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Evaluation of an Environmentally Sound Port (Ecoport) at the Sibolga Archipelago Fishing Port (PPN Sibolga) North Sumatera Province

Evaluasi Pelabuhan Berwawasan Lingkungan (Ecoport) di Pelabuhan Perikanan Nusantara (PPN) Sibolga Provinsi Sumatera Utara

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Abstract

Sibolga Archipelago Fishing Port is one of the fishing ports that carry out export activities with destination countries including Thailand, Vietnam, Peru, and Ecuador. The products caught by the Sibolga Archipelago Fishing Port have not been exported to the European market due to regulations on fishery product export certification. These problems can be overcome by implementing the eco-fishing port concept at the Sibolga Archipelago Fishing Port. The purpose of this study was to evaluate the environmentally sound Sibolga Archipelago Fishing Port (ecoport) according to the ecoport standard formulation. The method used in this study is a survey method. Collecting data using a purposive sampling approach. Data analysis was carried out descriptively using standard eco-fishing port parameters which consisted of four aspects, namely the physical ecology of the port, the socio-economic impacts around the port, handling of caught commodities and monitoring of illegal fishing. The results showed that the physical and ecological aspects got a score of 2.66, the socio-economic impact aspect got a score of 2, the handling of caught commodities got a score of 2 and the illegal fishing aspect got a score of 3. The ecoport index analysis got a score of 2.5 which means that the Sibolga Archipelago Fishing Port has been can be called an ecoport.

Keywords: Eco Fishing Port, Port, Export, Sibolga

Abstrak

Pelabuhan Perikanan Nusantara Sibolga adalah salah satu pelabuhan perikanan yang melakukan aktivitas ekspor dengan negara tujuannya antara lain Thailand, Vietnam, Peru dan Ecuador. Produk hasil tangkapan Pelabuhan Perikanan Nusantara Sibolga belum di ekspor ke pasar eropa dikarenakan adanya aturan sertifikasi ekspor produk perikanan. Permasalahan tersebut dapat diatasi dengan penerapan konsep *eco fishing port* di Pelabuhan Perikanan Nusantara Sibolga. Tujuan penelitian ini adalah untuk mengevaluasi Pelabuhan Perikanan Nusantara Sibolga yang berwawasan lingkungan *(ecoport)* sesuai dengan rumusan standar *ecoport.* Metode yang digunakan pada penelitian ini adalah metode survei. Pengumpulan data menggunakan pendekatan *purposive sampling.* Analisis data dilakukan secara deskriptif dengan menggunakan standar parameter *ecofishing port* yang terdiri dari empat aspek yaitu fisik ekologi pelabuhan, dampak sosial ekonomi di sekitar pelabuhan, penanganan komoditas hasil tangkapan dan pemantauan *illegal fishing*. Hasil penelitian menunjukkan aspek fisik dan ekologi mendapatkan skor 2,66, aspek dampak sosial ekonomi mendapatkan skor 2, aspek

penanganan komoditas hasil tangkapan mendapat skor 2 dan aspek *illegal fishing* mendapat skor 3. Analisis indeks *ecoport* mendapatkan skor 2,5 yang berarti PPN Sibolga sudah dapat disebut sebagai pelabuhan berbasis *ecoport*.

Kata kunci : *Ecofishing port*, Ekspor, Pelabuhan, PPN Sibolga

1. Introduction

Maintaining the quality of fishery products is important due to several cases of rejection of Indonesian fishery export products by several European countries (Pusdatin KKP, 2012). The Ministry of Maritime Affairs and Fisheries (MMAF) continues to improve the quality of fishery products. This commitment is outlined in the Minister of Maritime Affairs and Fisheries Regulation No. 01/Men/2007 which affirms that food safety must be guaranteed throughout the production chain. One of the concepts that will be implemented by KKP is eco fishing port, which adopts the concept of European Union countries in the environmental management of commercial ports for its application in Indonesian fishing ports so that the fishery products produced have good export quality and are accepted in destination countries.

The legal basis for the application of the eco-fishing port concept is the Government's policy through the Ministry of Maritime Affairs and Fisheries (KKP) in implementing the mandate of Law 45 of 2009 concerning Fisheries Article 41 where KKP is obliged to organise and guide the management of fishing ports and follow the provisions of the European Sea Ports Organization (ESPO) including aspects of waste, water quality, air and soil, sedimentation management, hoarding, sound, pollution, destruction of natural habitats, regulation of traffic volume. Aspects of water, air and soil quality and pollution are in line with Law No. 32 of 2009 on Environmental Protection and Management and ISO 14001 on the Environment.

Fishing ports in their management not only pay attention to economic and social aspects, but ecological aspects also need to be considered in the management of fishing ports. The combination of ecological, economic and social aspects is a method of real environmental port management approach for the sustainability of its development. In its management, the fishing port is required to apply the ecoport concept so that the fishing port environment can be well maintained to create comfort and beauty. In addition, the quality of the catch will also be hygienic because it comes from a clean water environment. Especially in type A and B ports, because oceanic and archipelago-type ports are fishing ports with a large production scale.

However, only a few fishing ports in Indonesia are environmentally based (ecoport). Based on previous research, fishing ports in Indonesia generally only pay attention to economic aspects in their management. One of the things that must be considered is port facilities because facilities are one of the elements that greatly affect operational activities which certainly have an impact on the surrounding environment. Sibolga Archipelago Fishing Port is one of the fishing ports that carry out export activities with destination countries including Thailand, Vietnam, Peru and Ecuador (Sibolga Archipelago Fishing Port Annual Report, 2020). This states that the catch products of Sibolga Archipelago Fishing Port have not been exported to the European market due to the regulation of fishery product export certification. As a fishing port with a large production scale, the export products of Sibolga Archipelago Fishing Port should have a great opportunity to be accepted in European countries. Seeing these problems, the Sibolga Archipelago Fishing Port is prepared to become an environmentally based fishing port (ecoport).

The purpose of this research is to evaluate the Sibolga Archipelago Fishing Port which is environmentally sound (ecoport) following the formulation of ecoport standards. This research was conducted from August to September 2022. This research was conducted at Sibolga Archipelago Fishing Port, Tapanuli Tengah Regency, North Sumatera Province.

2. Material and Method

2.1. Method

The survey was conducted by direct observation and interviews. Researchers made direct observations of objects in the form of facilities at the Sibolga Archipelago Fishing Port and interviews with respondents by distributing questionnaires. The data collected in this study include data on physical and ecological environmental aspects, social and economic impacts around the port, handling of catch commodities, and monitoring of illegal fishing. The data were collected through literature study, interviews and direct observation. Respondents in this study were 20 people consisting of 10 fishermen, 4 organoleptic panellists, 1 employee of the infrastructure section, 1 statistical section, 2 port operational sections, and 2 cleaners.

2.2. Data Analysis

2.2.1. Analysis of an Environmentally Sound Fishing Port (Ecoport)

The main Ecological and Physical Environmental Analysis of Fishing Port.

2.2.1.1. Fishing Port Water Quality

According to the Decree of the Minister of Environment No. 115 of 2003, the quality of fishing port waters can be assessed from the level of water pollution in the Sibolga Archipelago Fishing Port using the Pollution Index (IP) formulated as follows:

$$Pij = \frac{\sqrt{\frac{Ci}{Lij}M^2 + \left(\frac{Ci}{Lij}\right)R^2}}{2}$$

Where: Pij = *Pollution Index*, Ci = concentration of water quality parameters from the analysis, Lij = concentration of water quality parameters according to quality standards, M = maximum value, R = average value. Water quality category (Satari, 2015): $0 \leq PIj \leq 1.0 \rightarrow$ meets quality standards (good condition) (Score 3); $1.1 < PIj \leq 10 \rightarrow$ mild-moderate pollution (Score 2); and $PIj > 10 \rightarrow$ heavily polluted (Score 1).

2.2.1.2. Fishing Port Facilities

According to Satari (2015), in determining the level of completeness of fishing port facilities, a modified formula based on the Minister of Marine Affairs and Fisheries Regulation No. 08/MEN/2012 can be used. After that, the three groups of facilities are paired comparison, to get the formula for calculating the PP score as follows

PP score = (0.50xF. Main) + (0.33x F.Functional) + (0.17x F.Support)

Categories of fishing port facilities (Satari, 2015): Score 3 which mean the Fishing Port is well facilitated, a) if the main facilities have seven facilities that have been determined by the Minister of Marine Affairs and Fisheries Regulation No. 08/MEN/2012 (breakwater, jetty, port pond, shipping channel, complex road and drainage, land), b) if the functional facilities have nine facilities that have been determined by the Minister of Marine Affairs and Fisheries Regulation No. 08/MEN/2012 (fish marketing site, navigation, workshop, quality development laboratory, integrated service post, wastewater treatment plant (WWTP), temporary disposal site (TPS), clean water, fuel oil installation (BBM), electricity installation), and c) if the supporting facilities have six facilities following the Regulation of the Minister of Marine Affairs and Fisheries No. 08/MEN/2012. (Fishermen's meeting hall, operator's mess, fishermen's guesthouse, bathing and washing toilet (MCK), shops, guard post).

A score of 2 means that the Fishing Port has sufficient facilities, a) if the main facility has five facilities that must be present in the main facility based on the Minister of Marine Affairs and Fisheries Regulation No. 08/MEN/2012 (land, dock, port pond, complex road and drainage), b) if a functional facility has four facilities that must be present in a functional facility based on the Minister of Marine Affairs and Fisheries Regulation No 08/MEN/2012 (port administration office, TPI, clean water supply, and electrical installation), and c) if the supporting facilities have two facilities that must be present in the supporting facilities based on the Regulation of the Minister of Maritime Affairs and Fisheries No 08 / MEN / 2012 (guard posts and toilets).

A score of 1 means that the Fishing port is poorly equipped, a) if less than five essential facilities are required (land, jetty, port pond, complex road and drainage), b) if functional facilities are less than four facilities that must be present (port administration office, TPI, water supply, and electricity installation), and c) if the supporting facilities are less than the two required facilities (guardhouse and washroom).

2.2.1.3. Area Cleanliness Level

The assessment for the level of cleanliness of the area uses existing data from 2021 and compares it based on the area cleanliness standard from Satari (2015). Category of area cleanliness level: Very good hygiene condition (score 3), if the availability of facilities and infrastructure is 80-100% of the ideal standard (garbage trucks, garbage rickshaws, organic and non-organic waste bins, temporary landfills, cleaning tools) and the volume of waste collected is 90% - 100% of the existing waste volume.

Good hygiene condition (score 2), if the availability of cleaning facilities and infrastructure is 70-80% of the ideal standard and the volume of waste transported or processed through 3R (reduce, reuse, recycle) is 80% - 90% of the existing waste volume. Hygiene conditions are poor (score 1), if the availability of cleaning facilities and infrastructure is 60% - 70% of the ideal standard and the volume of waste transported or processed through 3R (reduce, reuse, recycle) is below 80% of the existing waste volume.

2.2.1.4. Green Open Space

The greening condition assessed is the greening in the form of existing Green Open Space (RTH) (the year 2022) in the mainland part of the port (RTH percentage of the total area) compared to the standard greening plan for private areas based on Law Number 26 of 2007 concerning Spatial Planning, which is classified: Greening condition is very good: 20% to 30% (score 3), Greening condition is moderate/good: 10% to 20% (score 2), and Low greening condition : 0 to 10% (score 1).

2.2.2. Social and Econimiv Impact Analysis around Fishing Port

2.2.2.1. Community Income

Measuring how much the income level of the port community is done by comparing the income of the community (fishermen) with the Decree of the Governor of North Sumatra Number 188.44/746/KPTS/2021. Community income category (Satari, 2015): income above minimum wage (score 3), income equal to MSE (score 2), and income below the minimum wage (score 1).

2.2.2.2. Labour Absorption

Based on the formulation of Siahaan (2012), which is to compare the amount of labour absorption in the Sibolga Archipelago Fishing Port area with the total workforce in Pondok Batu Village, Central Tapanuli Regency. Then the result of the comparison is multiplied by 100%. Criteria for labour absorption in direct and indirect fishing ports according to Siahaan (2012): labour absorption above 50% (score 3), labour absorption equal to 50% (score 2), and labour absorption below 50% (score 1).

2.2.2.3. Extension and Training

Counselling and training conducted by fishing ports using data from the number of counselling and training conducted in the past year (2021). Counselling and training category (Satari, 2015): counselling and training >2 times/year (score 3), counselling and training 1-2 times/year (score 2), and no counselling and training (score 1)

2.2.3. Analysis of Commodity Handling of Captured Fish

2.2.3.1. Organoleptic Test

Using the numerical assessment on the score sheet following SNI Number 01-2346-2006 concerning fresh fish then compared with the assessment criteria score based on the quality class of fish freshness according to Sulistyono (2015) which is attached in Appendix 2. Determination of categories using Sulistyono's (2015) opinion, namely: i) organoleptic score 9: fish freshness is excellent (score 3), ii) organoleptic score 7-8: fish freshness is good (score 2), and iii) organoleptic score ≤ 6: not fresh (score 1)

2.2.3.2. Cold Chain System

The cold chain system assessment uses analysis results based on the type of fish refrigeration used. The cooling system generally uses ice and freezers. Cold chain system category (Satari, 2015): using the freezer (score 3), using ice (score 2), and not using ice and freezer (score 1).

2.2.4. Analysis of Illegal Fishing Monitoring

2.2.4.1. Licensing

The frequency of checks by the maritime department at Sibolga Archipelago Fishing Port in the year on the licences held by fishing vessels. Licence category (Satari, 2015): i) more than once a year (score 3), ii) once a year (score 2), iii) no checks in a year (score 1).

2.2.4.2. Number of Prohibited Fishing Gears

Based on the percentage of the number of prohibited fishing gear units to the number of fishing gear units used by fishermen in the harbour. Categories of prohibited fishing gear (Satari, 2015): i) number of prohibited fishing gear units 0% (score 3), ii) number of prohibited fishing gear units 0-20% (score 2), and iii) number of prohibited fishing gear units >20% (score 1).

2.2.4.3. Capture Fleet

The frequency of physical vessel checks per year is carried out by the marine and fisheries resources supervision (PSDKP) and the martyrdom section. Calculated based on the analysis results with criteria based on (Satari, 2015): i) there is a physical check >1 time/year (score 3), ii) there is a physical check 1 time/a year (score 2), and iii) no physical check (score 1).

2.2.4.4. Observer Fishing Monitoring

The frequency of physical vessel checks per year is carried out by the marine and fisheries resources supervision (PSDKP) and the martyrdom section. Calculated based on the analysis results with criteria based on (Satari, 2015): i) there is a physical check >1 time/year (score 3), ii) there is a physical check 1 time/a year (score 2), and iii) no physical check (score 1).

2.2.5. Analysis of the Conformity of Sibolga Archipelago Fishing Port to the Formulation of Ecoport Standards

According to the formulation of ecoport standards, the ecoport components analysed include physical and ecological aspects of the fishing port (Ffe); social and economic aspects around the fishing port (Fse); aspects of handling catch commodities (Fpk) and aspects of monitoring illegal fishing (Fif), with a weight of 37%, 21%,

21%, and 21% respectively. N is the value of each function. This weighting is based on Satari (2015) who had previously calculated the paired comparison method first.

The formulation of the ecoport component functions in more detail is described as follows:

2.2.5.1. Physical and Ecological Aspects of Fishing Ports (Ffe)

This aspect weights 37% with physical and ecological functions (Ffe) as follows:

Ffe = 0.37KPP + 0.29FPP + 0.17TKK + 0.17 RTH according to Satari, (2015)

2.2.5.2. Social and Economic Aspects of Communities around Fishing Ports (Fse)

This aspect weights 21% with the following socio-economic community functions (Fse) (Satari, 2015):

Fse = 0.42PM + 0.42PTK + 0.16 PNY

2.2.5.3. Catch Commodity Handling Aspect (Fpk)

This aspect weights 21% with the commodity handling function (Fpk) as follows (Satari, 2015):

Fpk = 0.5Org + 0.5SRD

2.2.5.4. Illegal fishing monitoring aspect (Fif)

This aspect weights 21% with the following illegal fishing monitoring functions (Fif) (Satari, 2015):

Fif = 0.375 PIZ + 0.29 JATD + 0.21 AP + 0.125 PIO

The calculation of the four aspects above is then included in the ecoport index formula as follows:

Indeks *ecoport* = $\sum_{i=1}^{n}$(BxN) Fi

Description:

B = weight of each function (Ff=0.37; Fse=0.21; Fpk=0.4; Fif=0.21)
N = Value of each function
Fi = each function in the calculation of the ecoport index

Adopting the opinion of Siahaan (2012), the ecoport index to assess the level of port suitability in Indonesia against ecoport standards that are feasible to implement in Indonesia at the Sibolga Archipelago Fishing Port namely: 1) Ecoport Index 0 – 1: Not yet called an ecoport. 2) Ecoport Index 1.1 – 2: There is a need for improvement towards an ecoport. 3) Ecoport Index 2.1 – 3: Can already be called an ecoport.

3. Result and Discussion

3.1. General Conditions of the Research Location

Sibolga Archipelago Fishing Port (PPN) is located in Central Tapanuli Regency, North Sumatera Province. The geographical location of Central Tapanuli Regency is at an altitude of 0-1,266 m above sea level and is located at coordinates 1°11'00" - 2°22'0" LU and 98°07' - 98°12' East with boundaries to the north bordering Aceh Province, to the south bordering South Tapanuli Regency, to the east bordering North Tapanuli Regency and Humbang Hasundutan and Pakpak Bharat Regencies in the west bordering Sibolga City and the Indonesian Ocean. (BPS Tapanuli Tengah, 2022).

3.2. Sibolga Archipelago Fishing Port Facility

Sibolga Archipelago Fishing Port facilities can be seen in Table 1 below.

Table 1. Sibolga archipelago fishing port principal facilities

No.	Facility Type	Size	Condition	Description
	a. Main facilities			
1	Pier	3470 m^2	Good	Functionalised
2	Harbour pond	7.5 Ha	Good	Functionalised
3	Harbour road	10200 m^2	Good	Functionalised
4	Land area	15.2 Ha	Good	Functionalised
5	Retaining wall	284 m^2	Good	Functionalised
6	Complex drainage	-	Good	Functionalised
7	Tiles	-	Good	Functionalised
	b. Functional facilities			
8	Office Building	864 m^2	Good	Functionalised
9	Fish market place	1134 m^2	Good	Functionalised
10	Net repair place	800 m^2	Good	Functionalised
11	Freshwater installation	150 m^3	Good	Functionalised
12	Workshop	152 m^2	Good	Functionalised
13	Workshop building	780 m^2	Good	Functionalised
14	Petrol station supplies	2 units	Good	Functionalised
15	Meeting Hall	652,36 m^2	Good	Functionalised

16	Beacon sign	2 units	Good	Functionalised
17	WWTP	1803 m^2	Good	Functionalised
18	Security post	1 unit	Good	Functionalised
	c. Support Facilities			
19	Mess operator	2 units	Good	Functionalised
20	Employee house	7 units	Good	Functionalised
21	Fisheries business office	881,8 m^2	Good	Functionalised
22	Harbour park plaza	750 m^2	Good	Functionalised
23	BAP Kiosk	13 doors	Good	Functionalised
24	Sports facilities	1 unit	Good	Functionalised
25	Mosque	1 unit	Good	Functionalised
26	Garin's house	1 unit	Good	Functionalised

3.3. Analysis of the Development of an Environmentally Fishing Port (Ecoport)

3.3.1. Fishing Port Water Quality

The results of the analysis of seawater quality at Sibolga Archipelago Fishing Port according to Kostanti (2021) who has conducted previous research measuring several parameters of aquatic environmental quality consisting of pH, total ammonia (NH3-N), brightness, and total suspended solids (TSS). The results of the data analysis obtained the value of the Sibolga Archipelago Fishing Port pollution index can be seen in Table 2.

Table 2. Calculation of Pollution Index (IP) Value

No.	Parameters	Ci	Lix	Ci/Lix	New Ci/Lix
1	pH	7,8	7 - 8,5	0,05	0,05
2	Brightness	3,8	5	0,76	0,76
3	Ammonia (NH_3-N)	<0,010	0,3	0,03	0,03
4	Suspended Solids (TSS)	19,6	20	0,98	0,98
				(Ci/Lix)R	0,45
				(Ci/Lix)M	0,98
				PI	0,71

From the table above, the pollution index value is 0.71. With this value, the condition of the waters around the Sibolga Archipelago Fishing Port meets the quality standards (score 3) or is in good condition (not polluted).

3.3.2. Completeness Level of Port Facilities

Table 1 shows that the facilities at the Sibolga Archipelago Fishing Port are in the "good" category because it has seven basic facilities, 11 functional facilities, and has 8 supporting facilities following PERMEN-KP No. 08 of 2012. With these results, the score of fishing port facilities based on Satari (2015) is 3, which means that the Sibolga Archipelago Fishing Port has good facilities.

3.3.3. Area Cleanliness Level

There are 11 janitors at Sibolga Archipelago Fishing Port. Waste bins at the Sibolga Archipelago Fishing Port are divided into 2 types, namely organic and non-organic. The janitors use motorised rickshaws to transport waste from the bins to the temporary landfill every day. The road to the temporary landfill is in good condition and well-maintained. Waste from the temporary waste disposal site (TPSS) is transported a frequency of 4 times a week by truck to the final disposal site. Facilities and infrastructure for cleaning the Sibolga Archipelago Fishing Port consist of garbage trucks, motorised tricycles, temporary landfills and garbage cans (organic and non-organic), all of which are in good condition.

Thus it can be concluded that the availability of facilities and infrastructure is 80% and the volume of waste collected is 90% - 100% of the existing waste volume. Including the category of very good cleanliness (score 3).

3.3.4. Greening Condition

The parameter of greening conditions assessed is greening in the form of existing Green Open Space (RTH) (the year 2022) in the mainland part of the port (percentage of RTH of the entire total area of the area) compared to the standard greening plan for private areas according to Law Number 26 of 2007 concerning Spatial Planning. The area of green open space in the Sibolga Archipelago Fishing Port area is 5290 m^2 of the total land area of 15.2 Ha (152,000 m^2) or only 0.03% so it is concluded that the greening conditions at the Sibolga Archipelago Fishing Port are in the low category because RTH < 20% of the port area (score 1).

3.3.5. Community Income

Based on the results of interviews with 10 fishermen or crew members at the Sibolga Archipelago Fishing Port, the average income is IDR 3,268,000. Then, the average income of fishermen is compared with the city minimum wage which has been determined through the Decree of the Governor of North Sumatra Number 188.44/746/KPTS/2021 of 2021 concerning a Minimum Wage of IDR 2,522,609. It is concluded that the

average income of the crew or fishermen is above the minimum wage (score 3) and this states that the income of fishermen around and at the Sibolga Archipelago Fishing Port is in a decent condition.

3.3.6. Labour Absorption

Labour absorption data at the Sibolga Archipelago Fishing Port in 2021 is presented in the Table 3.

Table 3. Total labour absorption

No.	Type of work	Number of Labourers (Person)
1	Fisherman	6280
2	Company employee	391
3	Loading and unloading labourer	18
4	Handyman	15
5	Fish sorting labourer	13
6	Merchants	24
7	Canteen	24
8	Construction labourer	10
	Total	6775

The total labour force in Sarudik Sub-district in 2021 was 15,765 people. Meanwhile, those who work in the Sibolga Archipelago Fishing Port amount to 6775 people or 42%. With this figure, employment is below 50% (score 1).

3.3.7. Extension and Training

In 2021, the counselling and training activities carried out at Sibolga Archipelago Fishing Port were 2 times (Table 4). With this number, the score obtained is 2 or in the good category.

Table 4. Number of Counselling and Training

No.	Type of Coaching	Place	Destination
1	Guidance on Fishery Vessel Crew Certification or SKPI	Meeting Hall	Fisherman
2	The socialisation of the Fish Catch Certificate (SHTI) service	Meeting Hall	Fisherman

3.3.8. Analysis of Catch Commodity Handling

Organoleptic. The sample used in the organoleptic test is skipjack (*Katsuwonus pelamis*). Skipjack is one of the main fish commodities caught at the Sibolga Archipelago Fishing Port. The skipjack is landed from purse seine vessels at the hygienic TPI of Sibolga Archipelago Fishing Port. The fish is preserved using ice blocks on the boat so that when it is landed the fish is frozen and fresh. The results of the calculation of the organoleptic test of skipjack (*Katsuwonus pelamis*) with a 95% confidence interval obtained the value interval of $8.10 \leq \mu \leq 8.38$ and for the organoleptic value of fresh skipjack (*Katsuwonus pelamis*) is 8.10 and rounded to 8.0. From the calculation results, it is concluded that the skipjack (*Katsuwonus pelamis*) landed at Sibolga Archipelago Fishing Port is in good condition and suitable for consumption **(score 2).**

Cold Chain System. The dominating vessel at the Sibolga Archipelago Fishing Port is the purse seine vessel. The main purpose or target of purse seine vessels is pelagic fish. The vessel uses an ice-block cold chain system. The vessel anchors and unloads the catch at the hygienic TPI of Sibolga Archipelago Fishing Port. Fish are unloaded from the boat using a basket, and then sorted according to type and size by the hygienic TPI staff. The sorted fish are arranged on the floor of the hygienic TPI using baskets. After that, the auction process is conducted between the buyer and the ship manager or assistant boss. While the auction process is being conducted, the boat manager records the catch and the selling value of the catch. The fish that has been bought by the buyer is put into a box containing broken ice blocks. The catch is then taken to the next destination using trucks and pick-ups. From the description above, it can be concluded that the cold chain system of ships at the Sibolga Archipelago Fishing Port is not good because it still uses ice and when the auction process takes place, the fish stays long enough on the floor without using coolers such as ice blocks so that the quality of the fish will deteriorate quickly (score 2).

3.3.9. Analysis of Illegal Fishing Monitoring

Licensing. Licences are a must-have for any fishing fleet going to sea. According to the Regulation of the Minister of Maritime Affairs and Fisheries Number 58 of 2020 concerning capture fisheries, the licensing documents that must be owned by each fishing vessel are a fisheries business licence (SIUP), fishing licence (SIPI), fish transport vessel licence (SIKPI), letter of operation (SLO), sailing approval letter (SPB). Checking the completeness of the permits is carried out by the martyrdom section at the Sibolga Archipelago Fishing Port when the ship is going to sea or at the time of processing the Sailing Approval Letter (SPB). So it can be

concluded that checking permits that must be on board the ship has been carried out more than once a year (score 3).

3.3.10. Number of Prohibited Fishing Gears

Based on statistical data from Sibolga Archipelago Fishing Port in 2021, the fishing gear operated at Sibolga Archipelago Fishing Port includes purse seine, gillnet, Bagan and fishing rods so there are no prohibited fishing gear. The fishing gear used is following the Minister of Marine Affairs and Fisheries Regulation Number 18 of 2021 Article 6 paragraph 1 concerning the types of fishing gear allowed. Thus it is concluded that the percentage of the number of prohibited fishing gear at the Sibolga Archipelago Fishing Port is 0% (score 3).

3.3.11. Capture Fleet

According to Monintja (2001), a fishing fleet consists of several fishing units, consisting of vessels, fishing gear and fishers. The size of the vessel determines the amount of fish that can be transported during fishing activities. So it is necessary to check whether or not there is a practice of marking down the gross tonnage (GT) of the ship. This aims to prevent fishing vessels from obtaining catches above the licence that has been made. Fishing activities by falsifying the size of the vessel in the permit is one of the actions that include illegal fishing because it has violated the law. Fishing fleets that do not comply with their licences should be prohibited from operating.

The type of fishing gear used must also be following the regulation of the Minister of Marine Affairs and Fisheries Number 18 of 2021 Article 6 paragraph 1 concerning the types of fishing gear allowed. Prohibited fishing gear should not be used because it can damage the sustainability of fish resources in a water area. Therefore, checking the fishing fleet must be carried out so that there are no violations regarding the fishing fleet used by fishermen. At the Sibolga Archipelago Fishing Port, checks are carried out by the harbourmaster and marine resource monitoring base (PSDKP) officers with a frequency of more than once a year. So it is concluded that the activity of checking the fishing fleet is very good and gets (a score of 3).

3.3.12. Observer Fishing Monitoring

To prevent the practice of manipulating catch data on board, each fishing vessel must have an observer crew. Data from monitoring conducted by observers are needed to strengthen data as a basis for captured fisheries management that can prevent illegal fishing activities. Based on the results of the interview with the Sibolga Archipelago Fishing Port, there is one observer on the fishing vessel (score 3).

3.4. Analysis of the Conformity of Sibolga Archipelago Fishing Port to the Formulation of Ecoport Standards

The ecoport analysis component consists of four aspects, namely the physical and ecological aspects of the port, aspects of the social and economic impact of the community around the fishing port, aspects of handling catch commodities, and aspects of monitoring illegal fishing with a weight of 37%, 21%, 21%, 21% respectively. Calculation of the suitability of the Sibolga Archipelago Fishing Port to the formulation of ecoport standards can be seen in the Table 5.

Table 5. Analysis of Sibolga archipelago fishing port ecoport index calculation

No.	Ecoport Components	Weighting	Function
1	Physical and ecological features of fishing ports	37%	Ecological physical function (Ffe) = 0.37KPP+0.29FPP+0.17TKK+0.17KP=0.37x3 + 0.29x3 + 0.17x3 + 0.17x1 = 2.66
	a. Water quality of fishing port	3: good condition	
	b. Fishing port facilities	3: well-equipped	
	c. Area cleanliness level	3: very good hygiene conditions	
	d. Green open space	1: the percentage of green open space is less than the standard set by the spatial plan.	
2	Social and economic aspect of the community around the fishing port (Fse)	21%	Community socio-economic function (Fse) = 0.42PM + 0.42TK + 0.16Pny = 0.42x3 + 0.42x1 + 0.16x2 = 2
	a. Community income	3: income above the minimum wage	
	b. Labour absorption (PTK)	1: employment below 50%	
	c. Counselling and raining (Pny)	2: counselling and training 2 times a year	
3	Aspects of handling captured commodities (Fpk)	21%	Commodity handling function (Fpk) = 0.5Org +0.5SRD = 0.5x2 + 0.5x2 = 2
	a. Organoleptic	2: fish freshness is good	
	b. Cold chain system	2: using ice	
4	Aspects of monitoring	21%	Illegal fishing monitoring function (Fif) = 0.375Piz

illegal fishing (Fif)		+0.29JATD + 0.21AP + 0.125PIO = 0.375x3 + 0.29x3 + 0.21x3 + 0.125x3 = 3
a. Licensing	3: there is a check > 1 time / year	
b. Number of prohibited fishing gears	3; No prohibited fishing gear	
c. Capture fleet	3: there is a physical check more than once a year	
d. Observer monitoring of fishing	3: there are observers and adequate facilities	

The calculation results in Table 5, it is then tabulated in Table 6 to get the ecoport index value of Sibolga Archipelago Fishing Port.

Table 6. Ecoport analysis calculation function

Ecoport	Ecoport Components			
	Ffe	Fse	Fpk	Fif
Weight (B)	0,37	0,21	0,21	0,21
Value (N)	2,66	2	2	3
B x N	0,99	0,42	0,42	0,63

Based on the final results of the calculation of the sum of the weights and values of each aspect of the ecoport component, an ecoport index value of 2.5 is obtained. So it is concluded that the Sibolga Archipelago Fishing Port can already be called an ecoport-based port

4. Conclusions

In the physical and ecological aspects of the port, Sibolga Archipelago Fishing Port scored 2.66. The score is the result of an analysis covering four criteria, namely the quality of port waters scored 3, the level of completeness of port facilities scored 3, the level of cleanliness of the area scored 3 and the area of green open space scored 1. In the aspect of social and economic impacts on the community around the port, the Sibolga Archipelago Fishing Port scored 2. The score is the result of an analysis covering three criteria, namely community income scored 3, employment scored 1 and the number of extension and training scored 2. In the aspect of handling catch commodities, Sibolga Archipelago Fishing Port scored 2. The score is the result of analysis covering two criteria, namely organoleptic test scored 2 and the cold chain system scored 2. In the aspect of monitoring illegal fishing, Sibolga Archipelago Fishing Port scored 3. The score is the result of an analysis covering four criteria, namely licensing scored 3, the number of prohibited fishing gear scored 3, the fishing fleet scored 3, and monitoring of fishing by observers scored 3. The results of the analysis of the four aspects above using the ecoport formula, Sibolga Archipelago Fishing Port received a score of 2.5. From the ecoport assessment score, it is concluded that the Sibolga Archipelago Fishing Port can already be said to be an ecoport-based port.

5. Suggestion

It is recommended that some aspects whose ecoport index value has not reached a score of 3 need to be improved and developed to get a score of 3 or a very good category. Some aspects that need to be improved are the area of green open space, the amount of employment, the amount of counselling and training, the quality or organoleptic value of fish and the cold chain system used. Thus, the Sibolga Archipelago Fishing Port ecoport index will increase and not decrease during certain conditions. And research on the evaluation of ecoport based fishing ports should be carried out at all fishing ports in Indonesia

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