

## **Indonesian Fisheries Development Overview**

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### **INTRODUCTION**

Indonesia as an archipelagic country has 17,508 islands with a total area estimated at 7.8 million km<sup>2</sup> consisting mostly of marine waters (74.3%). Indonesia's marine waters total 5.8 million km<sup>2</sup> comprising 3.1 million km<sup>2</sup> of Indonesian waters and 2.7 million km<sup>2</sup> of Indonesian EEZ waters. The Indonesian waters itself comprise 0.3 million km<sup>2</sup> of marine territory waters and 2.8 million km<sup>2</sup> of archipelagic waters.

Fishing activities have been concentrated mostly in marine waters which were close to the densely populated areas instead of in offshore and EEZ marine waters. Given its situation marine fishery development is encouraged in offshore and EEZ areas that are still under exploited.

Compared to marine fishing, aquaculture activities are less developed in terms of production. Aquaculture contributes only 20 percent to national fisheries production: the balance is produced from marine fishing activities. The global trend indicates that marine resources in some places are already depleted and the cost of fishing operations is rising. Therefore in the near future aquaculture activities seem to be the most promising sector in fisheries.

### **FISHERIES DEVELOPMENT POLICIES**

Fisheries development depends upon both improvement in the quality of human resources involved in fisheries, as well as an integrated sustainable agribusiness and natural conservation approach. In order to achieve the fisheries development some efforts was focused mainly on efficiency and the benefits of increased manpower productivity, value added from fish processing, improved fisheries product quality, regional development and productivity as a whole.

Recognizing that the national fisheries sub sector is dominated by small scale fisheries, the government pays special attention to upgrading them through the

implementation of an integrated agribusiness system and the improvement of coastal communities. Therefore through this system, a pattern of nucleus-plasma partnerships will be promoted by strengthening the role of fisheries cooperation through applying advanced aquaculture technology appropriate to carrying capacity, and encouraging fishing activities in both the offshore and exclusive economic zone (EEZ).

The development of fisheries in REPELITA VI (Sixth Five Years Development Plan) is expected to increase the growth rate of the fisheries sub sector Gross Domestic Product at a year rate of 5.2 percent. To achieve this growth, therefore, fish production is to be increased by 4.9 percent a yearly reaching 4.58 million metric tons by the year 1998 (end of REPELITA VI). In line with the national fisheries target, marine and inland fisheries production is expected to increase 4.7 percent per year and 5.7 percent per year respectively reaching 3.34 million metric tons and 1.2 million metric tons in 1998. The increase of inland fisheries production is expected to come through aquaculture sources which is projected at an annual increment of 7.8 percent.

Export activities are planned to increase at an annual increment of 9.7 percent both in volume and value. By the end of the REPELITA VI (1998) fisheries exports will reach 800,000 metric tons with a value of US\$ 2.1 billion. In the same period the fish availability for domestic consumption is expected to increase at an average of 2.9 percent annually to meet the target of 19.2 kg/cap/year.

These objectives will be achieved by intensification, the expansion of fishing grounds and aquaculture, and increased diversification of businesses.

## **FISHERIES POTENTIAL AND PROFILE**

### **3.1. Marine Fisheries**

The total fisheries potential throughout Indonesia is estimated 6.7 million tons per year (1991) comprising 4.4 millions tons per year from Indonesian waters and 2.3 million tons per year from EEZ waters. Included in the figures are bivalve, sea weed, squid and others totally 0.5 million tons per year. The detailed figures of fish potential are shown in Figure 1.

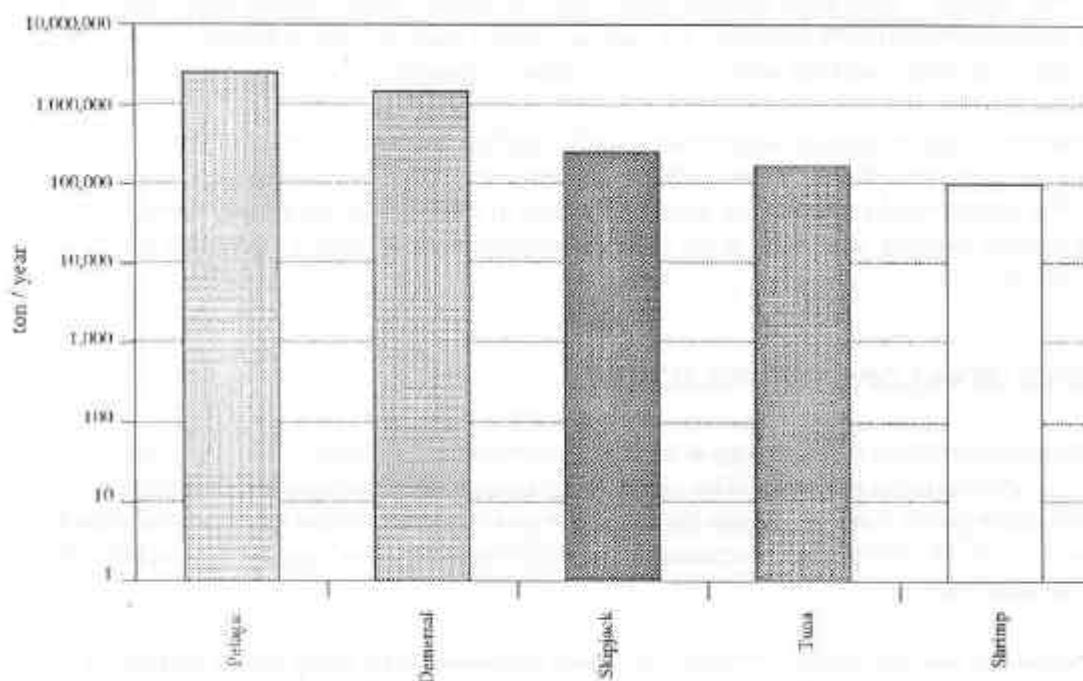


Figure 1. Indonesia marine fish potential (source : Marine fishery potential production and its distribution in Indonesian waters, Directorate General of Fisheries, Martosubroto, P., *et al.*, 1991 )

The quantity and variety of fish species in Indonesia's waters gives the country a great comparative advantage in the international market. Species include tuna, skip jack, shrimp, sea cucumber, sea weed, and grouper that not yet been fully exploited and in turn have a great opportunity to be developed in the future.

Marine fishery resources in Indonesian waters have been unevenly optimized and are mostly concentrated in coastal areas and in densely populated areas such as the Malacca strait, Northern Java, Bali strait, Karimata strait and Makassar strait. In those areas fisheries resources have been significantly utilized and are increasingly over exploited. This situation is triggering many problems mainly by the increasing fish yield and social conflicts.

Generally the utilization level of fisheries resources throughout Indonesian waters is estimated at 2,471,477 tons or 39.8% of the total finfish potential of 6,212,300 tons per year. Fisheries resources utilization in Indonesian EEZ waters is around 562,709 tons or 24.2% of the total potential of 2,323,780 tons per year.

### 3.2 Mariculture

The Indonesian coastline totals around 81,000 km including some located in small islands with many bays that hold potential for mariculture development.

In many areas mariculture is well developed such as in Aceh, North Sumatera, Riau, Lampung, Jakarta, West Java, Central Java, East Java, South Sulawesi, Southeast Sulawesi, Central Sulawesi, North Sulawesi, Maluku and Irian Jaya. The fish species that have been raised are finfish like Grouper (*Epinephelus sp.*), Snaper (*Lates calcatifer*), Clown fish (*Siganus sp.*), bivalves like Pearl (*Pinclada sp.*), Cockles (*Anadaragranosa*), Green mussel (*Mytilus viridis*), sea weed like *Euchema sp.* and *Gracilaria sp.*, Sea cucumber (*Holothuria sp.*), and others.

The total potential area that might be suitable for mariculture development is estimated at 114,325 Ha and its distribution in some regions is shown in Figure 2.

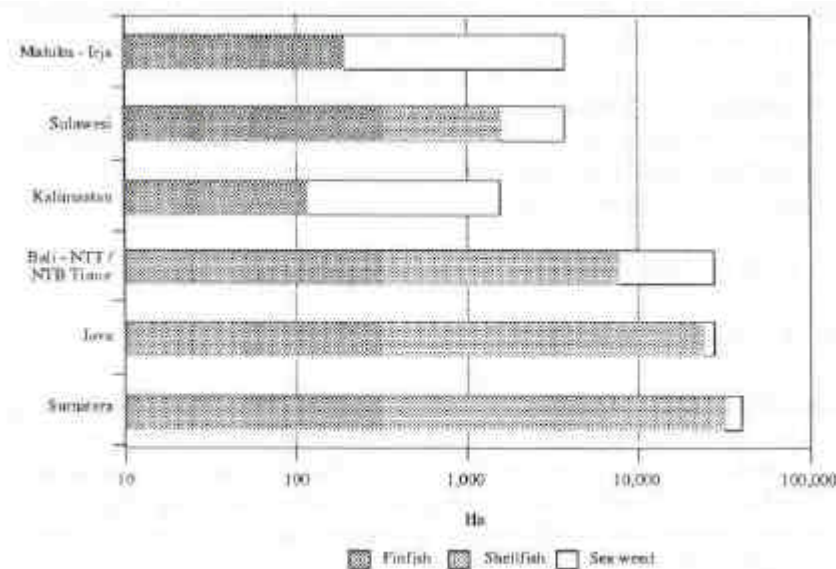


Figure 2. Potential areas suitable for mariculture development ( Source : Resource potential for aquaculture, Directorate General of Fisheries, 1991 )

### 3.3. Brackish Water Aquaculture

Brackish water aquaculture is potentially to be developed in mangrove areas which are the most suitable place for shrimp and milk fish farming. The total mangrove area in Indonesia is estimated around 4.3 million Ha and only 20% of them has potential for brackish water aquaculture development (830,900 Ha).

The Government has stipulated that only 20% is permitted to be converted into brackish water ponds in order to maintain the important role of the mangrove in protecting the coastline from wave damage and to provide nursery grounds for many species of fry and fingerlings. In line with the natural protection purposes the government also requires that a buffer zone of 200 meters along the coastline and 50 meters along the river margin should be maintained.

In developing brackish water the government encourages shrimp farmers to use the available potential areas outside of Java island like Sumatera, Kalimantan, Sulawesi, Maluku and Irian Jaya.

Brackish water aquaculture production is dominated mainly by milk fish and tiger shrimp (*Penaeus monodon*). The average brackish water production development between 1984/1993 was 10.79 percent and the highest average development was achieved by tiger shrimp (29.73 percent) and mud crab (31.99 percent).

### **3.4 Open Waters Fisheries**

The term open waters fisheries covers lakes, reservoirs, rivers and other river basins. The total potential area of the inland fisheries is 14 million hectares and the total fish production potentially derived from these resources is estimated at 850,000 tons per year which comprises common carp, Java carp, red tilapia, Nile tilapia, ornamental fish and others.

Reservoir fisheries (which has the potential to be developed through the application of the floating net) is estimated at around 52,000 hectares (2% of the total areas) of the major islands.

Cage culture production grew by 64.37 percent between 1984/1993 and registered the highest growth among other aquaculture activities. This figure was possibly mainly influenced by the increased reservoir fisheries activities in West Java (Jatiluhur, Saguling and Cirata reservoir). The rapid development of the reservoir fisheries in Java island is believed to have begun in 1988 with success in Saguling and Cirata reservoirs. The reservoir fisheries since then contained huge potential to be developed in other reservoir in the outer islands such as Sumatera, Kalimantan and Sulawesi. The quick development of the reservoir fisheries is continually threatened by occurrences of the up-welling

phenomenon that caused a massive decline in fish stocks due to the absence of dissolved oxygen at the bottom of the reservoir.

#### **4. STRUCTURE AND DEVELOPMENT OF FISHERIES**

##### **4.1. Technology and Human Resources**

Fisheries technology in Indonesia either for fishing or aquaculture is developed through scientific and technological approaches (both basic and applied). The development and coordination have been performed through the institutional linkages between Directorate General of Fisheries and its Technical Development Units (UPT) such as the Brackishwater Aquaculture Development Center, Freshwater Aquaculture Development Center, Mariculture Development Center and Fisheries Processing and Quality Control Center. Included in this program are fishermen and fish farmer training programs.

##### **4.2 Production and Export/Import**

Within five years period (1990-1994), Indonesian fish production was increased from 3.162 million tons in 1990 to 4.018 million tons in 1994 with average growth of 6.17% per year. Indonesian marine fishery production was comprised mainly of capture fisheries amounting to 76% of the total fish production in 1994 with increased average growth of 6.56% per year over the same period as presented in figure 3.

Both export volume and value of fisheries commodities were also increased with average growth of 13.68% and 12.62% per year respectively over the same period. The export commodities mainly consist of shrimp, tuna, skip jack, other marine finfish, frog thigh and jelly fish.

The same situation was also found in the volume of imported fish products over the same period. Imported fish products increased from 73.285 tons to 270,925 tons with average growth of 44.98% per year. This figure resulted from increasing fish meal volume for cattle that comprised 70% of the total volume of fish product in 1994. The fisheries export and import volume and value is shown in figure 4.

### 4.3 Fish Consumption

The level of domestic fish consumption in Indonesia is unevenly distributed throughout regions as well as income groups. In terms of regional distribution, the consumption of salted fish was more widely distributed than other processed fish products. The fish Supply was increased and in 1994 fish consumption was estimated to be 18.5 kg/capita/year.

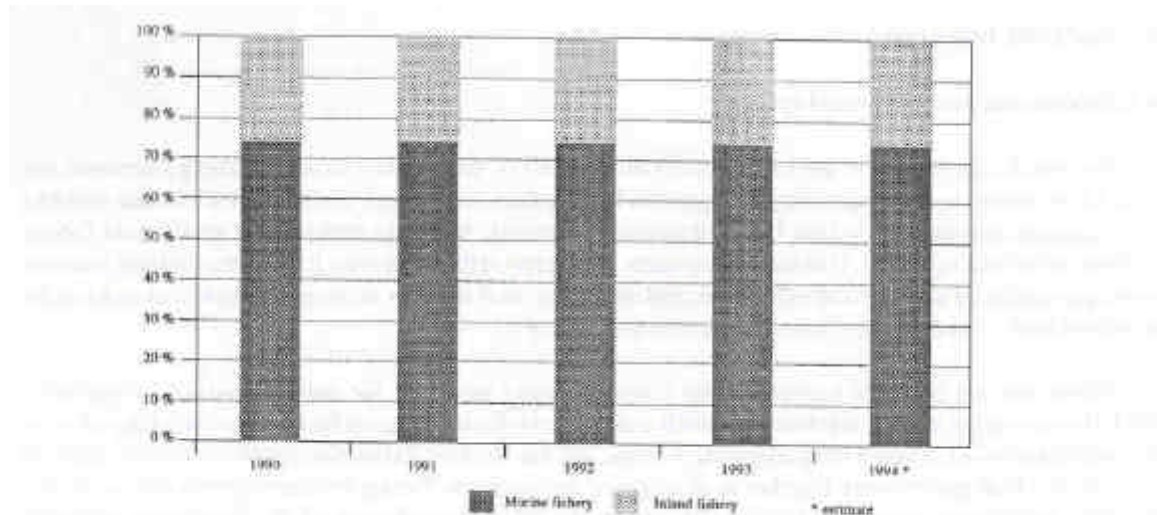


Figure 3. Fish production trend in 1990 - 1994 ( source : National fish production statistic, Directorate General of Fisheries, 1990 - 1992 )

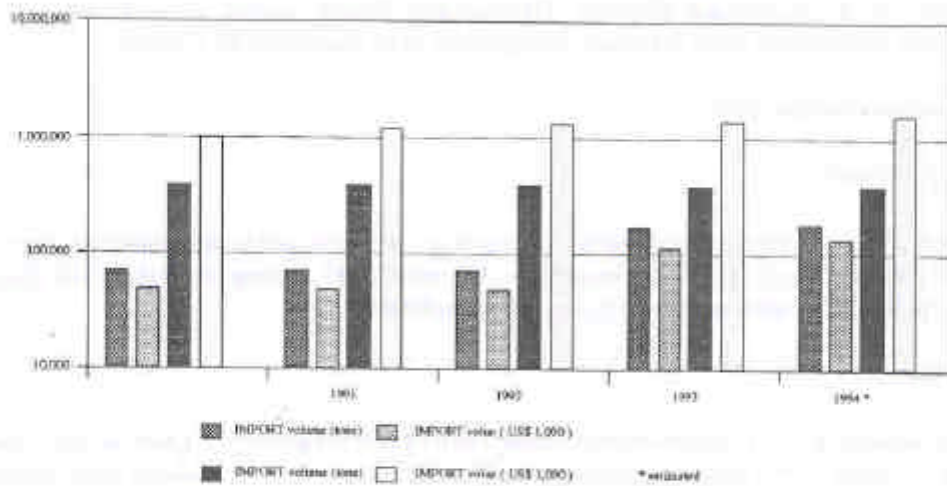


Figure 4. The fishery export - import by volume and value ( Source : Fishery export - import statistic, Directorate General of Fisheries, 1990 - 1992 )

#### **4.4 Infrastructure**

Infrastructure development is directed to support the improvement of fishermen and fish farmer productivity and to stimulate fishery investment. The total number of fishing ports is 28 which can be divided into 3 categories based on their ability to provide services. These are Ocean fishing ports (2), Archipelagic fishing ports (7) and Coastal fishing ports (19).

#### **4.5 Fisheries Businesses**

##### **4.5.1. Businesses and Partnerships**

The small sale fishery is the largest component (98%) of the national fisheries. The government has directed more attention to strengthening their growth, freeing them from bigger business pressures and avoiding unfair business competition. Within the agribusiness framework, the main problems of small-scale fishery development are lack of capital, skill and management. In contrast to the small-scale fishery, the national business corporation has better access to capital and processing units as well as better management practices and a wider marketing chain. However, they have insufficient fish supply.

Within the agribusiness framework the fishing industry including the national business corporation (BUMN) is encouraged to work together with small scale fisheries for their mutual benefit. Two working schemes have been established, namely the partnership scheme and the Nucleus Estate Small-holder (NES) scheme. In these schemes both parties work together at all stages of the business. The agribusiness system can be divided into many subsystems namely (1) subsystem on supplying and distribution of the production facilities, technology and agriculture resource development, (2) subsystem on agriculture product and farming businesses, (3) subsystem on post harvest processing or agroindustry, (4) subsystem on agriculture product distribution and marketing.

##### **4.5.2. Middle Scale and Large Scale Fisheries**

Fishing activities have been developing rapidly in line with the development of fishing techniques and the success of fishing fleet motorization programs. Unfortunately



fishing grounds are concentrated only in archipelagic waters even though some fishermen are operating in the Indonesian EEZ waters.

#### **4.5.2.1. Indonesian Fishing Fleet**

##### **- Indonesia EEZ Waters**

The total number of fishing gear operating in this area is 1,650 units and is dominated by long line 542 units (33%), fish net 491 units (23%) and purse seine 372 units (30%). Fishing grounds are still adequate in other areas except for the Arafura sea which is nearly overexploited.

##### **- Indonesian waters**

The total fishing gear is 2,178 units and is dominated by long line 594 units (27%), fish net 491 units (23%) and purse seine 372 units (17%). Fishing ground availability is limited and in the Malacca strait, and the Java sea is almost overexploited. Overexploited areas are in the Java sea and Karimata strait.

#### **4.5.2.2. International Fishing Fleet**

International fishing fleet operations are restricted only in the Indonesian EEZ waters. The total numbers of fishing fleet operating in this area are 1,315 units and are dominated by Taiwan's fishing fleets 460 units (35%), Thai's 439 units (33%) and the Philippine's 332 units (25%). Potential fishing grounds are located in the Indian ocean, Sulawesi sea and Pacific ocean.

### **5. FISHERIES RESOURCES MANAGEMENT**

#### **5.1. Research on Fisheries Resources and Marine Environment**

The available data gathered from the resources and environmental research are not adequate in terms of numbers and quality. Some constraints have been identified such as lack of manpower, budget, and other facilities that may have caused this situation to occur. For instance, fisheries potential data has not been evaluated routinely and properly

## **5.2. Resource Management Overview**

Fishery resources are characterized by specific attributes such as open access (which could cause them easily to be destroyed) and the ability to be renewed naturally. In turn institutional collaboration is needed to achieve a good fisheries management practices.

Considering these characteristics and in order to meet the goal of good fisheries management practices, a collateral fishery resources management system has been developed in Indonesia to optimize the same fishing ground used by many fishermen from other regions (e.g. in Sunda strait and Java sea). The aim of such a management system is to control the fishery resources properly and to avoid the conflicts that often occur when fishermen fish across provincial waters borders.

## **5.3. Fishing Control**

Indonesian fisheries are characterized by the uneven exploitation level In marine waters and this Is considered to be a major constraint to optimizing fish yield. Some areas such as the North Java sea, the Bali strait, the Malacca strait and the Karimata strait have been heavily exploited, and all of those areas are located close to densely populated areas.

Some important efforts have been undertaken in controlling the fishery resources through:

- Arranging the resource allocation.
- Managing fishing ground, beginning in 1976.
- Managing fishing ground in Indonesian EEZ waters (e.g. TAC = Total Allowable Catch, requirement for fishing fleet reporting their activities), beginning in 1983.
- Restricting the mesh size and the length of gill net, beginning in 1983.
- Banning bottom trawl, beginning in 1980.
- Limiting the numbers of fishing gear (recently is effective in Arafura sea), beginning in 1982.
- Evaluating the production facilities such as deep sea fish aggregate.
- Surveillance.

## **6. FISHERIES DEVELOPMENT CONSTRAINTS**

Some major problems and constraints in developing Indonesian fisheries are identified as follows:

### **6.1. Resources**

- Fisheries resources have not been evenly exploited and most fishing activities are concentrated in coastal waters and densely populated areas such as in the North Java sea, Bali strait, Malacca strait, Karimata strait and Makasar strait. Hence over fishing was occurring in those areas and was triggering both social conflicts and declining fish yields.

### **6.2. Fishing**

- The fishing industry is dominated by small-scale fishery which is limited by technology capability, capital availability and insufficient skill and management. Large scale fishing industry is being encourage to assist the small-scale fisheries through the NES scheme.
- Even though many fishery Infrastructures have been developed in some areas, facilities such as fish landing facilities more infrastructure are needed specially in Eastern Indonesia. The servicing and marketing mechanisms are needed to be improved.
- The low education level of the fisherfolk discourages the transfer of technology to the next generation due to their difficulties in absorbing the new technology.

### **6.3. Aquaculture**

- In mariculture, the technology and marketing mechanisms are need to be developed. The seed is mostly dependent on natural supply and spatial planning in some areas is not well established. Spatial planning is important for such businesses to provide the stability and security of the businesses.
- The recent rapid growth of the other sectors and the increase in population numbers appear to be responsible for the aquatic environment degradation. The negative impact of these developments can be seen in increased pollution, over exploitation of

fish resources, the use of reckless fishing techniques (including blasting, poisoning and others).

- Tiger shrimp development in the last decade has been fluctuating due to bacterial and viral disease outbreaks. Poor water quality due to either self pollution or external pollution and lack of knowledge on good shrimp farming practices are mostly responsible for the disease outbreaks.
- Shrimp farming production along of the coast of East Lampung and South Kalimantan in some years ago was destroyed due the harmful algae bloom.

### **THE ROLE OF SEAWATCH SYSTEM FOR FISHERIES DEVELOPMENT**

Considering the above constrains in developing both fishing and aquaculture, SEAWATCH system would be very worthwhile for fisheries development in term of data and information obtained as part of decision supporting system. Combination of an oceanographic parameters sensors attached to buoys and modeling software's is an effective way to obtain the latest information related to environmental monitoring such as harmful algae bloom, eutrophication, inland based pollution, oil spill, migration of pelagic fish species, and others. Hence the system will enable us to improve the most recent oceanographic data quality and will be stored in central database.

Some software packages related to the data checking and storage, processing, analysis, forecasting and presentation will be available within the project. Application of those software will make possible us in performing monitoring, analyzing and forecasting the coastal and marine waters quality which is influenced by inland based pollution. During pilot project, the study on coastal and marine environment changes is expected to be done by collaboration among institutions involved in coastal zone management, brackish and mariculture, and others activities.

Oceanographic parameters such as water temperatures at various depth and salinity data would be valuable to be used in predicting pelagic fish migration. Those data apparently very expensive to be collected by ordinary method (by employment of the research or fishing vessel). As we aware fish migration mostly depend on plankton availability and other physical and chemical parameters. Upwelling phenomenon which is bringing rich sea bottom up to the surface become a natural indicator for fish

abundance. The intensive monitoring of those related oceanographic data then can be used as a basic information for the upwelling phenomenon.

Considering the advantage of SEAWATCH Project supporting of the development of marine sector that give emphasis on sustainable development approach the strong collaboration among related agencies could be achieved and maintained. Data distribution among the system that will be built will enable all parties involved in getting relevant data and information. Impact of an intensive cooperation within the project framework will improve the quality of data and information exchange among agencies through telephone line.

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