ANALYSIS OF CATCH-FISHERIES MANAGEMENT AFTER TSUNAMI
(CASE STUDY AT PANGANDARAN COAST)
(Analisis Pengelolaan Perikanan Tangkap Pasca Tsunami- Studi Kasus di Pantai Pangandaran)

Irmadi Nahib
National Coordinating Agency for Surveys and Mapping
Jl. Raya Jakarta Bogor Km. 46 Cibinong, Bogor
Telp/Fax : + 6221 8759481
Email : irmnahib@gmail.com

ABSTRACT

The earthquakes and tsunamis often occurred in Indonesia. An impact of these unwanted natural disasters was predicted to increase the number of poor fishermen and to decrease their welfare. This prediction is not absolutely true. However, a proper application of economic policy on fisher after earthquakes and tsunamis can be a momentum to improve fishermen’s welfare in the long term. The objective of this paper is to study the impact of earthquakes and tsunamis to fishermen’s welfare based on theory of marine economic resources. After Earthquakes is expected to increase the stock of fisheries, which will lead to improvement of fishermen’s prosperity in the future.

ABSTRAK


Keywords : Fisheries, Management, Bioeconomic, Earthquakes, Tsunami, Pangandaran
Kata Kunci: Perikanan, Manajemen, Bioekonomi, Gempa Bumi, Tsunami, Pangandaran

I. INTRODUCTION

1.1. Background

Management of natural resources should impact on improving the welfare of the community. Ironically, the development of marine fisheries sector have done before, has no significant impact on improving the welfare of fishermen. The contribution of fisheries and marine sectors increase every year, on the contrary, the welfare of fishermen more decrease.

There was tectonic earthquake followed by tsunami waves with 6.8 Richter scale on Monday July 17, 2006 at 15:19:22 WIB. Based on data from BMG,
the center of earthquake was located at 9.46 East Longitude 107.19 East Longitudinal in about 288 km south of Bandung with 33 km depth of the sea. The south coastal area of west java from the Garut Regency in West Java Province to the south coast of Yogyakarta Province had terrible impact of the these natural disasters.

One area that damaged by this natural disasters was Pangandaran Beach (Ciamis Regency). The earthquake caused 405 dead, 274 injured, 27 missing and 13,198 moving to other places. In addition, it also caused the damage of infrastructure in coastal areas (coastal). There are 403 ships lost, 2,199 heavily damaged, 274 lightly damaged, 337 motor damaged. Meanwhile, 28,180 catching equipment / net lost / damaged.

The advanced impact of earthquake and tsunami disaster were predicted will increase the number of poor fishermen and their welfare will decrease. This statement is not absolutely true. The implementation of policies after the earthquake and tsunami is a momentum to improve the welfare of fishermen in the long term.

1.2. Purpose

The objective of writing this paper is to study the impact of the earthquake and tsunami to the welfare of fishermen's, based on the theory of economic resources (marine) by using simulation model.

II. METHODOLOGY

The study of methodology of fish resources management is based on the model bio-economic model.

2.1. Materials and Equipment

Tools used are: PC with the software: Microsoft Office and Vensim. Ideally the preparation of a simulation model using data real conditions of a region. The use of actual data will shows the scale of the changes occur, so that the chosen alternative policies will be able to solve the problem.

In the preparation of this simulation model, because of limited data, which is owned, the data used is a hypothetic data condition in a coastal area Pangandaran. This simulation model can be used as a template in other areas with actual data.

a. Assumptions used:

- Structure of the market is perfectly competitive so that the unit price of output is not affected much by the action of selling and buying someone.
- Aspects of uncertainty is variable exogenous (outside model)
- These parameters are economic and biophysics autonomous meaning does not change during the period of analysis used.
- Relations causal relationship limited in direct relationship and not a directly degree one.
- Function of the growth of fish assumed equal with the logistics functions
  \[ \frac{dx}{dt} = r \frac{x}{K} - x \cdot h \]
  - Function of the harvest: \[ h = q x E^2 \]

b. Preliminary data (before Earthquake and Tsunami occurred)

- The results of calculation using the model estimation of biological parameters Clarke, Yoshimoto and Pooley (CYP) of the SDI in the region "Pangandaran", the parameters \( K = 150,000; x = 40,000; q = 0.000008 \), and \( c = 0.22 p = 2.9 \) and \( r = 0.08 \). K is the Carrying Capacity, \( x \) is the biomass, and \( E \) are the input and, \( q \) is power catching coefficients.
- The amount of input used are affected by coastal fishermen who are not entirely fishermen (the unit of input in the form of people / labor).
- Coastal residents in "Pangandaran" are 300,000, and only 45% act as
fishermen. The growth of the population growth logarithmic (linear), which is influenced by births, deaths and migration. Based on the statistical data processed in the last 10 years: the birth rate = 30%, mortality rate = 12.5% and the level of migration = 7.5%.

c. Data Post Disaster Earthquake and Tsunami
- Biological parameters, assumed the earthquake-tsunami impact on the biological parameters.
- Function harvest changed
- Economic parameters. The post-tsunami, the cost to go into increased from $ 0.22 per effort to $ 0.98 per effort. While the government policy to provide assistance living allowance, so the price of basic needs remain stable, including the price of fish remains of $ 2.9 kg.
- Social parameters of the population. The number of casualties there is 2.5% of the total population in the coastal region "Pangandaran." Furthermore, the number of permanent residents who act as a fisherman to 30%. Population growth remains the growth logarithmic (linear), with the birth rate = 25%, the death rate increased to 15% and the level of migration = 9.75%.

2.2. Stage Activities
- Analysis of fish resources management conducted a simulation model using Vensim software.
- Preparation of the model / template, based on the pattern of causal relationships or causal relationship between the stock of resources (fish) with a variable flows and the relationships between the stock of fish with the economical parameters: (price=p) and costs, as follows:
- After causal relationship formed, and then build mathematic formula build: which the stated amount of free variable to bound variable bound.

- Picture a template that is used is represented at Figure 1.

III. MANAGEMENT OF FISHERY RESOURCES

3.1. Application Simulation Model of Fisheries Resources

Based on the results of a simulation using the data as presented at Appendix 1. Based on the results of the simulation on two condition (Appendix 1), it is concluded that the general biological parameters are not changed. But, the growth of fish more quickly reach the maximum point. After reaching the maximum point, there is a decreasing growth occur faster than the initial conditions and growth in stable condition also smaller. Fishing activities on the before condition the disaster, the early years of the rent will give a negative losses, but from year to year it is known that the loss would be smaller, and provide a relatively stable profit (of 1000). Similarly, the net benefit is obtained.

Post-earthquake-tsunami, which as shown in the image Appendix 1b, fishermen catch fewer fish. This is caused
The impact of the occurrence of the earthquake and tsunami directly lead to decreased of the number fishermen (effort decrease), the cost of catching a fish rise (as a result of destroyed fishing boats) and also the increase interest rate. Based on micro economic approach, managing the fish in these areas is not economical (the unprofitable, the cost > benefits).

In one side base on economical resources approach, this conditions bring positive impact on the sustainability of fish resources. Assuring the sustainability of fish resources, will improve the welfare of fishermen in the future. Then the earthquake-tsunami disaster could be the momentum for change in fisheries management policy. Improving the welfare of fishermen policy, which began with maintaining the sustainability of fish resources.

Fisheries management policy that the government conducted during this through the provision of assistance to the fishermen (and operational support ships for catching fish) and an effort to increase the price of fish, considered a policy that support fishermen, because it is the assessment of the welfare of fishermen (in the short term). Indeed, the condition of the fish open access regime, the actual condition of the low cost of catching fish and a low or high price of fish, will motivate the fishermen to catch the fish, so that more fishermen are catch fish, the more fishes also caught. Thus, the fish stock will be decreased. The fish stock decline, causing the number of fish that are caught will be a little more, so that the income of fishermen will decrease. In fact this policy will cause an increasing number of poor fishermen and also reduce poor fishermen is wealth (in the long term).

3.2. Fishermen Welfare Improvement Efforts

The preparation of a simulation model above makes the problems of fish resources management in open access regime clearer. The conditions of increasing the cost of catching fish, causes the decrease of profits, so the number of fishermen who do the catching decreased (decreased effort), so the stock of fish will increased. The choice of policy to maintain the sustainability of fish, should increase the cost of catching fish and/or lower prices. This policy in the short term (and temporary) will lower the welfare of fishermen.

The Management of fish resources, with a different company (production input is not limited to) generally. Supply curve (supply) in the company's activities is positive slope. Meanwhile, in the management of renewable resources production (including fish resources) or the amount of catching fish (supply) is limited, where after reaching the maximum point of growth, the supply curve is negative. This condition is known as the fish growth curve is backward bending supply curve (Figure 4 and 5).
This is a reason why a policy to reduce the murder (arrest) of fish, through efforts to decrease effort (from the effort of open access to optimal effort) as shown in Figure 3. Decrease effort is intended to provide opportunities to fish resources to be able to restore the self (the growth of arrest), so that the sustainability of fish resources remain secure. Direct Impact (in the short term) due to a decrease in policy effort (including restriction of the number of fishermen) lead to: the cost of catching a fish, the fish prices rise and income of fishermen were reduced. This condition is actually only temporary, because in the long term, as increased time, it will cause the increase of fish stock (sustainable). With guaranteed fish resources sustainability, the income of fishermen will increase again. The impact of policy application in open access regime management to the fish stocks the amount of fish catches and the fishermen welfare are presented in Figure 4 and 5.

Fisheries management policy, was begun in the 1970s, the economical growth oriented could improve production and the amount of fish caught significantly (in the 1969 as: 800ribu metric tons, in the 1980s as 5 million metric tons) and made Indonesia to contribute 5% of the entire world fish production (Fauzi, 2006).
catching fish), was over than Maximum Sustainable Yield (MSY) point. Meanwhile, outside the box see over fishing happened because of in balance caused by the phenomenon, only backward bending supply curve. Of course this policy will be gazed, because less the bureaucrats who know, understand and agree to implement them.

According to the outside of the box to apply the appropriate instrument to the fish resources which has over capacity and over fishing, is begun with the mapping of capacity or CUMAP (Capacity Utilization Mapping) as of the economical calculation base, also to reach maximum if we agree that the occurrence of over fishing as the impact of over capacity (over the effort, over fishing), the only option to improve the welfare of fishermen in the long term is to reduce the effort including reducing the number of fishermen/fishermen took over part of the profession). the program of fishermen took over, requires large cost and heavy challenge because concerns to the culture and livelihoods of people who have been the ancient generations. However, this is the fact that the program is needed by the fishermen and should be implemented. There are many Challenges to be able to implement this policy and will be more in stable economic conditions (lack of a natural disaster). Earthquake and tsunami natural disaster, has helped facilitate the government to start implementing the policy outside the box. The earthquake and tsunami disaster, has caused a decrease in the number of fishermen (by force and suddenly) and also reduce the ability of the fishermen. The destruction of most of the fishing fleet means that the declining compensate and thinkness/fishermen ability to continue to act as fishermen. This natural disaster should be seen as the momentum started to further momentum to start steps of "outside the box policy" to reduce over capacity (decrease the number of fishermen) to realize an increase of actual fishermen welfare.

Handling post-earthquake-tsunami assistance with the allocation of life and capital compensation to coastal communities, should be directed to the provision of capital for business instead of took over profession as fishermen. Instead professional fishermen, who conducted through the transmigration tsunami disaster victims to become plantation workers, is one example of the need to be promoted. Nature has started again harmonize in the nature of life. The government should immediately follow with the natural occurrence of the comprehensive and continue able policy to ensure the welfare of the community (especially our fishermen). Reduction of the number of fishermen by nature, is the momentum for our government to rearrange / define the ideal number of fishermen. Mapp the capacity or CUMAP (Capacity Utilization Mapping), must be followed by the relocating the fishermen in the region that have not yet been reached over capacity. This may be regarded as the wisdom behind the falls.

IV. CONCLUSION

1. Conditions of fisheries management in Indonesia (Pangandaran) enters the symptoms of over fishing. One of the efforts to increase the welfare of fishermen: the reduction in the number of fishermen, so that the sustainability of fish stocks will be guaranteed.

2. The preparation of a simulation model above, makes the problems (trade off) the management of fish resources in the regime of open Access. The conditions of increasing catching fish cost, causing a decrease in fishermen profits, but to increase fish stock.

3. The natural disaster (earthquake-tsunami) can be used as momentum to the implementation of thinking outside the box (the causes of over fishing because of balance which is caused by the backward bending supply curve phenomenon.)
4. Outside the box policies can overcome the fish resources over capacity and over fishing, is starting with the mapping of capacity or CUMAP (Capacity Utilization Mapping)-based economy, to obtain the maximum rent.

REFERENCES

Anonymous. 2001. Script Academic Coastal Region, General Director of Coastal and Small Islands. DKP, Jakarta


