INDONESIAN JOURNAL OF MULTIDISCIPLINARY SCIENCE

P-ISSN: 2808-5957
E-ISSN: 2808-6724

The influence illegal fishing surveillance policies on marine fisheries business

Saiful Umam[1], School of Business, IPB University, Bogor, West Java, Indonesia
Syamsul Ma'arif[2], School of Business, IPB University, Bogor, West Java, Indonesia
Nimmi Zulbainarni[3], School of Business, IPB University, Bogor, West Java, Indonesia

[*]Email for Correspondence: [1]sfumam@gmail.com, [2]syamsul4958@gmail.com, [3]nimmiz_reims@gmail.com

Keywords:

Extended Cost Benefit Analysis (ECBA)
illegal fishing
loss of illegal fishing
monitoring of illegal fishing

ABSTRACT

Illegal fishing that occurs in Indonesian waters has the potential to harm the marine fisheries business. The government seeks to overcome losses due to illegal fishing through policies and surveillance programs through increasing the fleet of surveillance vessels, increasing operations by sea and air and utilizing information technology. Surveillance of illegal fishing is a public policy, in order to measure the impact and benefits of the policy, economic valuation is needed as a basis for stating that the policy is feasible and provides benefits presented in a value. This study aims to analyze the direct and indirect impact of illegal fishing Surveillance policies on the marine fisheries business. The research method uses producer surplus and analysis uses Extended Cost Benefit Analysis (ECBA). The results showed that the policy of increasing Surveillance provides positive benefits of Rp.1.8 trillion/year, so the policy is feasible. The policy has the potential to save economic and social losses, when the supervision conditions before the policy of increasing Surveillance of social and economic impacts obtained amounted to Rp.466.9 billion / year and after the policy increased Surveillance to Rp. 2.3 trillion / year. The policy of increasing supervision greatly affects the fisheries business at sea, namely the needs and supply of fish for raw materials for the fishery industry are met, increasing the productivity of catches, absorption of labor as fishermen on ships, sufficient fuel stocks and for the government, state revenues from PNBP and fisheries taxes increase.

This is an open access article under the CC BY-SA license.

INTRODUCTION

Indonesia is recorded as the second largest fish producer in the world after China, with a total annual production of approximately 7 million tons and contributes 8.2% to world capture fisheries production (Chen, 2020; Klinsukhon et al., 2022). The estimated potential of Indonesia's capture fisheries is 12.01 million tons per year with the number of catches allowed at 8.6 million tons per year. The big potential of Indonesia's capture fisheries has an important role in providing food, employment opportunities, trade and community welfare so it needs to be managed with sustainability-oriented management (FAO, 2022; Kepmen KP, 2022; Prihadyanti & Azis, 2023). One of the fisheries management problems that has the potential to threaten and harm is illegal fishing activities. According to OECD (2018), the problem of illegal fishing in the fisheries world is seriously considered because it threatens and undermines the sustainability of fisheries, the livelihoods of coastal communities and the marine economy. According to Setkab (2016), Indonesia's losses due to illegal fishing amounted to 20 billion US dollars per year, including threatening 65% of coral reefs in Indonesia. For Indonesia, illegal fishing is a serious problem that harms the economy, social, ecology and sovereignty of the country. One of the serious impacts due to illegal fishing has the potential to kill the fisheries business, namely the processing business and the national fisheries industry and actually grow the fishery industry of other countries (Sularso, 2009). One of these conditions occurred at the General Santos Fishing Port in the Philippines that the majority of tuna on land was caught not from Philippine waters, but from the waters of other countries, especially Indonesian waters (Adolf, 2019).

One of the government's policies to suppress, reduce and eradicate illegal fishing is through monitoring illegal fishing (Djunarsjah et al., 2021; Kurniaty, 2018). The performance of illegal fishing supervision from

2015-2022 has caught 973 vessels consisting of 509 foreign-flagged fishing vessels or 52.3% and Indonesian-flagged fishing vessels of 464 vessels or 47.68%. Illegal fishing surveillanceactivities are public policy, to measure the impact and benefits of these policies, economic valuation is needed as a basis for stating that the policy is feasible or not feasible and provides benefits presented in a value or ratio. Based on Zulbairnarni (2022) without a value in rupiah, it will be difficult for us to declare that the policy or activity is feasible.

Research on the impact of illegal fishing in Indonesia has been widely conducted. Research from Chapsos and Hamilton (2019) states that illegal fishing in Indonesia has reduced economic income, severe environmental damage, and far-reaching livelihood implications for coastal communities. Research from Zulbainarni et al. (2022) using economic valuation methodology examines the economic valuation of moratorium and transshipment policies on tuna fisheries, a case study in Bitung, North Sulawesi. The results showed that as long as this policy is implemented, it will cause a decrease in the benefits of 9 tuna fishery business actors by Rp1.23 trillion per year. Economic and social impacts of Rp2.63 trillion per year consisting of economic impacts of Rp1.35 trillion per year and social impacts of Rp1.28 trillion per year causing 19,972 people to lose their jobs.

Based on the background and formulation of the problem, the research objectives are analyzing the condition of illegal fishing activities in Indonesia, the monitoring policy of illegal fishing in Indonesia, the direct and indirect impacts of illegal fishing supervision policies on the marine fisheries business, and formulate alternative illegal fishing supervision policies. Hopefully, the results of this research can be a consideration and input in strengthening policies and programs to surveillance illegal fishing in Indonesia.

METHOD

The research was conducted from July to October 2023 at the Directorate General of Marine Resources and Fisheries Surveillance (PSDKP) of the Ministry of Marine Affairs and Fisheries, as one of the work units that has the task and function of supervising illegal fishing activities in Indonesia. The types of data used in this study are primary data and secondary data. Primary data were obtained through interviews and discussions with key persons, business actors, fisheries associations, fishery cooperatives, fishermen, illegal fishing vessel crews, Patrol vessel captains, authorized officials, government agencies Directorate General of Capture Fisheries, Directorate General of PSDKP. While secondary data comes from reports, statistical data, regulations or policies and other relevant information. The research method used is a case study.

Policy analysis is carried out to identify, analyze various policies and programs carried out by the government in eradicating illegal fishing. Various policies and programs are then evaluated to map the latest conditions. Then for impact valuation calculated by:

1) Estimation of potential benefits for each variable, namely:
   a) The value of fishery production potential saved by calculating:

      Production Value per year : Ship productivity x fish price

      The price of fish is assumed to be at a market price of Rp.35,000 / kg.
   b) The potential value of state revenue from PNBP is calculated referring to the calculation in Government Regulation Number 85 of 2021 concerning Types and Rates of Non-Tax Types of State Revenue applicable to the Ministry of Marine Affairs and Fisheries.
   c) The potential value of calculating state revenue from taxes is calculated by:

      Tax = Production yield x rate

      The rate is calculated based on Government Regulation (PP) Number 55 of 2022 concerning Adjustment of Arrangements in the Field of Income Tax.
   d) Potential Value of Fisheries/ABK Workers

      Value of labor: number of crew on board x average UMP x 12 months (1 year)

      UMP = Provincial Minimum Wage (*Upah Minimum Provinsi*) used in this study is Rp.2.72 million/month, based on the Central Statistics Agency (BPS) in 2022 the average provincial minimum wage (UMP, *Upah Minimum Provinsi*) throughout Indonesia.
   e) Value Calculation of Fuel Oil (BBM) value:

      Wfo M/E = Cfo x Power Machine x t

      Wfo M/E = Main Engine Fuel Weight (kg)
      Cfo = Coefficient of fuel consumption/engine power/hour : 0.165/HP/hour
      Machine power = *Horse Power* (HP)
      T = Length of operation/trip (hours)
2) Producer surplus $= \pi_a - \pi_b$ where π_a = Benefit after policy, = Benefit before policyπ_b
   π_a = and = $TR_a - TC_b \pi_b TR_b - TC_b$
   TR_a = Total benefits after policy
   TC_a = Total cost after policy implementation
   TR_b = Total benefit before policy

TC_b = Total cost before policy implementation

3) Analysis of Ectended Cost Benefit Analysis (ECBA): After that, an Extended Cost Benefit Analysis (ECBA) of economic and social impacts was carried out directly or indirectly (Zulbairnarni et al., 2016) with the following formula:

$$NPV = \sum_{t=0}^{T} \frac{B_t}{(1+r)^t} - \sum_{t=0}^{T} \frac{C_t}{(1+r)^t} - \sum_{t=0}^{T} \frac{EXT}{(1+r)^t}$$

Remarks : NPV = Net present value, = B_t 1st year benefit, = t-year costC_t, R = Discount rate, EXT = Externality calculated based on direct and indirect economic impacts.

RESULTS AND DISCUSSION

General Overview

The potential of capture fisheries in Indonesia is 12.01 million tons / year with the number of allowable catches (JTB) of 8.64 million tons/year spread across 11 WPPNRI. One of the contributions to the development of the fisheries sector is measured through the contribution of national GDP. Fisheries GDP from 2015-2021 contributed an average of 2.64% to National GDP (MMAF, 2022). Then the Non-Tax State Revenue (PNBP) of capture fisheries contributed IDR 1.1 trillion in 2022. The production value of capture fisheries in 2022 is 7,399,551 tons or an increase when compared to production in 2021 with an increase of 2.42%. The number of fishermen in 2022 is 2,925,818 people, the number of fishing vessels in 2021 is 1,004,060 with a size of 5-30 GT of 98% and the fleet of large vessels with sizes above 30 GT is only 2%. The place of research is at the Directorate General of Marine Resources and Fisheries Surveillance which is an Echelon I work unit under the Ministry of Marine Affairs and Fisheries which has the task of supervising marine and fisheries resources, one of whose duties is to surveillance and law enforcement illegal fishing in Indonesian waters.

Illegal fishing surveillance policy

Based on KKP (2023) the results of illegal fishing monitoring activities from 2015-2022 based on the location of the largest illegal fishing vessel fishing waters in WPPNRI 711 as many as 376 vessels or 38.64%, WPPNRI 712 as many as 148 vessels or 15.21%, WPPNRI 716 with the number of vessels namely 117 vessels or 12.02% and WPPNRI 571 as many as 134 vessels or 13.7% of the total vessels perpetrating illegal fishing. Then if an analysis is carried out on the time of violation or the illegal fishing vessel is caught, then the highest illegal fishing vessel arrests occur in March, April, May and February. Then, based on the nationality of the crew, illegal fishing vessels consist of 4,302 foreign nationals (57.36%) and Indonesian citizens (42.64%) with a total of 5,787 people. Foreign Nationals come from several countries such as Viet Nam, Malaysia, Philippines, China, Thailand, Timor Leste, Myanmar, Taiwan and Panama. Based on the type of vessels used by illegal fishing actors, fishing vessels 951 vessels or 97.74% and fish carriers as many as 22 vessels or 2.26%. When viewed from the capacity of the ship used, based on the size of the ship, it is grouped with the size of small ships that are below 30 GT and large sizes that are above 30 GT, then ships with a weight or GT below 30 GT cumulatively as much as 42,188 GT or 84.59% and ships with a GT size below 30 GT which is 7,683 GT or 15.41%. According to (MMAF, 2023a) the mode carried out by illegal fishing actors consists of not having a fishing permit, using prohibited fishing gear, violating fishing grounds, violating the use of fishermen, illegal transshipment at sea, falsifying documents and turning off the vessel monitoring system (VMS).

The policy of surveillance illegal fishing is through the application of the concept of Monitoring, Control and Surveillance (MCS) which uses several surveillance instruments, namely patrol vessels, patrol planes, satellite imagery, vessel monitoring systems, surveillance information technology at sea. The government implements a policy of monitoring illegal fishing by changing the paradigm from Illegal, unreported and unregulated (IUU) fishing to legal, reported and regulated (LRR) fishing. Several policies and programs are carried out by strengthening and increasing the number of surveillance vessels, the frequency of days of air operations and sea operations, the use of information technology for the detection of illegal fishing as well as training and maintenance activities for surveillance facilities. These policies and programs are carried out through surveillance costs both in the nature of investment costs and average operational costs before the supervision improvement policy of Rp.795.2 billion consisting of 50.57% supervisory vessel procurement costs, 37.68% supervisory ship operations, 6.31% repair and maintenance costs, 0.68% monitoring technology, 4.07% air operation costs and 0.69% HR training costs. Then after the increase in illegal fishing surveillance policy, there was an increase in costs used for illegal fishing supervision amounting to Rp.964.7 billion with the composition of the procurement cost of supervisory vessels 81.43%, operational supervisory vessels 12.24%, repair and maintenance costs 2.79%, monitoring technology 0.32%, air operation costs 2.55% and HR training costs 0.67%.

Impact of Illegal Fishing

Impact identification results illegal fishing in Indonesian waters has an economic, ecological, social impact and the impact of state sovereignty with descriptions, namely (1) economic impact, namely loss of state revenue in the form of taxes and PNBP, fish supply for export and meeting the domestic fish processing industry, (2) economic impact, namely ecosystem damage in the form of damage to coral reefs, depletion of fish resources resulting in overfishing (overfishing), (3) social impacts, namely the emergence of fishermen conflicts due to competition for fishing grounds, fuel misuse and fuel subsidy distribution that is not on target, job losses in the fisheries sector which lead to reduced employment, (4) sovereign impacts, namely the rejection of Indonesian products because they are considered fishery products are products of illegal fishing and allow irresponsible management, water security i.e. unsafe Indonesian waters and many activities illegal fishing which worsens Indonesia's image in terms of maritime security. The impact of the research is the direct and indirect impact economically and socially.

Valuation of the Impact of Illegal Fishing

Impact valuation is an attempt to quantitatively value the resulting impact of supervisory activities Illegal fishing, the impact of the policy before and after the improvement of supervision policy is:

1) Impact of surveillance on fisheries production: The impact of the supervision activities carried out currently saves 9,236 tons/year with a production value of Rp. 369,424,948,500/year, if increased supervision is carried out, the potential saved is 55,414 tons/year with a production value of Rp. 2.2 trillion/ year. Through the improvement of supervision policies, the influence on the marine fisheries business, namely the needs of fisheries production for the processing industry is met, fishing productivity increases and the ability to catch fish at sea closer.
2) The impact of the supervision policy on PNBP fisheries state revenue: The impact of the current supervision is to save state revenue losses in the form of PNBP of Rp. 789,426,202/year with a policy of increasing supervision, the impact of state revenue losses that can be saved of Rp. 3.9 billion / year will be obtained. The influence on business is PNBP paid by business people to the state due to an increase in profitable business activities
3) Impact on fisheries sector tax revenue: The value of potential tax losses that can be saved is Rp. 1.8 billion/year with improved supervisory performance, the potential loss of state revenue that can be saved is Rp. 11.08 billion/year. The influence on business is PNBP paid by business people to the state due to the increase in business activities and the volume of fish production produced.
4) Impact on ABK/workforce: Then through the current supervision the potential employment that can be saved from the results of supervision is Rp. 41.1 billion/year or as many as 1,261 people. Through increased supervision, the potential for jobs that can be saved is Rp. 131.3 billion / year or 2,764 people. The influence on business people is increasing the absorption of fisheries workers, especially the fishing sector and opening new job opportunities.
5) Impact on fuel usage: Current monitoring activities will save the potential loss of fuel by 7,903,090 liters or Rp. 53.7 billion/year. Then, if the supervision performance is improved, it will have an impact on the increase in the potential that can be saved by lost fuel of Rp.322.4 billion/year or 16,956,730 liters. The influence on business actors is to directly facilitate the acquisition of fuel and fuel subsidy programs to fishermen as business people on target.

The impact of illegal fishing eradication policy on marine fisheries business actors if increased surveillance is carried out through increased surveillance capacity will provide benefits of Rp.1.8 trillion/year.

Table 1. Analysis of Extended Cost Benefit Analysis (ECBA)

Details	Illegal Fishing Surveillance Conditions before Increased Surveillance Policies (Rp)	Policy to Increase Surveillance of Illegal Fishing (Rp)
Benefit	466.965.633.519	2.335.617.593.795
Cost	964.726.216.307	795.952.702.961
Net Benefit (CBA)	497.760.582.788	1.539.664.890.834
Present Value	456.661.085.127	1.412.536.597.095
Change in net benefit (i-9%)		1.869.197.682.222

Based on the previous table, with increased surveillance by the government, it will get positive benefits of Rp.1.8 trillion per year, so that the policy of increasing surveillance of illegal fishing is feasible. Present value with an increase in policy to increase illegal fishing surveillance with an increase in net benefit of Rp.1.5

trillion per year, up to the next 10 years illegal fishing monitoring activities will provide benefits to the government as shown by the Net Present Value (NPV) of Rp.13.07 trillion.

The policy of increasing surveillance will have an economic impact of Rp.1.8 trillion/year and social of Rp.474.5 billion/year with a total impact of Rp.2.3 trillion/year. In detail, the economic and social impact of supervisory conditions before the increase and after the surveillance improvement policy is presented in table 2.

Table 2. Total Value of Economic and Social Impact Illegal Fishiing

	Illegal fishing surveillance conditions before increased surveillance policies (Rp)		**Policy to increase surveillance of illegal fishing (Rp)**	
	Economic Impact	***Social Impact***	***Economic Impact***	***Social Impact***
Fisheries Production Value Saving Potential	369.424.948.500		1.847.124.742.500	
Potential Saving Government Revenue from PNBP	789.426.202		4.736.557.212	
Fisheries Tax Rescue Potential	1.847.124.743		9.235.623.713	
Potential Rescue Income from the workforce/ABK		41.163.120.000		205.815.600.000
Fuel Oil Rescue Potential		53.741.014.074		268.705.070.370
Sum	372.061.499.445	94.904.134.074	1.861.096.923.425	474.520.670.370
Total	466.965.633.519		2.335.617.593.795	

The results of the study on the influence of illegal fishing surveillance policies greatly affect the fisheries business at sea. The threat of illegal fishing at sea still occurs because surveillance capabilities at sea have the potential to interfere with fisheries business activities at sea. The impact of illegal fishing activities will harm business people and businesses, namely the production of fish resources is exploited illegally, causing the supply of fish raw materials for industry to decrease, loss of opportunities and opportunities for employment as fishermen, loss of state revenue in the form of taxes and PNBP capture fisheries and misuse of fuel / fuel subsidies that trigger scarcity and government subsidy assistance that is not on target. The government needs to increase the capacity of illegal fishing surveillance at sea, through policies (1) increasing surveillance facilities and infrastructure at sea such as surveillance vessels and surveillance technology so that surveillance at sea is more effective and efficient, (2) increasing the intensity of surveillance at sea, surveillance at sea, aerial surveillance and utilizing satellite data and information. Then the implication is that in order for the illegal fishing eradication policy to be successful, marine fisheries business actors support the implementation of illegal fishing supervision policies by complying with the provisions of the implementation of laws and regulations in the field of fishing so as not to worsen illegal fishing activities at sea which will harm business actors and fisheries management in general.

CONCLUSION

Illegal fishing activities in Indonesia are carried out by Indonesian-flagged fishing vessels and foreign-flagged fishing vessels. The highest locations of illegal fishing waters occur in fisheries management area (WPPNRI) WPPNRI 711, WPPNRI 712, WPPNRI 716 and WPPNRI 571. The impact of illegal fishing activities is detrimental economically, socially, ecologically and state sovereignty which is directly detrimental to fisheries business actors at sea.

The policy of increasing surveillance provides positive benefits of Rp.1.8 trillion/year and cumulatively within ten years will obtain benefits of Rp.13 trillion. So that the policy of increasing surveillance of illegal fishing deserves to be continued. Through this increase, it will affect the fisheries business at sea where the needs and supply of fish for raw materials for the fishery industry are met, increase the productivity of catches increase, absorption of labor as fishermen on ships, fuel stocks are sufficient and for the government, state revenue from PNBP and taxes increase. The policy of increasing supervision increases the potential for saving economic and social losses, during the supervision conditions before the social and economic impact policy obtained amounting to Rp.466.9 billion/year and after the policy of increasing supervision to Rp.2.3 trillion/year.

The government needs to formulate the impact in the form of value from the results of supervisory activities on resources in the form of valuation so that the performance of the surveillance program can be accepted by the public and easily understood properly. In order to obtain a more comprehensive value of losses and impacts from illegal fishing activities, it is necessary to conduct research with broader variables on economic and social impacts as well as impact research in the field of ecology and state sovereignty. This value will greatly assist policy makers, in this case the government in formulating sustainable fisheries governance policies.

REFERENCES

Adolf, S. (2019). *Tuna Wars : Power Around the Fish We Love to Conserve*. Springer Nature Switzerland.

Chapsos, I., Koning, J., & Noortmann, M. (2019). Involving local fishing communities in policy making: Addressing Illegal fishing in Indonesia. *Marine Policy*, *109*, 103708. https://doi.org/10.1016/j.marpol.2019.103708

Chen, X., Zhou, Y., & Zou, L. (2020). Review on global fisheries. *Brief Introduction to Fisheries*, 19-96.

Djunarsjah, E., Kusumadewi, D., & Chairuniza, G. (2021, June). The effectiveness of Indonesia's fisheries policy to reduce illegal fishing. In *IOP Conference Series: Earth and Environmental Science* (Vol. 805, No. 1, p. 012018). IOP Publishing.

FAO. (2022). *The State of the world Fisheries and Aquaculture. Towards Blue Transformation.* Food and Agriculture Organization.

KEPMEN KP (Kementerian Kelautan dan Perikanan). (2022). *Keputusan Menteri Kelautan dan Perikanan Nomor 19 Tahun 2022 Tentang Estimasi Potensi Sumber Daya Ikan, Jumlah Tangkapan Ikan Yang Diperbolehkan, Dan Tingkat Pemanfaatan Sumber Daya Ikan Di Wilayah Pengelolaan Perikanan Negara Republik Indones*ia. Kementerian Kelautan dan Perikanan.

KKP. (2020). *Rencana Strategis Kementerian Kelautan dan Perikanan* Tahun 2020-2024. Kementerian Kelautan dan Perikanan.

KKP. (2023). *Data hasil tangkapan kapal pengawas*. Kementerian Kelautan dan Perikanan.

Klinsukhon, S., Tongdee, N., & Sulit, V. T. (2022). Overview of the status and trends of capture fisheries and aquaculture in Southeast Asia. In *The Southeast Asian State of Fisheries and Aquaculture 2022* (pp. 1-43). Secretariat, Southeast Asian Fisheries Development Center.

OECD. (2018). *Trade and agriculture directorate fisheries committee. combatting illegal, unreported and unregulated fishing where countries stand and where efforts should concentrate in the future. TAD/FI(2017)16/FINAL*. OECD.

Prihadyanti, D., & Aziz, S. A. (2023). Indonesia toward sustainable agriculture–Do technology-based start-ups play a crucial role?. *Business Strategy & Development*, *6*(2), 140-157.

Setkab. (2016). *Kurangi Stok Dunia 90%, Presiden Ajak Dunia Perangi Illegal Fishing*. Setkab.

Sularso.A. 2009. *Overfishing, Overcapacity dan Illegal fishing, studi Kasus Laut Arafuru.* Kementerian Kelautan dan Perikanan.

Zulbainarni, N., Sukarsih, Y., Jahroh, S., & Abdullah, A. (2022). Economic Valuation of Moratorium and Transhipment Policy to Tuna Fisheries Business, Study Case in Bitung, North Sulawesi. *Jurnal Manajemen & Agribisnis*, *19*(1), 79-79. DOI: http://dx.doi.org/10.17358/jma.19.1.79

Zulbairnarni, N. (2022). *Valuasi Ekonomi dalam Penentuan Pemanfaatan Sumber Daya dan Lingkungan Secara Berkelanjutan*. IPB.