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Fisheries surveillance strategy in Tegal Municipality, Central Java, Indonesia

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Abstract

Fishing, activities conducted by fishermen in Tegal, should always be followed by surveillance on fisheries and marine resources. The purpose of this study is to develop fisheries surveillance strategy in Tegal Municipality. The data used are primary and secondary data from various sources of information related to research. The analytical method used is SWOT (Strengths, Weaknesses, Opportunities, and Threats) and QSPM (Quantitative Strategic Planning Matrix). The findings showed that fisheries surveillance strategy to be implemented in Tegal Municipality are; i. to increase intensity of the sea patrol, ii. to improve quality service of letter of feasibility for fishing vessel operations, hereinafter referred to as SLO, and; iii. to increase programs aiming to spread the most current regulations on fisheries surveillance. The rank of the surveillance strategies formulated based on QSPM approach is; i. to increase frequency of programs of which purpose are to spread the most current regulations on fisheries surveillance with total score attractiveness of 6.91; ii. to increase intensity of the sea patrol with total score attractiveness of 6.89, and; iii. to improve quality of service with total score attractiveness of 6.38. Increase in frequency of programs that spread information on the current fisheries regulation is expected to develop the fishermen's awareness about the regulation and their obedience towards the regulation. SLO aims to supervise and get rid of illegal fishing equipment that can damage the environment. Object of the sea patrol is to prevent illegal fishing.

Keywords: Fisheries surveillance, SWOT, QSPM.

Introduction

The goals of natural resource exploration and management are to improve public welfare. Related to fish resource management and surveillance, government should pay close attention to fishing activities. Overfishing will damage the environment/ ecosystem[1]. The government has yet to conduct an effective surveillance towards the management and exploration of fisheries resources; as evidence, the number of illegal fishing in the Indonesia Fisheries Management Areas (FMAs) is pretty high. 109 fishing boats that consist of 68 Indonesian boats and 41 foreign boats were caught[2]. Illegal fishing is against the law because this activity unreported to the government[3]. Several modes of illegal fishing are: fishing without any permits, violating the existing regulations on fisheries, falsifying documents, and using illegal fishing equipments. Therefore, the government must conduct surveillance to prevent irresponsible fishing.

The Government of the Minister of Maritime Affairs and Fisheries (MMAF) through Directorat of Surveillance (PSDKP) supervise fishing activities in FMAs carefully. Technical Execution Unit (UPT) of PSDKP Base and Station is the institution responsible for the activity. In carrying out its duty, UPT PSDKP is supported by the Surveillance Unit of PSDKP (Satwas SDKP) and Working Areas of PSDKP (Wilker PSDKP) that spread all over Indonesia. One of the Working Areas is in Tegalsari, a working unit under Cilacap Station of UPT PSDKP. It was established in order to enforce regulations on fisheries sector and create sustainable fisheries resource management in Tegal Municipality.

Tegal Municipality is a city located on the North Java Coastal Area of which total area is 39.68km^2. Its coastal line stretches for 10.5km, and as the result, Tegal Municipality is really suitable for fishing. Table-1 shows number of fishing boats and fishing equipments in Tegal Municipality.

Table-1: Number of Fishing Boats in Each Region in Tegal Municipality[4].

Region	Boat	Motor Boat	Motor Vessel	Total
Margadana Sub-district	0	6	4	10
South Tegal Sub-district	0	5	0	5
East Tegal Sub-district	9	18	7	34
West Tegal Sub-district	6	259	877	1,142
Total	15	288	888	1,191

From the Table-2, there are violations of fisheries by fishermen in Tegal Municipality.

Table-2: Violation of Fisheries in Tegal in 2018[5,6].

Month	Vessel Inspected	Vessel Violate	Type of Violation
January	7	0	-
February	7	2	violating the fishing ground
March	12	2	violating the fishing ground
April	3	3	not carry documents, violating the fishing ground
May	2	1	violating the fishing ground
June	2	1	violating the fishing ground
July	7	0	-
Agust	3	2	violating the fishing ground
Sept.	7	0	-
October	10	6	not carry documents
Nov.	14	7	not carry documents, violating the fishing ground
Dec.	9	4	not carry documents
Jumlah	83	28	-

In order to prevent overfishing or illegal fishing, fishing should be followed by surveillance and enforcement of the fishing regulations[7].

Related to the explanation above, the researchers is interested in identifying both internal and external factors the Tegalsari Marine Resource and Fisheries Surveillance Working Area encounters in formulating an effective alternative strategy for fisheries surveillance. Thus, the purpose of this research is to analyze fisheries surveillance strategy in Tegal Municipality.

Materials and methods

The setting of the study was Tegalsari Marine Resource and Fisheries Surveillance Work Area and the study was conducted between January-April, 2019.

The sampling method was purposive samplingtechnique[8]. The criterion to select respondents was individuals participating directly in fisheries surveillance activities in Tegal Municipality. Table-3 showed the number and description of the respondents.

Table-3: Respondents.

Respondents	Total (individual)
Staffs of Department of Marine Affairs and Fisheris of Central Java	6
Staffs of Department of Marine Affairs, Fisheries, Food, and Agriculture of Tegal	2
Cilacap Station Fisheries Supervisor UPT PSDKP	5
Fisheries Supervisor of PSDKP Tegalsari Working Area	5
Fisheries Surveillance Boat Crews	2
Head of Tegalsari Beach Fishing Port	4
Sea Patrol Officers of Tegal	5
Surveillance Community Group Members	1
	30

The data collection technique was interview with questionnaire that probed information on the strength, weakness, opportunity, and threat in the fisheries surveillance programs in Tegal Municipality.

The data analysis method was quantitative analysis with SWOT. SWOT analysis was conducted in order to identify various factors in systematic manner and then formulate strategy and policy. It emphasizes on logical thinking in maximizing Strength, and Opportunities, and minimizing Weaknesses, andThreats[9].

Furthermore, Quantitative Strategic Planning Matrix(QSPM) began with selecting key factors of particular strategy using SWOT analysis[10-12]. Each strategy was weighed and presented in the form of matrix. Based on the matrix, the respondents gave evaluation using the Likert scale, and then the weighting results obtained from the key factors of the chosen strategy was multiplied by the evaluation from panel of experts. The results were then ranked; strategy with the highest final score was the most important strategy.

Results and discussion

The field observation revealed that in carrying out their responsibility the surveillance staffs were facing several issues (Table-4), for example illegal fishing equipment that damages the environment, high frequency of < 10 GT fishing boats, shortage of supervising staffs and infrastructure for fisheries surveillance, inadequate data and poor law enforcement.

Table-4: Issues and Problems on the Fisheries Surveillance Program in Tegal.

Issues	Problems
Fishing equipment that can potentially damage the environment	A lot of fishermen are using small bottom trawl and seine net for fishing
Fishing boats	High number of <10 GT fishing boats in Tegal
Fisheries surveillance staffs	Shortage of staffs responsible for fisheries surveillance
Infrastructure for fisheries surveillance	Lack of fisheries surveillance infrastructure
Data	Poorly organized data on fishermen, fishing boats or fishing equipment
Law enforcement	Lack of fisheries regulation enforcement

Internal Factor Analysis Summary (IFAS) of PSDKP Tegalsari Working Area: Fisheries surveillance internal factors in the SWOT analysis consisted of strength factors and weakness factors. i. Strength factors referred to several advantages PSDKP Tegalsari Working Area has, namely: (a) authority to check fishing vessel; (b) skillful fisheries surveillance staffs; (c) sea patrol, and; (d) authority to issue fishing permit (SLO) for each fishing vessel. ii. Weakness factors referred to several limitations that cause hindrance for the fisheries surveillance programs, namely (a) shortage of fisheries surveillance staffs; (b) lack of infrastructure for the fisheries surveillance program; (c) poorly organized fisheries surveillance data, and; (d) poor law enforcement.

Based on the identification, score of the strengths factors (S) was 1.73 and that of the weakness factor (W) was 1.55, while aggregate score of the internal factors was 3.28. Table-4 described IFAS result of PSDKP Tegalsari Working Area surveillance program in a more detailed manner.

External Factor Analysis Summary (EFAS) of PSDKP Tegalsari Working Area: Fisheries surveillance external factors in the SWOT analysis consisted of opportunities factors and weakness factors: i. Opportunities factors referred to opportunity PSDKP Tegalsari Working Area has, namely: (a) regulations on fisheries surveillance; (b) public participation in the fisheries surveillance program, and; (c) support from other public institutions for the surveillance program. ii. Threatsfactors referred to an external condition that may disrupt the surveillance program, namely: (a) high number of fishing boats; (b) use of illegal fishing equipment, and; (c) vast surveillance area.

Based on the identification, score of the opportunities factors (O) was 1.48 and that of the threats factor (T) was 1.54, while aggregate score of the external factors was 3.01. Table-5 described the result of EFAS of PSDKP Tegalsari Working Area surveillance program in a more detailed manner.

Table-5: IFAS of PSDKP Tegalsari Working Area.

Internal Factor	Score		Score
	Weighing	Rating	
Strength			
Authority to check fishing vessel	0.13	3.43	0.46
Skillful fisheries surveillance staffs	0.12	3.10	0.36
Sea patrol	0.13	3.47	0.43
Authority to issue fishing permit (SLO)	0.13	3.63	0.47
Total	0.38	10.00	1.73
Weakness			
Shortage of fisheries surveillance staffs	0.13	3.73	0.48
Lack of infrastructure for the fisheries surveillance program	0.13	3.03	0.39
Poorly organized fisheries surveillance data	0.12	2.87	0.34
Poor law enforcement	0.12	2.87	0.33
Total	0.49	12.50	1.55
Total of IFAS	0.87	22.50	3.28

Table-6: EFAS of PSDKP Tegalsari Working Area.

External Factor	Score		Score
	Weighing	Rating	
Opportunities			
Regulations on fisheries surveillance	0.16	3.00	0.49
Public participation in the fisheries surveillance program	0.17	3.00	0.52
Support from other public institutions for the surveillance program	0.16	3.00	0.47
Total	0.49	9.00	1.48
Threats			
High number of fishing boats	0.17	2.83	0.47
Use of illegal fishing equipment	0.16	3.07	0.49
Vast surveillance area	0.18	3.17	0.57
Total	0.51	9.07	1.54
Total of EFAS	1.00	18.07	3.01

Formulating Fisheries Surveillance Strategy in Tegal Municipality: Referring to the results of IFAS and EFAS and formulation of alternative strategies, the most effective strategy was S-T strategy since the scores of the strengths factors (S) and threats factors (T) were dominant. In other words, the fisheries surveillance strategies in Tegal are the S-T strategies. Figure-2 showed the strategy formulation mapping.

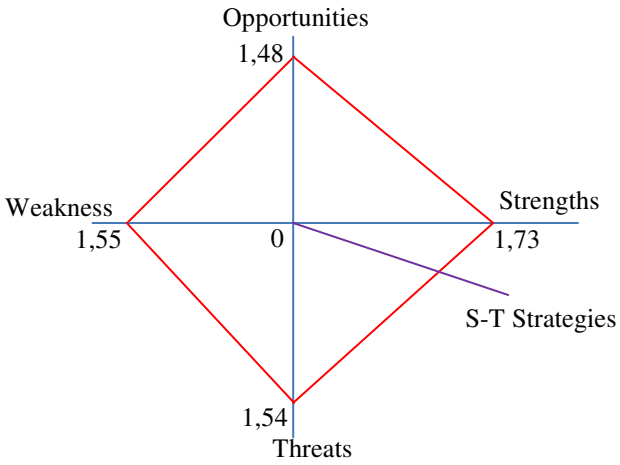

Figure-1: Mapping of Fisheries Surveillance Strategy in Tegal Municipality[13,14]

Based on the strategy formulation and the results of IFAS and EFAS, fisheries surveillance strategy to be implemented in Tegal are (1) to increase intensity of the sea patrol, (2) to improve quality of SLO service, and; (3) to increase programs aiming to spread the most current regulations on fisheries surveillance.

Selecting Ranking for the Fisheries Surveillance Strategies in Tegal: The QSPM (Quantitative Strategic Plan Matrix) model showed that the fisheries surveillance strategies were dominated by the strengths (S) and threats (T) factors. Table-7 showed results of QSPM approach to determine ranking for the fisheries surveillance strategies.

The surveillance strategies ranking was as follows: i. Increase frequency of programs that spread information about the most current fisheries regulation with total score attractiveness (TAS) of 6.91; ii. Increase intensity of sea patrols with TAS of 6.89, and; iii. Improve fishing permit (SLO) service with TASof 6.38.

Policy Implication: Some strategies should be developed and policies should be established in order to monitor fishing activities and prevent illegal fishing in Tegal. The first strategy is to conduct socialization. Authority should conduct programs of which purpose is to spread the recent information on fisheries regulation regularly. These programs can also increase fishermen's understanding and obedience towards the existing regulations encouraging them to take the environment/ ecosystem into account while fishing[15]. The second is to enforce regulation on fishing permit (SLO) to prevent illegal fishing equipments that can damage the environment. Prior to fishing, every fishing boat/ vessel should obtain an SLO from Fish Surveillance Staffs. SLO is the requirement for Port Clearance (SPB/ Surat Persetujuan Berlayar) from harbor master. Violation to these regulations will result in postponement and written warning, which may lead to revocation of business license[16].

The last is to conduct sea patrols to prevent illegal fishing or overfishing[17]. Sea patrols decreased number of illegal fishing[18]. Therefore, the authority should increase number of patrol boats and intensity of sea patrol to preserve fisheries and marine resources as well as create sustainable fishing activities around the area.

Table-7: Formulation of Fisheries Surveillance Strategyin Tegal Municipality.

Internal / External	Strength – S	Weakness – W
	1. Authority to check fishing vessel. 2. Skillful fisheries surveillance staffs. 3. Sea patrols. 4. Authority to issue fishing permit (SLO).	1. Shortage of fisheries surveillance staffs. 2. Lack of infrastructure for the fisheries surveillance program. 3. Poorly organized fisheries surveillance data. 4. Poor law enforcement.
Opportunities – O 1. Regulations on fisheries surveillance. 2. Public participation in the fisheries. surveillance program. 3. Support from other public institutions for the surveillance program.	S – T Strategy 1. Increase intensity of the sea patrol. 2. Improve quality of SLO service. 3. Increase the frequency of regulatory socialization.	
Threats – T 1. High number of fishing boats. 2. Use of illegal fishing equipment. 3. Vast surveillance area.		

Table-8: QSPM of Fisheries Surveillance in Tegal.

Internal – External Factors	Weigh-ing	Alternative Strategies					
		SLO		Sea patrol intensity		Socialization	
		AS	TAS	AS	TAS	AS	TAS
Strength							
Authority to check fishing vessel	0.134	3.4	0.45	3.7	0.49	3.7	0.49
Skillful fisheries surveillance staffs	0.118	3.2	0.38	3.6	0.42	3.5	0.41
Sea patrol	0.125	2.6	0.33	4.0	0.50	3.8	0.48
Authority to issue fishing permit (SLO)	0.130	3.8	0.49	2.6	0.34	3.7	0.48
Weakness							
Shortage of fisheries surveillance staffs	0.127	2.6	0.33	3.5	0.45	3.8	0.48
Lack of infrastructure for the fisheries surveillance program	0.130	2.6	0.34	3.6	0.47	3.6	0.47
Poorly organized fisheries surveillance data	0.120	2.3	0.28	3.2	0.38	3.8	0.46
Poor law enforcement	0.116	3.5	0.41	3.6	0.42	3.6	0.42
Opportunities							
Regulations on fisheries surveillance	0.162	3.3	0.54	2.9	0.47	2.9	0.47
Public participation in the fisheries surveillance program	0.174	3.2	0.56	2.9	0.51	3.0	0.52
Support from other public institutions for the surveillance program	0.156	3.7	0.58	3.7	0.58	2.7	0.42
Threats							
High number of fishing boats	0.166	3.7	0.61	3.5	0.58	3.6	0.60
Use of illegal fishing equipment	0.161	3.2	0.51	3.7	0.59	3.7	0.59
Vast surveillance area	0.181	3.2	0.58	3.8	0.69	3.4	0.62
Total		44.3	6.38	48.3	6.89	48.8	6.91

Conclusion

Based on the SWOT and QSPM analysis, fisheries surveillance strategies to be implemented in PSDKP Tegalsari Working Area from the most to the least important are: (1) to increase frequency of programs that spread information about the most current fisheries regulation; (2) to increase intensity of sea patrols, and; (3) to improve quality of fishing permit (SLO) service.

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References

1. Subagyo P. Joko (2013). Indonesian Sea Law. PT. Rineka Cipta, Jakarta, Indonesia, 1-167. ISBN 978-97-95185-35-2

2. Directorate General of Marine and Fisheries Resources Surveillance (2018). Book of the Annual Report of the Directorate General of Surveillance of Marine and Fisheries Resources. Jakarta.

3. Mahmudah, Nunung (2015). Illegal fishing: Corporate Criminal Liability in Indonesian Territorial Waters. *Sinar Grafika, Jakarta, Indonesia*, 1-190. ISBN 978-979-007-637-2

4. Statistics of Tegal Municipality (2018). Tegal Municipality in Figures 2018. ISSN / ISBN : 0215-6024.

https://tegalkota.bps.go.id/publication/2018/08/16/818654a03225e14269799108/kota-tegal-dalam-angka-2018.html

5. Waters Police of Central Java (2018). Report of Patrol Activities in Tegal Waters 2018.

6. Directorate General of Marine and Fisheries Resources Surveillance. 2018. Report of indications of fishing vessel violations based on VMS 2018.

7. Monintja, R., Aji S., Sondita, F.A. and Ari P. (2006). Perspective of Arafura Marine Capture Fisheries Management. CV. Sinar Jaya, Bogor, Indonesia, pp 1-226, ISBN : 979-99614-8-3

8. Usman, H. dan Akbar P.S. (2009). Social Research Methodology. PT. Bumi Aksara, Jakarta, Indonesia. Pp 1-184, ISBN 978-97-90104-28-0

9. Rangkuti, Freddy. (2013). SWOT Analysis Technique for Dissecting Business Cases. PT. Gramedia Pustaka Utama,Jakarta, Indonesia, Pp 1- 192. ISBN : 978-60-20306-52-0

10. Pratiwi Ayu, Wahyudi S., Roni Z. and Amran R. (2017). Formulating Strategy Through QSPM Based on SWOT Framework: A Case Study Spin-Off Company in Malaysia. *Advanced Science Letters*, 23(9), 8646-8651. DOI**:**https://doi.org/10.1166/asl.2017.9945

11. Taslimi M.S. and Omeyr A.K. (2014). Formulating a Strategy Through Quantitative Strategic Planning Matrix (QSPM) Based on SWOT Framework (Case Study: Industrial Group of Barez Tires). *International Journal of Economy, Management and Social Sciences*, 3(8), 451-457. http://waprogramming.com/download.php?download=53bd4f034d5b38.54394448.pdf

12. Yusuf Risna and Rizky Muhartono (2017). Development Strategy for Capture Fisheries in North Kayong Regency. *Journal of Maritime and Fisheries Socio-Economic Policy*, 7(2), 103-114. ISSN: 2089-6980. DOI:http://dx.doi.org/10.15578/jksekp.v7i2.6459

13. Suci Puji Rahayu (2015). The Essence of Strategy Management. *Zifatama Publisher, Malang, Indonesia*, 1-170. ISBN : 978-6002-1662-99-1

14. Suwali Syaiful Anwar and Agus Setiadi (2017). Development Strategy of Coffee (coffea s.p) Agroindustry on Gapoktan Gunung Kelir in Jambu District Semarang Regency. *Agromedia*, 35(2), 83-92. ISSN: 0215-8302. http://jurnalkampus.stipfarming.ac.id/index.php/am/article/view/208.

15. Assauri Sofjan (2013). Marketing Management. Rajawali Pers, Jakarta, Indonesia, 1-450. 979-421-115-x.

16. Report (2017). Regulation of Ministry of Marine Affairs and Fisheries No. 1/2017 regarding Letter of Feasibility for Fishing Vessel Operations.

17. Krisnafi Y., Iskandar B.H., Wisudo S.H. and Haluan J. (2017). Optimization of Fisheries Surveillance Vessel Deployment in Indonesia Using Genetic Algorithm (Case study: Fisheries Management Area 711, Republic of Indonesia). *AACL Bioflux*, 10(3), 565-577. ISSN 1844-9166 (online).http://www.bioflux.com.ro/home/volume-10-3-2017/

18. Nikijuluw Viktor PH. (2008). Blue Water Crime, The Socio Ecomonics Dimensions of Illegal Fisheries. Cidesindo. Jakarta, Indonesia, 1-196. ISBN 978-97-96381-03-6