic capability of the Indonesian Armed Forces – Navy in protecting the country's marine dimension consists of three elements: its surface capability, its undersea capability, and its amphibious capability. Therefore, a discussion of the need for nautical data within the National Defense of the sea dimension will flow from the three basic capabilities of the Indonesian Navy as mentioned. Victory at sea is not unconditionally ensured by the Navy's capability, for without nautical data and information which is complete, up-to-date and accurate, it would be difficult for a country's armada to win a war. Principally because, whether in peace or at war, hydro-oceanographic data is necessary, not only in planning a war, but also to plan each movement or maneuver of the Navy's elements, which should firstly and primarily concern itself with safe navigation, whether while still at its base, within the shipping lanes or in the operation's theatre. To ensure safe navigation, hydro-oceanographic data and information in the shape of nautical charts, tide forecast tables, current flow

and wave forecast, sun and moon rise/set forecast including duration of day and night and position of moon, weather/climate forecast, maritime geography, Indonesia Pilot book, navigational aids, magnetic deviation, gravitational anomaly areas, mine fields, oceanographic conditions and weather/climate conditions are required. Advancement in submarine ship technology, has made this kind of vessel a complete weapons system and has an impact which should be taken into account by surface vessels and vital objects / targets on land, so that essentially an anti submarine warfare unit duty during peacetime will be to avert, or impede the presence of illegal foreign submarines in Indonesian jurisdictional waters and destroy each effort toward sabotage, subversion, infiltration and data collection made by foreign/enemy submarines. During war, its duty is to destroy enemy submarines. Therefore, the Indonesian Navy has to prepare a complete and comprehensive Anti Submarine operation plan which is adjusted to the geographical and oceanographic condition of Indonesia. With the advance of technology and the increasing capability of equipment, particularly those used in submarine and anti submarine operations to date, the need for nautical data and information to support such marine operations becomes more complex. Particularly to support Submarine/Anti Submarine operations, not only sea charts, tide forecasts, surface and subsurface currents, pilot book, three dimensional sea bottom contour maps, kinds and distribution of sea bottom sediments, magnetic deviation and gravitational anomalies are required, but also several other kinds of data are required in order to support a successful Submarine/Anti Submarine operation, namely: seawater temperature and salinity, speed of sound, Deep Scattering Layers, false target, bio-fouling and ambient noise information. The Seawatch Indonesia System has the capability to obtain data on site and at the same time provide a lateral view of the oceanographic condition in the form of models for temperature, salinity, currents, tides, waves etc.

V. THE ROLE OF SEAWATCH INDONESIA DATA IN SUPPORTING DISHIDROS ACTIVITIES.

Nautical technology has experienced a very speedy development, both on the software as well as on the hardware side. Seawatch Technology, while important for Dishidros/Navy/Armed Forces needs, in its broader aspect of data collection and information gathering is very much needed in improving the welfare of the Indonesian population, as Indonesia is a country with two thirds of its area consisting of seas, so a system is required which can monitor the nautical environment, collect marine data and make real-time predictions of future marine conditions. So all changes in the marine environment quality can be observed as soon as possible and could be anticipated immediately, particularly for Navy/Armed Forces requirements.

Seawatch data is used to obtain dependable marine data and information, such as complete, accurate and up to date hydro-oceanographic information, so that the smooth implementation of these activities can be realized.

Basically, hydro-oceanographic data collected by Seawatch Indonesia is very important in complementing the data and information necessary to support national development efforts, specifically for integrated marine development.

As we all know, Seawatch data is obtained from buoys put on the sea surface and provided with sensors which will transmit data through the Inmarsat satellite, and these buoys can gather more complete, accurate and up to date data and information. In utilizing and analyzing this data, we can observe natural tendencies at sea and its surroundings so early warning, anticipation and forecasts could be made regarding the various possible developments. Besides which, in observing these hydro-oceanographic conditions, tracing chemical and biological underwater developments is possible, and detection of offshore oil spills and its spread could easily be made, so that this information will enable calculation and formation of the oil slick model, so any claims for damages due to that spill, could also be calculated. Detection of fish distribution and other marine biota could also be made.

The installation of a Seawatch Indonesia workstation at Dishidros is an important reason why Seawatch data could be accessed at any time and utilized to correct nautical books and to prepare for the Navy's/Armed Forces interests. Dishidros, which is one of the users of the data from Seawatch, urgently needs more data and information on marine conditions for all Indonesian waters. With installation of a Seawatch buoy, required data can partly be assuaged. But even so, we need to safeguard the data itself so it will not fall into hands which could cause losses to the nation.

There are several matters related to Seawatch Indonesia and Dishidros activities, among others:

1) Dishidros has the National Tide Data Center, so Seawatch Indonesia is one of the potential data sources. Seawatch Indonesia buoys are provided with tide sensors, so both raw and processed data can be saved at the National Tide Data Center, and can be accessed both by the Navy/Armed Forces to meet its requirements as well as by the general public.

2) Information and simulations derived from Seawatch data could be one of the reference materials in planning and controlling surveys and processing of survey results can be made within the Dishidros survey subdivision and resultant data utilized for correction of nautical books published by the Rapingla subdivision.

3) Information and simulations derived from Seawatch data could be very useful in the efforts to improve quality of the Rapingla subdivision of Dishidros, whether to improve quality of the nautical publications, weather forecasts, as well as to improve the quality of scientific papers in the oceanographic and meteorological fields.

Seawatch data in the form of barometric pressure readings, wind speed, wind direction, air quality parameters, current speed and direction, sea water temperature, significant wave height, significant wave period, sea water salinity, oxygen content, sea water productivity, blue attenuation, green attenuation, red attenuation, and sea water nutrient content will support the production of accurate information.

Above data can be subdivided as below:

a. Meteorological Data

Meteorological data consisting of wind speed and direction, air pressure and humidity are important data which has to be known for various needs, among others for navigational safety, cloud distribution, wave propagation patterns and storm warnings. Data could further be used in the form of nautical information published in the form of nautical environment information for the use of ships, particularly Indonesian warships. Besides which, air parameters have an influence on the propagation of electromagnetic waves, and differing air condition could affect direction of electromagnetic propagation. This has an effect on the accuracy of electronic tools used in surveys and nautical operation. In this case, the parameters for air changes can be used to correct the accuracy of the electronic tools used in the survey, particularly for positioning. So the resulting map eventually published will be correct and accurate. For scientific purposes, monitoring of climatic conditions is very important in predicting the start of the monsoon and dry season and for possible El Nino occurrence, also ENSO and La Nina.

b. Oceanographic Data.

Current speed and direction influences a lot of matters, for instance the speed and direction of sediment transport, so that data on current direction and speed will enable correct positioning of intended wharf construction. Distribution of surface material such as oil spillage caused by a marine accidents, can be monitored and its direction and speed can be predicted. Direction and speed of currents are also useful in navigation, particularly when nearing sea lanes and narrow passages with many underwater coral outcrops. Availability of current speed and direction data will enable determination of current prediction for a given area. The same data is also used to update nautical information published in the Tide table and Indonesia Pilot published by Dishidros. Sea water temperature, salinity and conductivity data, is needed to correct sonar readings or for other underwater detection equipment.

Data on significant wave height and significant wave periodicity is useful for navigational safety, construction of offshore/on shore buildings and to get accurate abrasion information for particular coasts. For the needs of Indonesian warships and beaching of Landing Speed Tanks and landing of Marines, this information is also invaluable. Combined with marine biological information, and oxygen content, it is an important source for correction of published or new publication of nautical books by Dishidros, whether for the general public or special nautical publications for the Navy/Armed Forces.

VI. CONCLUSION.

1. Hydro-oceanographic data plays an important role in supporting operations of the Navy/Armed forces, such as sea warfare, amphibious operations and combined operations and in planning exploration and exploitation of marine resources, whether for national or international interests.
2. Hydro-oceanographic survey and charting covers systematic collection, processing and presentation of Hydrographic, Oceanographic,

Meteorological, Marine Geography and Marine Geology and Geophysical data based on the technical standards set by the International Hydrographic Organization (IHO).

3. Considering the vast area which lies within the national jurisdiction of Indonesia, and the shortage of nautical data of the required accuracy and the quickly increasing need for more nautical information, the obvious challenge in the hydro-oceanographic survey field will increase correspondingly. Therefore, proper preparations need to be made, in the fields of manpower, equipment, means, methods and technology as well as budgets enable us to face the actual present and future challenges.
4. Data on the Indonesian marine environment at Dishidros to date, is still insufficient.
5. Seawatch data are extremely required by Dishidros to make and correct nautical books, both for public as well as for Navy/Armed Forces use.

VII. CLOSING.

This article, originally titled Survey Activity and Hydro-oceanographic charting in Marine Research, was written to provide material and information regarding the scope of Hydro-oceanographic Survey and Charting in Indonesia in general and at Dishidros particularly.