The Role of Community-Based Surveillance (POKMASWAS) in Combating Illegal Fishing in Indonesia

Didik Agus Suwarsono, Master of Environmental Management

School of Environment

Humanities, Arts and Social Science Colleges

Flinders University

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ABSTRACT

Illegal fishing is a serious problem for Indonesia due to the significant impacts on ecology, society and the economy. With regard to the ecological aspects, illegal fishing causes declines in fish stocks, destruction of the marine environment and extinction of certain species. From the economic perspective, Indonesia loses US$4 billion annually caused by illegal fishing which is a huge amount. Illegal fishing also triggers social problems such as escalation of conflict, increasing unemployment rates and increasing poverty level in coastal areas. On the other side, efforts to combat illegal fishing face many challenges including the geographical complexity of an archipelagic country with more than 17,000 islands and a large area of Exclusive Economic Zones (EEZ) in excess of 200 square nautical miles. The Indonesian government had limitations on technology capacity, human resources and facilities (e.g. patrol boats) to conduct surveillance in Indonesian waters. These limitations and challenges should be solved by developing a surveillance system which involves local communities in combating illegal fishing. In this context, community-based surveillance (POKMASWAS) offers an alternative approach to assist the Indonesian government to deal with limitations on combating illegal fishing.

This research demonstrates that the role of POKMSWAS is making a contribution to combating illegal fishing in Indonesia through monitoring and surveillance activities in the Natuna Sea which is one of the vulnerable areas of illegal fishing in Indonesia. This research was conducted by interviewing 23 respondents from government staff and POKMASWAS members in Jakarta, Batam and Natuna to obtain perceptions of the nature of the problem of illegal fishing, including scale and trend, the benefits of POKMASWAS and their role in monitoring and surveillance of IUU. This research focuses on four key issues including (1) describing illegal fishing trends in Indonesia; (2) explaining the role of POKMASWAS in combating illegal fishing; (3) elaborating the performance of POKMASWAS based the perceptions of key stakeholders and (4) developing recommendations to improve the role of POKMASWAS in combating illegal fishing in Indonesia.

The findings of this research show that respondents from a range of stakeholder groups have similar perspectives regarding illegal fishing as a major problem for Indonesia and the Natuna Sea due to the significant ecological, social, economic and political impacts. However, respondents have different perceptions related to illegal fishing trends whether decrease or increase. The results of this study also show that POKMASWAS plays a vital role in combating illegal fishing by collecting information of illegal fishing and reporting to law enforcement and

relevant agencies. Information on illegal fishing activities at sea is very useful to assist law enforcement agencies take immediate action including inspection and arresting illegal fishermen and also reducing operational costs for patrolling. However, POKMASWAS also has many limitations regarding their capacity to conduct monitoring and surveillance of illegal fishing. This research recommends some potential strategies to improve the role of community-based surveillance including: (1) involving more fisheries stakeholders in POKMASWAS especially in vulnerable areas of illegal fishing such as the Natuna Sea, the Arafura Sea and the North of Sulawesi Sea; (2) developing empowerment programs and supplying surveillance equipment and facilities to improve POKMASWAS capacity in conducting monitoring and surveillance; (3) updating legal frameworks about POKMASWAS to accommodate monitoring, surveillance and reporting procedures and also the role of local government in supervising programs; (4) developing reporting systems and enhancing coordination of POKMASWAS with relevant agencies;

Keywords: IUU fishing, community-based surveillance (POKMASWAS), community participation, monitoring, surveillance

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signature : 

Date : 17 July 2018

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Finally, this thesis is dedicated to the efforts of combating illegal fishing. I hope this thesis makes a positive contribution to improving the role of community-based surveillance in Indonesia.

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LIST OF ABBREVIATIONS

AIS	Automatic Identification System
APFIC	Asia-Pacific Fishery Commission
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
EEZ	Economic Exclusive Zone
FAO	The Food and Agriculture Organization of the United Nations
FMA	Fisheries Management Area
GPS	Global Positioning System
IACCAT	International Commission for the Conservation of Atlantic Tuna
IATTC	The Inter-American Tropical Tuna Commission
IOTC	Indian Ocean Tuna Commission
IPOA	Indonesian Plan of Action
IUCN	International Union for Conservation Nature
IUU	Illegal, Unreported, and Unregulated
MCS	Monitoring, Control, and Surveillance
MMAF	Ministry of Marine Affairs and Fisheries
MSY	Maximum Sustainable Yield
NPOA-IUU	National Plain of Action to Prevent and Combat IUU Fishing
PLB	Personal Locator Beacon
POKMASWAS	Community-Based Surveillance
RLFP	Regional Fisheries Livelihoods Programme
RFMO	Regional Fisheries Management Organization
RPOA	Regional Plan of Action
SEAFDEC	Southeast Asian Fisheries Development Centre
UNCLOS	The United Nations Convention on the Law of the Sea
VMS	Vessel Monitoring System
WCPFC	Western and Central Pacific Fisheries Commission

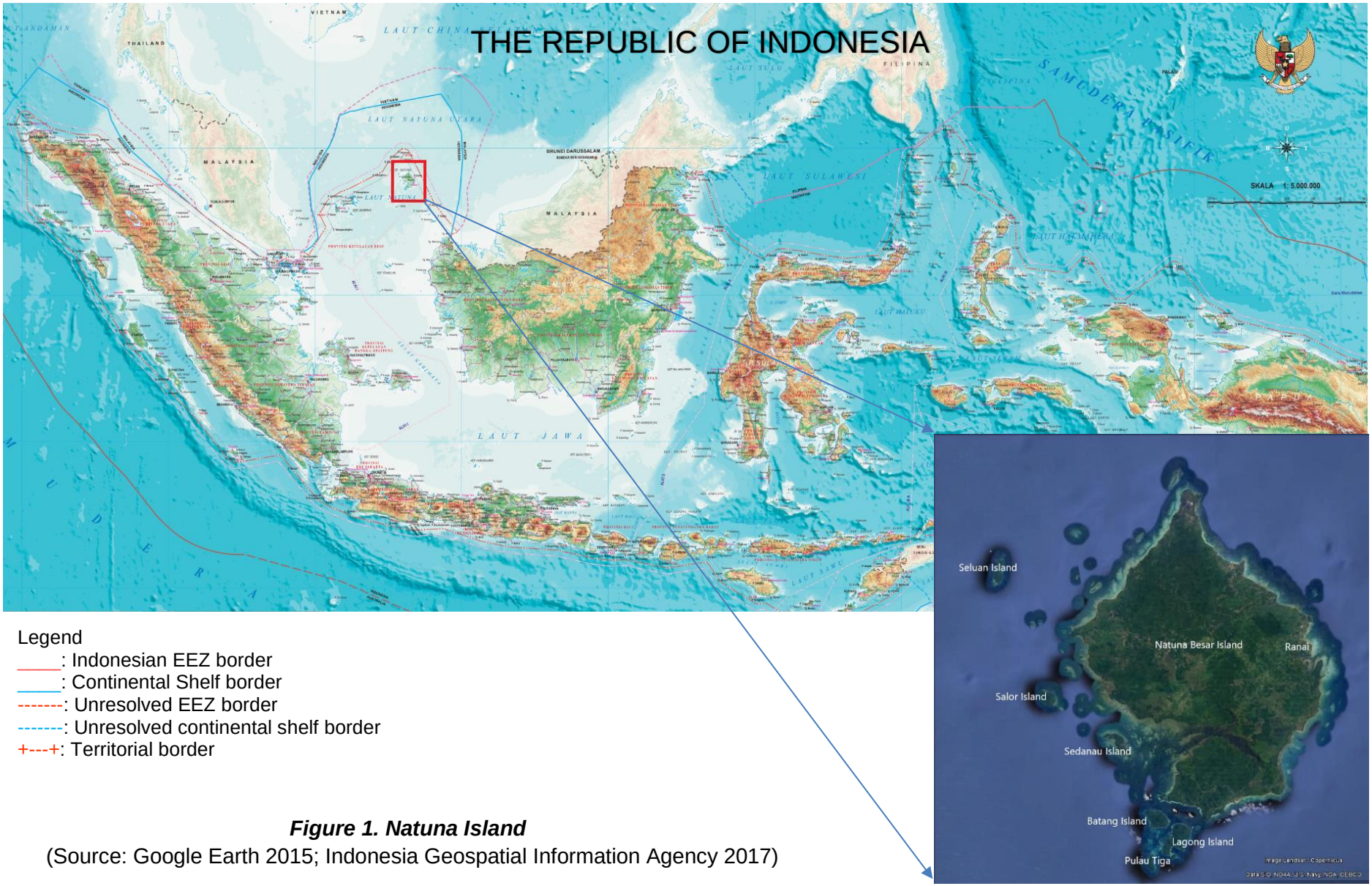
1. INTRODUCTION

1.1 Background

Illegal fishing is a major problem for Indonesia posing significant ecological, economic and social impacts. This research is based on the case study of Natuna, a remote island in Indonesia, and its surrounding waters (See Figure 1). The Natuna Sea is particularly vulnerable to illegal fishing for a number of reasons. It is surrounded by other countries that also have a heavy a reliance on fishing and fisheries products. It is in very close proximity to China, Thailand and Vietnam. Each year large numbers of illegal fishing vessels are arrested in the Natuna Sea (Sodik 2009). Combating illegal fishing in the Natuna Sea is highly challenging. There is limited government capacity to patrol and police these remote Indonesian waters and illegal fishers use a range of means to disguise themselves and their activities.

This research is focussed on the role of community-based surveillance in combating illegal fishing in Indonesia through monitoring and surveillance of foreign Illegal Unreported and Unregulated (IUU) activities. Local communities play a significant role in helping to combat illegal fishing in the Natuna Sea and other places in Indonesia through community-based surveillance (POKMASWAS), a voluntary, well-organised, community-based surveillance program designed to provide information about illegal fishing activities to law enforcement agencies.

Several studies have examined POKMASWAS as an initiative that engages local community in fisheries surveillance. For instance, Widayatun (2016) demonstrated the role of POKMASWAS in coral reef conservation in coastal areas of Biak, Buton and Raja Empat. POKMASWAS members were directly involved during the process of planning and surveillance of the area of coral reefs. Similarly, some studies have explored the role of POKMASWAS in conservation of mangrove areas in Segara Anakan (Dharmawan, Böcher & Krott 2017).



Legend
_____: Indonesian EEZ border
_____: Continental Shelf border
-------: Unresolved EEZ border
-------: Unresolved continental shelf border
+---+: Territorial border

Figure 1. Natuna Island
(Source: Google Earth 2015; Indonesia Geospatial Information Agency 2017)

Past research has investigated the role of community-based surveillance activities in Marine Protected Areas and in combating destructive fishing activities such as bombing and poisoning in Spermonde Island, off South Sulawesi (Glaser et al. 2015). However, previous studies have also mainly focussed on community-based surveillance efforts in near shore waters and local fisheries violations. The role of community-based surveillance for illegal foreign fishing activities has not been adequately explored.

1.2 Aims and objectives

This study was designed to explore stakeholder perceptions about the role of community-based surveillance in combating Illegal foreign fishing in Indonesia. It is based on a case study of POMASWAS (community-based surveillance program) in Natuna, Indonesia.

1.2.1 Research objectives:

The specific objectives of this study are to:

- Describe Illegal foreign fishing trends in Indonesia and the Natuna Sea.
- Explain the role of community-based surveillance in combating Illegal foreign fishing in Indonesia.
- Investigate the performance of POKMASWAS in combating illegal foreign fishing in Indonesia (and Natuna) based on perceptions of key stakeholders.
- Develop recommendations to improve the role of community-based surveillance in Indonesia.

The findings of this research are expected to give constructive feedback to the governments and community-based surveillance Organizations to improve the role of community-based surveillance in combating illegal fishing in Indonesia especially in the Natuna Sea.

2. LITERATURE REVIEW: ILLEGAL, UNREPORTED AND UNREGULATED FISHING

2.1 Introduction

Illegal, unreported and unregulated fishing (IUU) is a serious threat not only for marine and fisheries resources, but also more generally to marine environmental and human activities. IUU fishing is one of the driving forces of overfishing worldwide. It has significant impacts on fishing capacity, depleting fish stocks, and destroying the marine environment worldwide (Agnew et al. 2009). Socio-economic impacts of IUU fishing are inevitable (Sunyowati 2014). The Organization for Economic Cooperation and Development (2006) claims that the IUU fishing value is in excess of U$S4 billion and up to U$S9 billion annually. It is a significant cost for fisheries industries. Moreover, IUU fishing threatens coastal communities in developing countries, mainly artisanal fishing, where many fishermen rely on locally caught catch for their livelihood (Christensen 2016). It is clear that IUU fishing has ecological and socio-economic impacts on the marine and fisheries sectors. The Food Agriculture Organization (2016) also has a target to end IUU fishing and destructive fishing as part of the 2030 Agenda for Sustainable Development.

However, as a global problem, IUU fishing needs to be understood in a comprehensive perspective. This chapter presents IUU fishing issues with the major focus on the (1) definition of IUU fishing, (2) impacts of IUU fishing (3) scope of IUU fishing (4) driving factors of IUU fishing (5) existing strategies to combat IUU fishing, and (6) illegal fishing in Indonesia and indonesian efforts to deal with illegal fishing problem

2.2 Definition IUU Fishing

IUU Fishing has three components, (1) illegal fishing, (2) unreported fishing, and (3) unregulated fishing. A more thorough definition of IUU Fishing is highly important to

understand the concept of IUU fishing and to adequately address the issue (Miller & Sumaila 2014). Illegal, unreported and unregulated fishing is explained in Box 1.

Box 1. Definition of IUU Fishing

Illegal fishing refers to activities:

a. conducted by national or foreign vessels in waters under the jurisdiction of a State, without the permission of that State, or in contravention of its laws and regulations;
b. conducted by vessels flying the flag of States that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the States are bound, or relevant provisions of the applicable international law; or
c. in violation of national laws or international obligations, including those undertaken by cooperating States to a relevant regional fisheries management organization.

Unreported fishing refers to fishing activities:

a. which have not been reported, or have been misreported, to the relevant national authority, in contravention of national laws and regulations; or
b. undertaken in the area of competence of a relevant regional fisheries management organization which have not been reported or have been misreported, in contravention of the reporting procedures of that organization.

Unregulated fishing refers to fishing activities:

a. in the area of application of a relevant regional fisheries management organization that are conducted by vessels without nationality, or by those flying the flag of a State not party to that organization, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or
b. in areas or for fish stocks in relation to which there are no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law.

Source: Food and Agriculture Organization (2001, p. 2)

The definition above has been accepted widely, especially in international agreement documentation such as the FAO Agreement on Port State Measures (Borit & Olsen 2012). However, each country adopts the definition in different technical terms.

2.3 The Impacts of IUU Fishing

The impacts of IUU fishing on fisheries resources is noticeable in the context of overfishing. Overfishing and depletion of fish stocks is a global problem: it is the concern of fisheries management worldwide (Jackson et al. 2001). Overfishing threatens marine habitat and fisheries resources. The Food and Agriculture Organization (2016) estimated that, in 2013, 69 percent of fish stocks were sustainably managed, while the 31 percent of overfished stocks is a big problem for fisheries as well as having negative consequences for ecologyand social-economy. Clark and Clausen (2008) claim that large predator fish have suffered losses of around 90 percent globally, and this influences the balance of the ocean ecosystem. Moreover, some species are fully exploited and over exploited and their numbers have significantly decreased. Over 44 species have been listed on the IUCN Red List of Threatened Species as vulnerable, endangered and critically endangered and 18 species were classified as overfished with lower risk (IUCN Red List of Threatened Species 2012). Similarly, Srinivasan et al. (2010) point out that swordfish, several types of shark, cod, tuna, and marlin which are important species commodities for fisheries trade, are also classified as moderately overfished. In the last decade, depletion of global fisheries stocks is a serious issue which has a significant impact on the socio-economic aspects of the fishermen.

Illegal fishing has significant impacts on depletion of other living marine resources including straddling fish (fish stocks that migrate through, or occur in, more than one exclusive economic zone) and highly migratory species (Johns 2013). IUU fishing has other detrimental impacts on the marine environment. According to Petrossian (2015), IUU fishers often use destructive methods such as operating trawls, blast fishing, and cyanide. These fishing methods create immense destruction to the marine environment, especially coral reefs and demersal fish (i.e. those living on the sea floor). Liddick (2014) argues that illegal fishing on a large-scale has contributed to coral reef destruction and near extinction of species such as dugongs, sea turtles, and dolphins. Destructive fishing threatens 50 percent of coral reefs in South East Asia. The study also claimed that 70 percent of coral reefs in eastern Indonesia has been

killed by blast fishing and cyanide (Fox & Caldwell 2006). This destruction has significant impacts on the other species which rely on the role of the coral reef as a nursery ground.

IUU fishing also threatens socio-economic aspects of fisheries (Agnew & Barnes 2004). It has two implication for the fishing industry. First, IUU fishing results in a high economic loss. According to the Food and Agriculture Organization (2016), economic losses from IUU fishing are estimated around US$23.5 billion annually or equivalent to 26 million tonnes of fish. This value is equal to 15 percent of total fish production worldwide. Second, IUU fishing also has an adverse impact on the social and prosperity aspect of the coastal area. IUU fishing happens at sea. Ships often do not land at ports. Fisheries business activities such as fish landing and trading do not happened in fishing ports and this impacts on the increasing unemployment rate within fishing, fish processing and related businesses (Liddick 2014). Furthermore, Schmidt (2005) points out that IUU fishing is often associated with poor social conditions, low salary levels, non-standard safety equipment and a low-level of education of the fishermen. As a result, IUU fishing can pose significant risks to fishermen engaging in this activity.

2.4 The Scale of IUU Fishing

The scale of IUU fishing pratices varies between one region and another. It is influenced by various aspects such as governance, law enforcement and fisheries management (Sumaila, et. al. 2008). However, some studies also illustrate the incidence of IUU fishing worldwide. Sumaila et al. (2006) mapped the level of IUU fishing in each region based on the level of IUU incidence reported worldwide by FAO and other media (Figure 2).

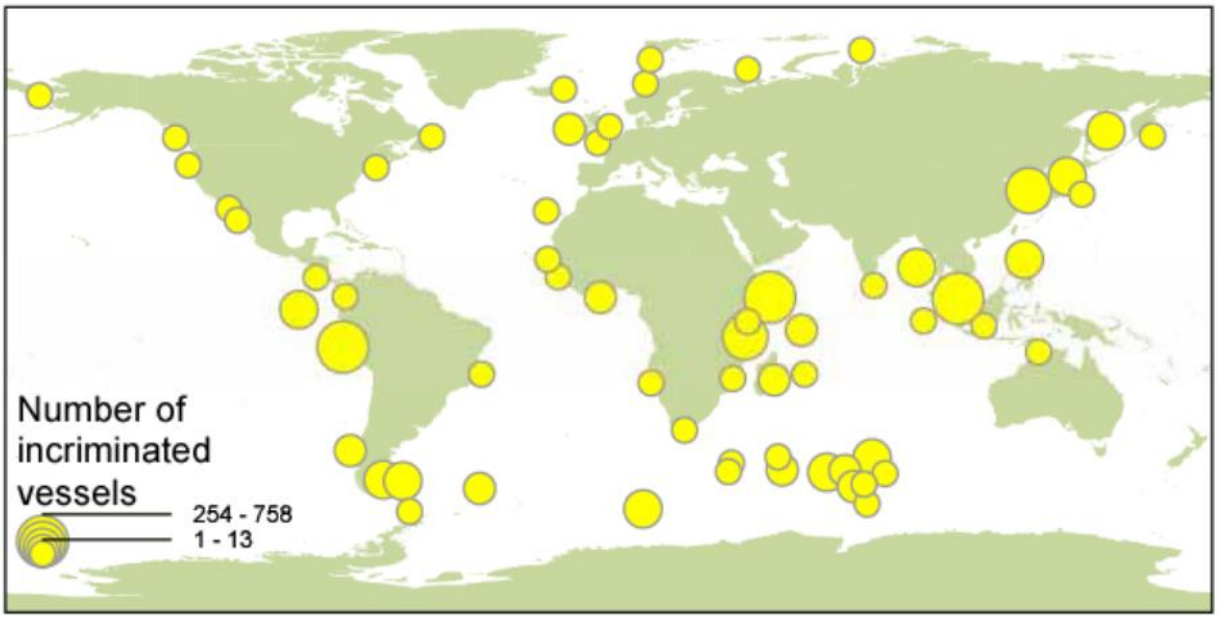


Figure 2. Global illegal fishing incidence between 1980 and 2003
Source: Sumaila, et al. (2006, p. 698)

Figure 2 illustrates that the majority of IUU fishing activities happen in Exclusive Economic Zones. Illegal fishing activities conducted by foreign fishing vessels entering EEZs are the dominant occurrences. This map is for the period 1980 and 2003 confirms that Africa, Southeast Asia, and South America are the regions with the highest incidence of IUU fishing. Indonesian waters are also considered as one of the most vulnerable areas of IUU fishing because many illegal fishing activities happen in this region (Sumaila, et. al. 2006).

2.4.1 The scale of illegal fishing in the Southeast Asian Region

Southeast Asia is one of the strategic regions for global fisheries production. Seventeen percent of global fish production is contributed from fishing industries in six countries namely Indonesia, Vietnam, Myanmar, Thailand, Philippines and Malaysia (Food and Agriculture Organization 2016). The number of fishers in Southeast Asia exceeded 10 million, equivalent to a quarter of global fishers (Williams & Staples 2010). However, Southeast Asia is one of the vulnerable regions with large Exclusive Economic Zones (EEZ) which suffer from IUU fishing (Christensen 2016). According to Williams (2013), there are three regions in Southeast Asia with the highest level of IUU fishing activities. The Eastern Indian Ocean, the Northwest

Pacific, and the Western Central Pacific show a significant percentage of IUU fishing with 32 percent, 33 percent, and 34 percent respectively. These waters are also the main fishing ground for Southeast Asia countries legal commercial fishing enterprises.

2.5 The Driving Factors of IUU Fishing

Defining the driving factors of IUU fishing is essential in understanding IUU fishing as a wicked problem. Driving forces of IUU fishing can be divided into economic, social and institutional factors which each play a role in increasing trends of IUU fishing. The economy is one of the main driving factors. Gallic and Cox (2006) point out that expanding fishing capacity and a high number of subsidies (e.g. fuel subsidies, vessels and fishing gear subsidies) can contribute to increasing IUU fishing. Economic motivation to acquire high economic revenues are followed by excessive fishing fleet capacity to reach distant water and conduct illegal fishing activities in state waters (Schmidt 2005). Fisheries subsidies also play the role of increasing IUU fishing because fisheries subsidies which contribute to the maintenance, the development or the transfer of fishing capacities, are likely to artificially reduce the cost of IUU. Subsidies of US$16 billion or equivalent to 60 percent of global fisheries subsidies, aim to enhance fishing capacity (Sumaila & Pauly 2006) and increase fishing productivity and industrial development (Beddington, Agnew & Clark 2016). Therefore, it directly impacts on increasing fishing pressure and drives IUU fishing in many regions.

The social aspect is also becoming a driving force of IUU fishing including poverty issues and unemployment which have a contribution to increasing IUU fishing. In many cases, fishermen fish illegally due to their poverty, and in this context fines and penalties are not effective ways to reduce the number of people IUU fishing (Schmidt 2005). For instance, illegal fishing in Australian waters in the early 1990s by Indonesian fishermen was triggered by poverty issues. Fishermen who fish illegally in Australian waters were from poor families (Agnew & Barnes 2004). In this context, poverty issues and poor conditions in coastal areas motivate fishermen to fish illegally and this is commonly happening in the developing world.

Thomas et al. (2016) argue that social norms, such as local wisdom and other cultural local values, can influence the level of compliance because these beliefs have a great influence on individual attitudes. Social norms have a direct relationship with individual perspectives and environmental behaviour. In the other words, social norms can force individuals to comply with regulations including preventing illegal fishing activities. In contrast, social and cultural values can also drive illegal fishing especially if social norms are highly tolerant of illegal fishing activities. In this situation, social and cultural norms cannot force local fishermen to comply with regulations. Daliri et al. (2016) demonstrate how social norms play a vital role in driving illegal fishing in the Persian Gulf and at the same time describe the use of social and cultural dimensions to eliminate illegal fishing.

Lack of Institutional capacity and governance also drives illegal fishing activities worldwide. There are two significant issues in this context. First, there are many regulations both at the international or regional level which unwittingly have created opportunities for IUU fishing practice because they do not provide a clear mechanism and neglect to consider that each country has different conditions regarding the capacity to monitor and implement the regulations. For instance, the freedom of high seas under the United Nations Convention on the Law of the Sea (UNCLOS) created free navigation for all vessels which enables illegal fishing vessels to undertake illegal activities on the high seas (Baird 2006). At the same time, flag states do not have a strong capacity to control the activities of their fishing vessels. Similarly, the 'flag of convenience' in some countries such as Belize, Panama, St. Vincent and the Grenadines, Seychelles, etc. (Gallic & Cox 2006) also play a major role in development of IUU fishing worldwide (Miller & Sumaila 2014). The flag of convenience facilitates illegal fishing vessels to avoid detection and penalties from wrongdoing. Second, the commitment of coastal and flag states (i.e. states in which vessels are registered) to combating IUU fishing varies between each country and triggers massive IUU fishing. The inability to conduct monitoring and law enforcement effectively causes illegal fishing throughout the world (Lindley & Techera 2017). In this context, Dirhamsyah (2006) also highlights that law enforcement is one of the

biggest challenges for Indonesia to deal with in regard to many maritime crimes including illegal fishing.

2.6 International and Regional Efforts to combat IUU Fishing

As a global problem, IUU fishing is the concern of many countries and international bodies. A wide range of frameworks and initiatives have been created as a part of the efforts to combat IUU Fishing. With regard to legal aspects, many regulations have been created in the international and regional context as a part of the efforts to combat IUU fishing. For instance, the *International Plan of Action on Combating Illegal, Unreported, Unregulated Fishing 2001* defines the criteria of IUU and explains the responsibility of each country (Food and Agriculture Organization 2001). Another example is the *International Plan of Action on Port State Measures to combat Illegal, Unreported, Unregulated Fishing 2009* which focuses on the port state management in detecting, preventing and dealing with distribution of IUU catch in fisheries ports (Food and Agriculture Organization 2009). In the context of IUU fishing in the high seas, many Regional Fisheries Management Organizations (RFMOs) have been established to conduct responsible fishing activities. For instance, Ásmundsson (2016) points out that there are five RFMOs (See Figure 3) managing tuna and tuna-like species including:

- The Commission for the Conservation of Southern Bluefin Tuna (CCSBT);
- The Indian Ocean Tuna Commission (IOTC);
- The International Commission for the Conservation of Atlantic Tuna (ICCAT);
- The Inter-American Tropical Tuna Commission (IATTC);
- The Western and Central Pacific Fisheries Commission (WCPFC)

As regional fisheries bodies, RFMOs play a significant role combating IUU fishing on high seas through responsible conservation and management measures. RFMOs have an authority in deciding on a total allowable catch, authorizing fishing vessels operated in high seas, creating fishing regulations and international standards for fishing vessels and fishing gear and also giving sanction for country members (Aranda, Murua & de Bruyn 2012). All these instruments present a serious effort on combating IUU fishing in the world

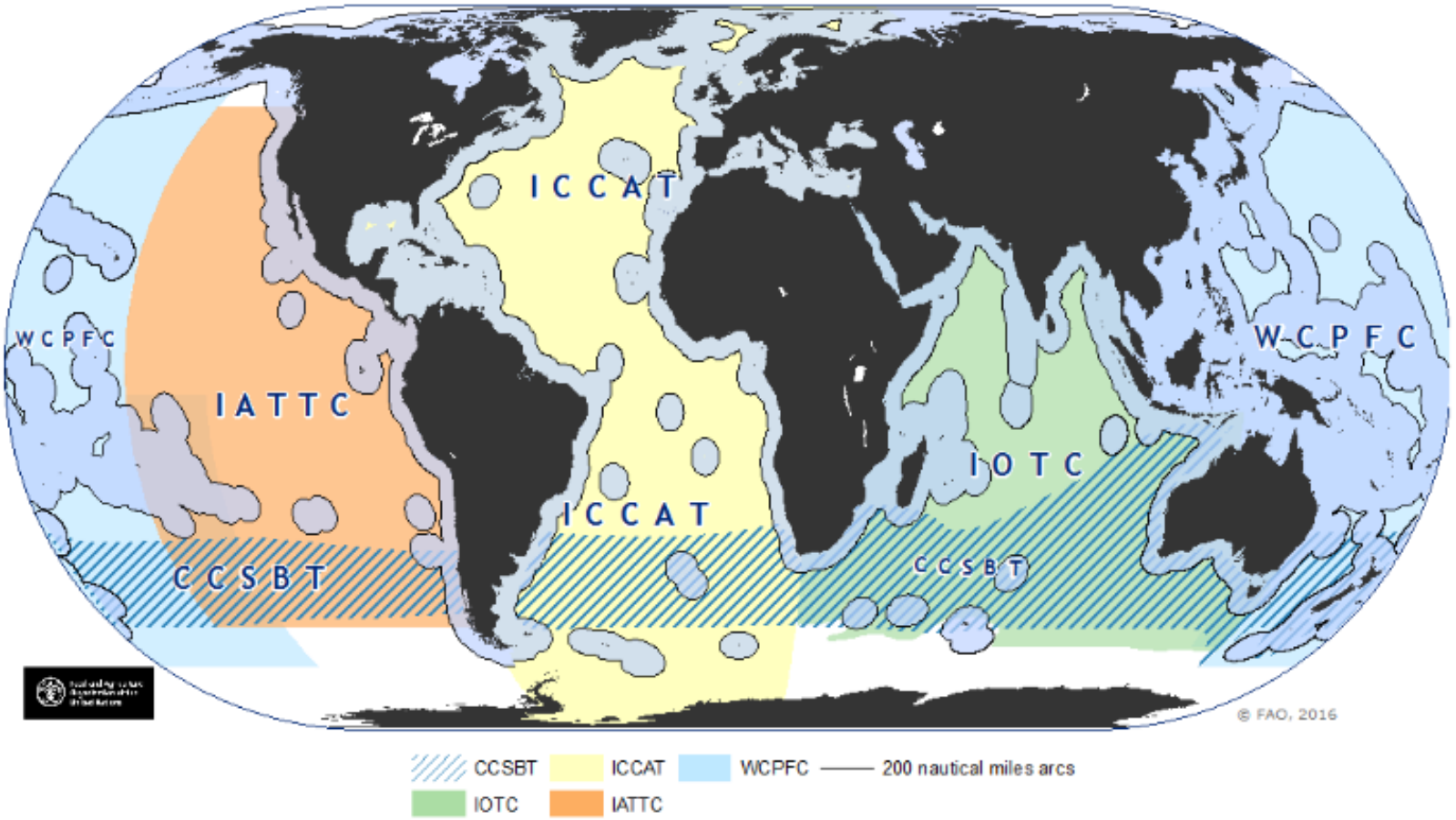


Figure 3. Regional Fisheries Management Organization (RFMO) convention area for Tuna and Tuna-Like Species
Source: Ásmundsson (2016)

In the context of combating IUU fishing, the Food and Agriculture Organization (2002b) emphasizes that any combating IUU fishing framework should involve flag nation-state/country (i.e. state or country in which vessels registered), coastal states (i.e. all nation-states/country that have ocean coasts) and port states (state/country which inspect fishing vessels which come to their ports). There are some key actions which need to be conducted including:

- Nation-states where vessels are registered should:
    - conduct fishing vessels registration by considering the capacity of flag states to control their fishing vessels before giving them a licence;
    - avoid registering fishing vessels which have a history of IUU fishing;
    - record fishing vessel data;
    - authorize fishing with strict control on fishing gear used, species caught and fishing ground and season.
- Nation-states with a coastal line should:
    - verify foreign vessels permitted in coastal states;
    - keep records of foreign fishing vessels authorized to fish in its waters;
    - obligate foreign fishing vessels to install Vessel Monitoring System (VMS);
    - require fishing vessels to be monitored by on board observers.
- Regulators at ports in port states should:
    - deny illegal fishing access to ports except in emergency conditions;
    - refuse illegal fishing vessels landing or transhipping the catch;
    - require illegal fishing vessels to provide information about identity and fishing activities when illegal fishing vessels request access to port;
    - inspect illegal fishing vessels in ports.

At the regional level, considerable initiatives have been created to combat IUU fishing. RPOAIUU (2007) points out that the *"Regional Plan of Action (RPOA) to Promote Responsible Fishing Practices including Combating Illegal, Unreported and Unregulated Fishing (RPPOA*

IUU) is the most significant initiative supported by 11 countries including Australia, Brunei Darussalam, Cambodia, Indonesia, Malaysia, Papua New Guinea, Philippines, Singapore, Thailand, Timor-Leste and Vietnam; and four regional fisheries bodies including FAO/Asia-Pacific Fishery Commission (APFIC), Southeast Asian Fisheries Development Centre (SEAFDEC), InfoFish and Worldfish Center. According to Pomeroy et al. (2016) RPOA-IUU provides share-learning, capacity building (training, workshops), scientific and technical advice and discussion among country members to deal with irresponsible fishing practices at the regional level. RPOA-IUU also provides a clear mechanism on preventing IUU fishing vessels coming to countries' ports. RPOA also offers a comprehensive platform in which the members can cooperate closely. Johns (2013) claims that RPOA-IUU has achieved great success on combating illegal fishing. For example, RPOA countries deny illegal fishing vessels to access port and land the catch which limits the movement of illegal fishing vessels in Australia and the South East Asian region.

2.6.1 Monitoring, Controlling and Surveillance (MCS) Measures

The concept of Monitoring, Controlling and Surveillance (MCS) was introduced by the Food Agriculture Organization (FAO) at the Monitoring, Controlling and Surveillance (MCS) Conference in 1981 to standardize the fisheries management framework in order to achieve sustainable fisheries exploitation (Flewwelling 2003). A technical definition of Monitoring, Controlling and Surveillance (MCS) can be seen in Box 2.

Box 2. Technical defenition of MCS

- **Monitoring** involves collecting, measuring and analysis of fishing activities but not limited to catch, species composition, fishing efforts, bycatch, discards, and fishing area of vessels operations, etc. This information is primary data that fisheries managers use to arrive at management decisions. If this information is unavailable, inaccurate or incomplete, managers will be handicapped in developing and implementing management measures.
- **Control** involves the specification of the terms and conditions under which resources can be harvested. These specifications are normally contained in national fisheries legislation and other arrangements that might be nationally, sub-regionally, or regionally agreed. The legislation provides the basis for which fisheries management arrangements, via MCS, are implemented. For maximum effect, framework legislation should clearly state the management measures being implemented and define the requirements and prohibitions that will be enforced.
- **Surveillance** involves the regulation and supervision of fishing activity to ensure that national legislation and terms, conditions of access, and management measures are observed. This activity is critical to ensure that resources are not over exploited, poaching is minimized and management arrangements are implemented.

Source: Flewwelling (2003, p. 7)

Strengthening MCS is one of the approaches to eliminate illegal fishing activities. According to the Food and Agriculture Organization (1994) MCS has four components which play significant roles in combating illegal fishing including:

1) Before fishing

In this step, MCS requires preventive mechanisms to anticipate IUU fishing including:

- Inspection of vessels and fishing gear to ensure that fishing vessels follow the regulations;
- Illegal fishing gear can be detected before operation;
- Collecting fisheries statistical data;
- Pre-fishing interaction with fishers seeking feedback from fishers.

2) While fishing

MCS has several instruments which can be used to control fishing vessels whilst at sea through inspections or satellite monitoring. Some of the ‘at sea’ instruments of MCS include:

- Inspection of logbooks to acquire information of catch, effort, location, , and gear during fishing vessels operating at sea;
- Use of government patrol vessels, patrol aircraft fisheries inspectors, Navy and Coastguard;
- Observer programs that collect information on fishing activities including setting of fishing gear, catch and compliance of fishing gear while fishing;
- Vessel Monitoring System (VMS) offering real-time position, direction and operations of fishing vessels at sea.

3) During landing

- , Checking of catch and related documentation of fishing vessels such as logbooks. Inspection of weight and size of landing catch. Landing inspection is one of the vital steps in MCS because it represents output control of MCS fishing vessels.

4) Post landing

- Post landing inspection is a crucial step to ensure traceability of fisheries product. MCS requires inspection of fish markets, transport providers and sales. Besides collecting information of biological and economic value of catch, post landing inspections are also vital to detect the possibility of illegal catch in fish markets.

The core of MCS outlined above clearly describes mechanisms of monitoring, controlling and surveillance of fishing vessels activities either legal or illegal. These mechanisms are expected to limit the movement of illegal fishing vessels and reduce the scale of illegal fishing worldwide. MCS also creates international pressure on countries associated with illegal fishing activities. For instance, the European Union (EU) has put pressure on countries exporting fish products to strengthen their MCS regulations. The EU has introduced a warning and penalty system

that controls countries' export capability. Countries that do not comply with the EU conditions are banned from exporting their products. In this instance, several countries have been warned by the EU including Thailand, South Korea, the Philippines (European Union 2015) and Vietnam (European Union 2017) to take necessary action to reduce illegal fishing by their fishing vessels.

2.6.2 Community participation in combating illegal fishing

Community participation is considered as an adaptive approach in natural resources management. Stakeholder participation has two vital perspectives regarding increasing legitimacy and acceptance of decision by the public (Conroy 2013) and also helping to deal with limitations such as cost and human resources in natural resources management (Herminia & Valerio 2009). In the context of combating illegal fishing, the MCS framework also encourages the public from participating in the combating of illegal fishing through participatory fisheries management. According to the Food and Agriculture Organization (1994) the MCS framework is designed as a transparent and open system which the public can be involved in each part of the MCS, including giving constructive feedback to fisheries agencies on designing fisheries regulations and also collecting fisheries data. There are some benefits of public participation in MCS including:

1) better public understanding of the rationale behind MCS activities;
2) greater partnership among fisheries stakeholders including government, fishers, traders, etc. to conduct responsible fishing and combat illegal fishing;
3) greater acceptance and sense of belonging on decision making have been made;
4) increasing voluntary compliance of fishers and peer pressure to eliminate fisheries violations;
5) greater availability of MCS funding because private companies and individuals have strong commitments to be involved in combating illegal fishing.

A public participation approach can be one of the key successes in combating illegal fishing. Some countries have involved local communities in combating illegal fishing and fishing violations in their waters. Osterblom et al. (2015) illustrate that the success of reducing the illegal fishing level in the Southern Ocean, managed by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), is strongly influenced by increasing awareness of non-state actors (e.g. fishing companies, fishers and Non-Government Organizations) about illegal fishing scale in CCAMLR. Fishers, fisheries companies and NGOs are actively involved in protecting sea birds and fish stocks and reporting illegal fishing activities in the Southern Ocean. This is a clear example of how public participation plays a significant role in combating illegal fishing.

2.6.3 The concept of collecting information

Community participation to provide information can be divided into several types of activities including survey, surveillance, monitoring and recording. These activities are often conducted by the community to collect and manage information. However, there is a significant difference between the four types of observation. According to Alexander (2008), each activity has a specific definition as shown in Box 3.

Box 3. Definition and type of visual observation

- *Survey*: Making a single observation to measure and record something.
- Surveillance: Making repeated standardized surveys in order that change can be detected. This is quite different to, but often confused with, monitoring. Surveillance lacks the 'formulated standards' that are so important in monitoring. Surveillance is used to detect change but does not differentiate between acceptable and unacceptable change.
- *Monitoring*: Surveillance undertaken to ensure that formulated standards are being maintained. Monitoring should be an essential and integral component of management planning: there can be no planning without monitoring and no monitoring without planning. Monitoring projects should not be unnecessarily complicated. A decision must be made about how accurate a monitoring project

needs to be. There should be a direct relationship between the accuracy of the conditions that management can deliver and the level of accuracy that a monitoring project is designed to measure. The development of any monitoring strategy should be based on the availability of resources and on a risk assessment. We need to understand what we can afford to do; which features are the most vulnerable (i.e. most likely to change) and which need remedial management (i.e. those which should change).

- Recording: Making a permanent and accessible record of significant activities (including management), events and anything else that has relevance to the site. Recording management activities must be given the highest priority: if something is worth doing it must be worth recording. Recording is an expensive activity and it must be planned with exactly the same rigor as all other aspects of reserve management. Information and records are only as good as they are accessible. Good data management is essential, but this can be quite a challenge, especially on large sites or when there is a need to share information over several sites.

Source: Alexander (2008, p. 49)

Data collection procedures (e.g. monitoring activities) as a core of an adaptive management have been developed through various approaches. This is not as a simple as only collecting data by involving the local community. Monitoring is considered as a vital step in natural resources management which can influence the whole process and the result (Aceves-bueno et al. 2015). It means that the procedures and methods to collect data are highly significant in ensuring the quality of monitoring reports. However, major sources of monitoring data and information can help the government deal with limitations in data collection. According to Sugiyama (2005), government institutions have some limitations on collecting fisheries data and information because (1) they have a limited budget to collect data, (2) ther is a limited number of government staff, (3) there is limited training on data collection and (4) other duties of government staff. Therefore, adaptive management encourages community participation in monitoring activities.

2.7 Illegal fishing in Indonesia

Indonesia has adopted the definition of IUU fishing from the FAO in its national legal framework, *National Plan of Action to Combat Illegal Fishing* formalised by Ministerial Regulation 50 year 2012. According to the Ministry of Marine Affairs and Fisheries (2012), the Indonesian legal frameworks classify IUU fishing activities into activities as described by Box 4:

Box 4. Type of IUU Fishing Activities in Indonesian Legal frameworks

Illegal refers to activities such as:

a. operating a fishing vessel without licenses;
b. operating carrier fishing vessel without licenses;
c. fishing operations taking a place in unapproved fishing area;
d. using dangerous goods and operating with or using prohibited fishing gear;
e. manipulating fishing licenses;
f. Manipulating supporting license documents including the size of vessel, registration, and the ownership;
g. reporting incorrect detail in the supporting document for license of vessels such as incorrect name, size, type of engine, size of engine;
h. reporting incorrect detail in the supporting document for license of vessels type, size, and number of fishing gear and auxiliary gear;
i. sailing without Port Clearance Letter;
j. operating fishing vessel or carrier vessel without Vessel Monitoring System (VMS).
k. conducting illegal transshipment at sea;
l. transporting the catch to other countries without notification to port base;
m. operating fishing/carrier vessel in the jurisdiction of other countries without permission from the countries and Indonesia.

Unreported refers to fishing activities:

a. transshipping catch at sea without record the catch
b. failing to report catch to avoid the tax;
c. landing at fishing port without reporting to Port Authorities.

Unregulated refers to fishing activities such as sports fishing.

Source: Ministry of Marine Affairs and Fisheries (2012)

Illegal fishing in Indonesia results in many serious environmental, economic and social impacts. From an ecological perspective, illegal fishing reduces fish stocks, encourages overfishing and decreases the quality of the marine environment. According to Sunyowati (2014) illegal fishing has destroyed spawning and nursery grounds for fish and reduced Indonesian fish stocks because of inappropriate fishing methods. Illegal fishermen operate trawl nets, known to be destructive of the marine environment. The most affected places are the Natuna, Arafura and Sulawesi Seas (Sodik 2009). These areas are highly vulnerable to illegal fishing activities.

Socio-economic impacts of illegal fishing are debilitating. The average economic cost to Indonesia emanating from illegal fishing activity is estimated to be US$4 billion annually (Sodik 2009) and the number is predicted to increase up to U$20 billion or 25 percent of Indonesia's total Maximum Sustainable Yield of fish in 2012 (Jaelani & Basuki 2014). Economic losses include taxes, subsidies, and fish processing (Sunyowati 2014).

Illegal fishing in Indonesian waters triggers local conflicts in coastal areas because of the exacerbated competition to find fishing grounds. Decreased fish stocks as a result of Illegal fishing increases unemployment rates in the fisheries industries. Many fisheries companies have to reduce crews and employees (Sunyowati 2014).

Indonesia's large EEZ creates a challenge for managing IUU. Indonesia has 17, 508 islands (National Agency on Survey and Mapping 2009) and 200 square nautical miles of Exclusive Economic Zones (Thamrin 2015). The Exclusive Economic Zones are monitored by Indonesian patrol vessels either from the Ministry of Marine Affairs and Fisheries or other institutions including the navy, coastguard, and water police.

Moreover, Indonesia is challenged in responding to IUU because of lack of human resources, limited technological capacity and lack of surveillance facilities. Indonesia does not have coastal Radio Detection and Ranging (RADAR) to monitor water areas. According to the

Ministry of Marine Affairs and Fisheries (2015a), Indonesia only had 495 fisheries investigators, 354 patrol vessel crews, 765 Fisheries Inspectors supported by 31 patrol vessels and 104 small boats (i.e. length overall 12 metres). These numbers are too few to conduct surveillance for all Indonesian coasts and seas. For these reasons Indonesia relies on participation of local communities to assist in combating illegal fishing. POKMASWAS was an initiative to engage local communities to participate in surveillance of illegal fishing. POKMASWAS is a voluntary group which supports the government by conducting fishing surveillance activities such as patrolling, monitoring fishing sites and reporting illegal fishing activities.

One of the central objectives of this thesis is to describe Illegal fishing trends in Indonesia and the Natuna Sea, and to explain the role of community-based surveillance in combating Illegal fishing in Indonesia. Both are discussed below.

2.7.1 Illegal fishing trends in Indonesia

The large number of illegal fishing vessels arrested by the Indonesian government indicated that many illegal fishing vessels operated in Indonesian waters. Table 1 presents illegal fishing trends in Indonesia, as defined by arrested at sea. Illegal fishing in Indonesia is conducted by both foreign fishers and also Indonesian fishers (Sodik 2009). According to the Ministry of Marine Affairs and Fisheries (2017a), 938 illegal fishing vessels were arrested between 2010 and 2017 consisting of 264 Indonesian fishing vessels and 674 foreign fishing vessels. Foreign IUU effort is therefore greater. More public attention is paid to foreign illegal fishermen because illegal fishing by foreign fishermen not only impacts on ecology, social and economy but also on the state's sovereignty (Hamzah 2015). Combating foreign illegal fishing represents the State's efforts to enforce sovereignty. IUU fishing by Indonesian fishers includes manipulating fishing licenses, operating prohibited and destructive fishing gear, blast fishing and use of cyanide (Ministry of Marine Affairs and Fisheries 2012).

Table 1 Illegal fishing arrests based on countries of origin

No	Country by origin	Year (Unit)								Total
		2010	2011	2012	2013	2014	2015	2016	2017	
1.	Indonesia	24	30	42	24	27	42	23	52	264
2.	Malaysia	22	11	5	14		5	26	19	102
3.	Vietnam	115	42	40	17	9	36	83	90	432
4.	Thailand	7	3	8	4	7	6	1		36
5.	China	7						1		8
6.	Hong Kong		1							1
7.	Taiwan		6							6
8.	Philippines	8	13	17	9		6	29	6	88
9.	East Timor								1	1
	Total	183	106	112	68	43	95	163	168	938

Sources: Ministry of Marine Affairs and Fisheries (2017a)

Table 1 shows that Vietnam, Malaysia and Thailand are the most dominant illegal fishers in Indonesian waters. The number of illegal fishing vessels arrested dropped by 40 percent from 183 boats in 2010 to 68 boats in 2013. The number of illegal fishing vessels arrested decreased between 2010 and 2014 because the number of operational days for patrol vessels was reduced - to save money from the budget of the Directorate of Patrol Vessels (Ministry of Marine Affairs and Fisheries 2015b) . From 2015 to 2016, there was a considerable increase in the number of illegal fishing vessels arrested from 95 boats to 168 boats. The latest update, in 2017, shows that the number of illegal fishing vessels until October 2017 exceeded 163 boats. The number of illegal fishing vessels arrested indicates that illegal fishing activities in Indonesian waters remains high. Kristian Erdianto (2017) also estimates that illegal fishing trends in Indonesian waters will increase as the impacts of declining fish stocks around

Indonesia increase along with a growing fish demand, and many illegal fishermen from foreign countries are predicted to come to Indonesian waters.

Data about numbers of foreign illegal fishing vessels arrested from 2013-2017 from the Ministry of Marine Affairs and Fisheries shows unstable trends in illegal fishing. According to the Ministry of Marine Affairs and Fisheries (2017c) the number of foreign illegal fishing vessels arrested significantly decreased from 2010 to 2014, however it gradually increased between 2014 and 2017 (see Figure 4).

Figure 4. Illegal foreign fishing vessels arrested in Indonesia from 2013 to 2017
Source: Ministry of Marine Affairs and Fisheries (2017c)

Figure 4 shows the number of illegal fishing vessels arrested from 2010-2017. Overall, decreasing trends happened between 2010 and 2014, while the number of illegal fishing vessels arrested gradually increased in the last four years. There was a significant increase of illegal fishing vessels arrested from 16 boats in 2014 to 140 boats in 2016, while the number slightly declined in 2017. The majority of illegal fishermen were arrested in Indonesian

Exclusive Economic Zones (EEZ) between 2014 and 2017 (Ministry of Marine Affairs and Fisheries 2017a). Considering the government report above, respondents claim that the illegal fishing trend in Indonesia remains high or moderately increased between 2014 and 2017. The Natuna Sea, the Arafura Sea, and North of Sulawesi Sea are the most vulnerable seas due to the large number of foreign fishing vessels identified in these places (Sodik 2009). The number of foreign illegal fishing vessels arrested may not describe clearly illegal fishing trends in Indonesia. It is highly likely that the operating in Indonesian waters is much greater than the number arrested. From this perspective, there is no doubt that illegal fishing trends in Indonesia remain high.

However, illegal fishing trend is understood differently among Indonesian people due to the influence of media. Media plays a significant role in public perception about IUU fishing in Indonesia especially in shaping public opinion (Wibowo 2016). News about the success in combating illegal fishing programs by government was fully explored in media either newspapers, television or online media. For instance: several reputable and national press reported illegal fishing in headlines including:

Sindonews.com is one of the national publications under Multimedia Nusantara Citra (MNC). MNC is one the big media companies in Indonesia which also has several TV channels. Sindonews.com had up to five million daily visitors in 2017 (Rizky 2017). This media also has concerns about illegal fishing issues. Sindonews.com published an article with a bombastic headline on 8th April 2017: "*Indonesian efforts in combating illegal fishing become role model in many countries*" which explained that countries such as China and Thailand have followed Indonesian policy to combat illegal fishing by establishing an illegal fishing task force (Fajriah 2017).

Detik.com is one of the most popular national online media in Indonesia based on ratings from Alexa.com (one of the ranking website agencies). Detik.com is an online media under the CT Corporation which had around 53 million readers in 2017 (Detik 2018). This media also

actively informed the public about illegal fishing issues. For instance, Detik.com reported in 22nd November 2016 that Indonesian Fisheries Gross Domestic Product (GDP) grew 40 percent in 2016 which it was claimed was the result of the success of the Indonesian government in combating illegal fishing (Medistiara 2016).

Kompas is a national media outlet which was first published in 1965. Kompas publishes newspapers and also online media. According to International Media and Newspapers (2016) Kompas was the only media from Indonesia which was considered in the Top 200 Newspapers in the World in 2016. This shows that Kompas is highly reputable media. Kompas also published several articles on the issue of illegal fishing. Kompas wrote a news article on 17th June 2017 which noted that the success of the Indonesian government in combating illegal fishing had a positive impact on increasing Maximum Sustainable Yield (MSY) from 7.3 million ton/year in 2015 to 12.54 million ton/year in 2017 (Azizah 2017).

The media has not clearly stated that there is a decreasing trend of illegal fishing in Indonesian waters. However, the content of the news concerning illegal fishing (e.g. the success of the government in combating illegal fishing) has influenced readers and public perception about illegal fishing. All the positive achievements likely confirmed that the problem of illegal fishing has been solved by governments. As a result, the public simply concludes that illegal fishing in Indonesia decreased from the previous period.

Moreover, there is a scientific publication which also discussed the decreasing trend of illegal fishing vessels operating in Indonesian waters. Cabral et al. (2018) also claimed that fishing hours of foreign boats (i.e. China, Thailand, Taiwan and South Korea) in Indonesian waters significantly decreased by over 90 percent between 2013 and 2017 based on analysis of Automatic Identification System (AIS) data from anti-collision signals processed through Global Fishing Watch. However, it did not analyse illegal foreign fishing vessels from Vietnam and the Philippines many of which were arrested in Indonesian waters between 2014 and 2017 (Ministry of Marine Affairs and Fisheries 2017a). Another limitation of the analysis is the

use of AIS to detect illegal fishing vessels, as illegal fishing vessels usually do not install AIS. From this perspective, it is clear that the argument concerning decreasing trends of illegal fishing also has limitations.

This is the challenge of this study in explaining illegal fishing trends in Indonesia. Perception of illegal fishing trends may be different because this is strongly influenced by many sources, either statistical data from governments, news from media or other publications.

2.7.2 Indonesian Efforts to Combat IUU Fishing

Indonesia has taken serious action on combating illegal fishing. The following section discusses three aspects of Indonesian efforts to prevent, deter and eliminate IUU fishing through fisheries management reforms, strong law enforcement and developing community-based surveillance. These points will be elaborated on below.

2.7.2.1 Fisheries Management Reforms

Due to the considerable illegal fishing activities in Indonesian waters there were problems with fisheries management. Fisheries management reforms were conducted through improving the Indonesian legal framework and implementing an international instrument such as Monitoring, Controlling and Surveillance. These points will are explained below.

2.7.2.1.1 Legal Framework

Legal frameworks play an important role as an instrument in combating illegal fishing. Lindley and Techera (2017) point out that global and national legal frameworks should cover four significant issues to combat IUU fishing including fishing, shipping, maritime security and labour issues. Many international regulations and agreements can be referenced by coastal states and flag states. Sodik (2009) emphasizes that Indonesian legal frameworks should comply with international regulations to enhance the effectiveness in combating illegal fishing in Indonesian waters. Since 2012, the Indonesian government has reformed legal frameworks related to marine and fisheries management in the country. The Indonesian legal framework

was revised to comply with international regulations. Some international agreements have been adopted into Indonesian legal frameworks including the Vessel Monitoring System, Bycatch Management, Fisheries Management Area and Fishing Gears, Observer Programs, Log Books, IPOA IUU Fishing, Port State Measures and other regulations (Ministry of Marine Affairs and Fisheries 2017b). This shows the Indonesian commitment to comply with international rule and combat illegal fishing.

2.1.7.1.2 Implementation of MCS in Indonesia

Fisheries management reforms in Indonesia are also conducted by optimizing the implementation of Monitoring Controlling and Surveillance (MCS) through an MCS governance system. According to Dirhamsyah (2005), institutional issues such as coordination among agencies, power sharing and corruption are the classic problem for fisheries management in Indonesia. Management reforms are aimed at improving the role of each marine and fisheries agency on monitoring, controlling and surveillance activities including instruments used in MCS (see Fig 5).

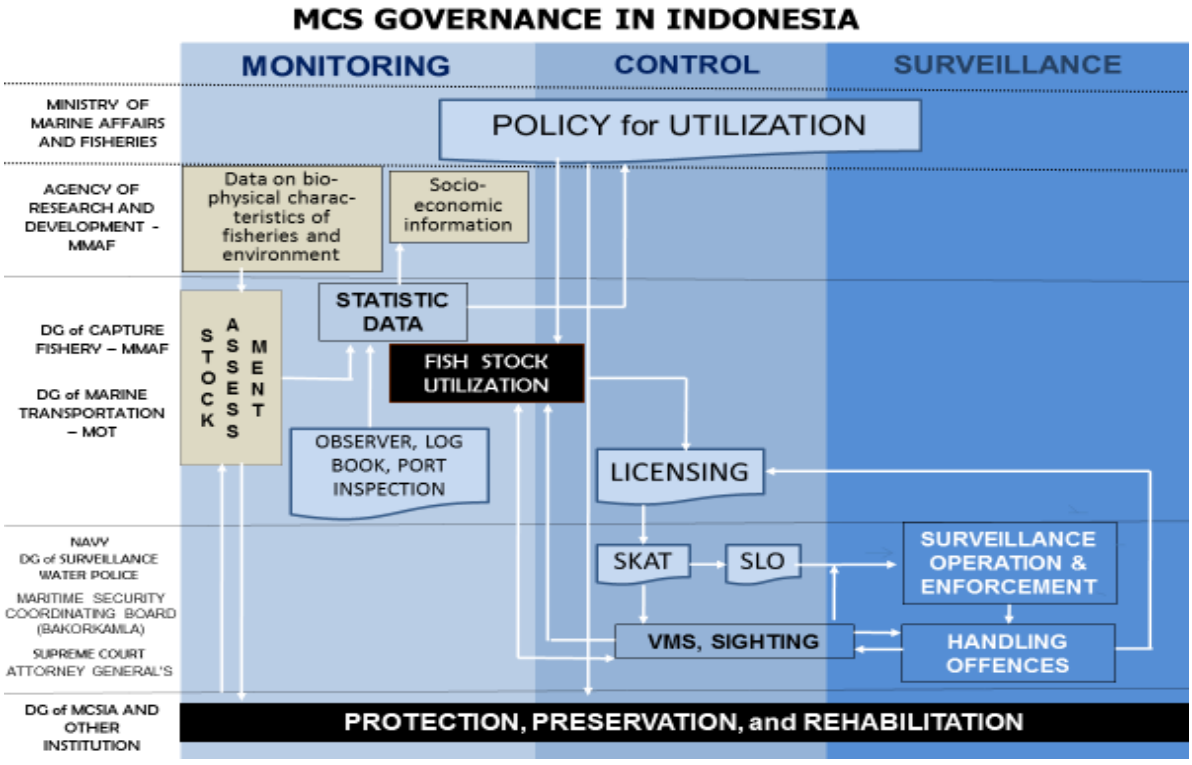


Figure 5. MCS Governance in Indonesia
Source: Ministry of Marine Affairs and Fisheries (2012, p. 13)

Figure 5 explains each function of the agencies in Monitoring, Controlling and Surveillance in Indonesia.

- Monitoring is conducted by several agencies including Research and Development agencies which collect bio-physical data of fisheries and marine environments and also socio-economic data. Bio-physical data is used by the Directorate Capture Fisheries to assess fish stock. In the process of monitoring, fisheries statistical data is also produced considering each socio economic parameter, data from observers, log books and landing catch. Fish stocks become important in consideration of fish utilisation.
- Controlling is conducted by the Directorate General of Capture Fisheries and the Ministry of Transportation through control of the licence system and management of the fish stocks. Legal Operational Letter (SLO) and VMS Activation (SKAT) which are issued by the Directorate General Marine and Fisheries Surveillance are also used as an instrument to control fishing vessels and they cannot go to sea without those documents (licence, SLO and SKAT).
- Surveillance is conducted by five institutions including the Directorate General Marine and Fisheries Resources Surveillance, Navy, Water Police, Attorney and Coast Guard. Law enforcement is conducted for fishing vessels which break the fisheries regulations (Ministry of Marine Affairs and Fisheries 2012).

2.1.7.2 Law Enforcement- surveillance and compliance

There are several strategies developed by Indonesia to combat IUU fishing supported by national law. Thamrin (2015) explained that Indonesia conducts strong law enforcement to combat illegal fishing in Indonesian waters including patrolling and inspecting local and foreign fishing vessels, and arresting illegal fishing vessels. The illegal fishing Task Forces were established in 2015 as part of the commitment to combating illegal fishing. There are five institutions which are members of the task force including the Ministry of Marine Affairs and Fisheries, Navy, Police, Attorney, and Coast Guard (Ministry of State Secretary 2015). This

task force is expected to overcome overlapping authority among law enforcement agencies and strengthen institutional capacity on combating illegal fishing.

Moreover, the Indonesian government also acts firmly on illegal foreign fishing vessels by sinking the vessels (Hamzah 2015). The sinking illegal fishing vessel policy is mandated by the 2009 Fisheries Act 45 in article 69 verse 4 which allows illegal fishing vessels to be sunk based on Indonesian regulations (Ministry of Marine Affairs and Fisheries 2009). This policy is aimed as a deterrent to illegal foreign fishermen. According to the Ministry of Marine Affairs and Fisheries (2017d), 317 illegal fishing vessel were sunk between 2014 and 2017 (Figure 6).

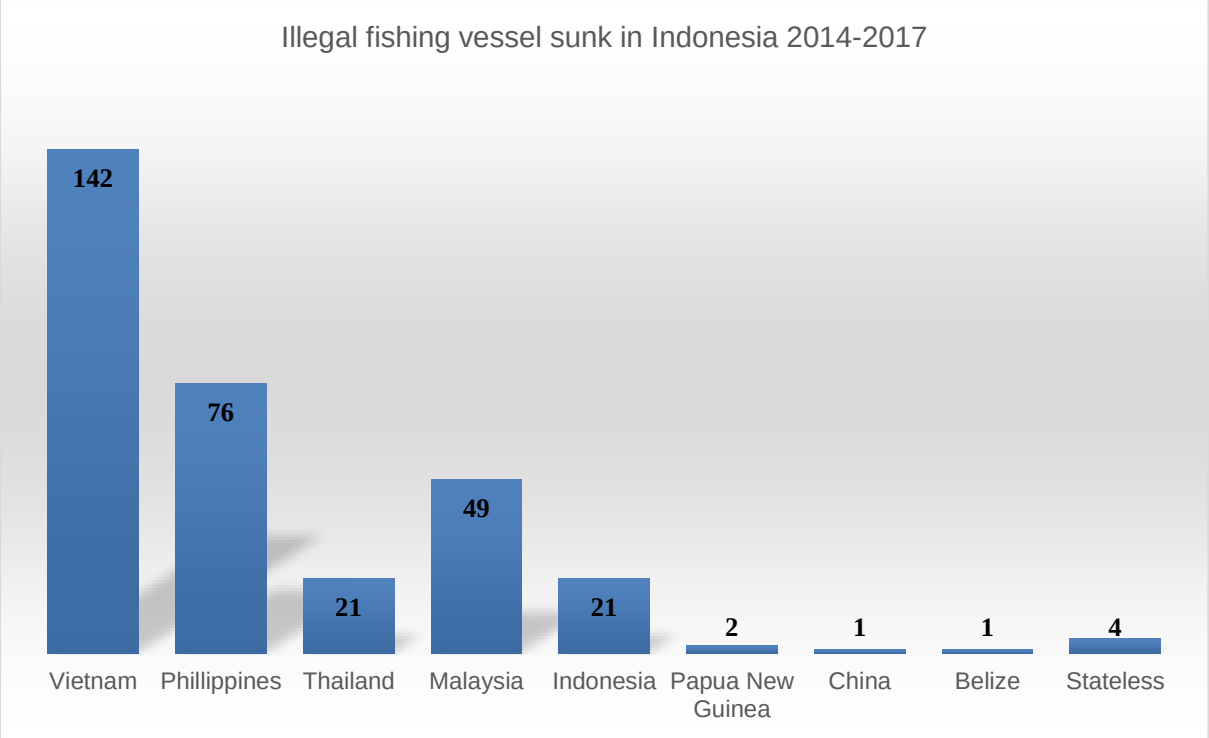


Figure 6. Number of Illegal Fishing Vessels (by country of origin) Sunk in Indonesia
Source:Ministry of Marine Affairs and Fisheries (2017d, p. 1)

Nearly half of the total illegal fishing vessels sunk during the period were Vietnamese fishing vessels with 142 boats. The number of Illegal fishing vessels sunk from the Philippines, Malaysia and Thailand were 76, 21, and 49 boats respectively, while 21 local illegal fishing

boats were sunk. Other illegal fishing vessels sunk were from Papua New Guinea, China, Belize and Stateless (unregistered vessels in any states). Sinking illegal fishing vessels is a strong law enforcement policy by the Indonesian government as a part of the way to reduce the number of illegal fishing activities in Indonesian waters.

2.8 Community-Based Surveillance (POKMASWAS)

As well as fisheries management reforms and strong law enforcement, the Indonesian government has also developed participative surveillance involving the local community through community-based surveillance. POKMASWAS is one form of community participation in natural resources management, in this case for combating illegal fishing, POKMASWAS is considered to be one of the best approaches to combating illegal fishing, particularly because the governments have limited fisheries officers, lack of technological capacity and surveillance facilities. The concepts of community participation, monitoring and surveillance will be discussed below.

2.8.1 Community-Based Surveillance in Indonesia

To combat illegal fishing the Indonesian government introduced a community-based surveillance initiative in 2001. This initiative was formalized through Indonesia's Ministerial Decree 58/2001 on Community Surveillance Systems. POKMASWAS is voluntary. A wide range of people from local communities are involved in POKMASWAS. Groups of local leaders, religious leaders, traditional leaders, NGOs, and some local fishermen support the government by conducting fishing surveillance activities such as patrolling, monitoring fishing sites and reporting illegal fishing activities (Ministry of Marine Affairs and Fisheries 2001). They are the core of this community surveillance system (Ministry of Marine Affairs and Fisheries 2016b). According to the Indonesian Ministry of Marine Affairs and Fisheries (2015a), there are 1,646 POKMASWAS groups in 34 Provinces in Indonesia.

POKMASWAS is based on two basic principles. First, it is self-organized, and established through a Local Government Decree. POKMASWAS members appoint a group leader and

organisers, and plan their activities including regular meetings, patrolling activities, monitoring fishing grounds, communicating with other POKMASWAS groups, and reporting their monitoring results to related bodies such as fisheries inspectors, water police and the navy (Ministry of Marine Affairs and Fisheries 2001). Second, POKMASWAS is self-funded. Patrolling activities are conducted by members without government funding (Widayatun 2016). However, the Indonesia government and local governments provide equipment such as binoculars, GPS tracking tools, maps and office supplies as a part of POKMASWAS empowerment programs (Pauwelussen 2016).

The role of local government, especially district government, is more focused on supervising POKMASWAS. According to the Ministry of Marine Affairs and Fisheries (2001), District Governments have duties to create the monitoring procedures, conducting coordination with POKMASWAS, following up POKMASWAS reports and creating capacity programs to improve POKMASWAS skills. However, there was a significant change after the establishment of the Autonomous Act 23 Year 2014. District government lost the authority to supervise POKMASWAS. This regulation mandates the Provincial Government to supervise POKMASWAS which was previously undertaken by District Governments (Ministry of Home Affairs 2014).

POKMASWAS groups are strongly influenced by local wisdom, culture and traditional values. In this context, Yuliana and Winata (2012) argue that local wisdom plays a crucial role in protecting marine environments in Indonesia and this value is implemented by POKMASWAS members in combating illegal fishing and protecting their marine environment. For instance, *Panglima Laot* is the terminology for local wisdom in Aceh which represents local maritime leaders who have strong authority and great influence on local fishermen including in protecting marine and fisheries area from foreign fishers (Wilson & Linkie 2012). The value of *Panglima Laot* is adopted in the community-based surveillance system to protect fishery resources in Aceh waters by managing opened and closed day and area for fishing and giving

sanction to local fishermen who do not comply with local wisdom (Fikri 2013). Adoption of local wisdom and traditional values is also applied in other provinces and districts and this helps protect the marine environment.

2.8.2 Monitoring, surveillance and reporting procedures

In conducting monitoring and surveillance of illegal fishing, POKMASWAS members follow particular procedures. Figure 7 presents the standard operating procedures of monitoring and surveillance conducted by POKMASWAS.

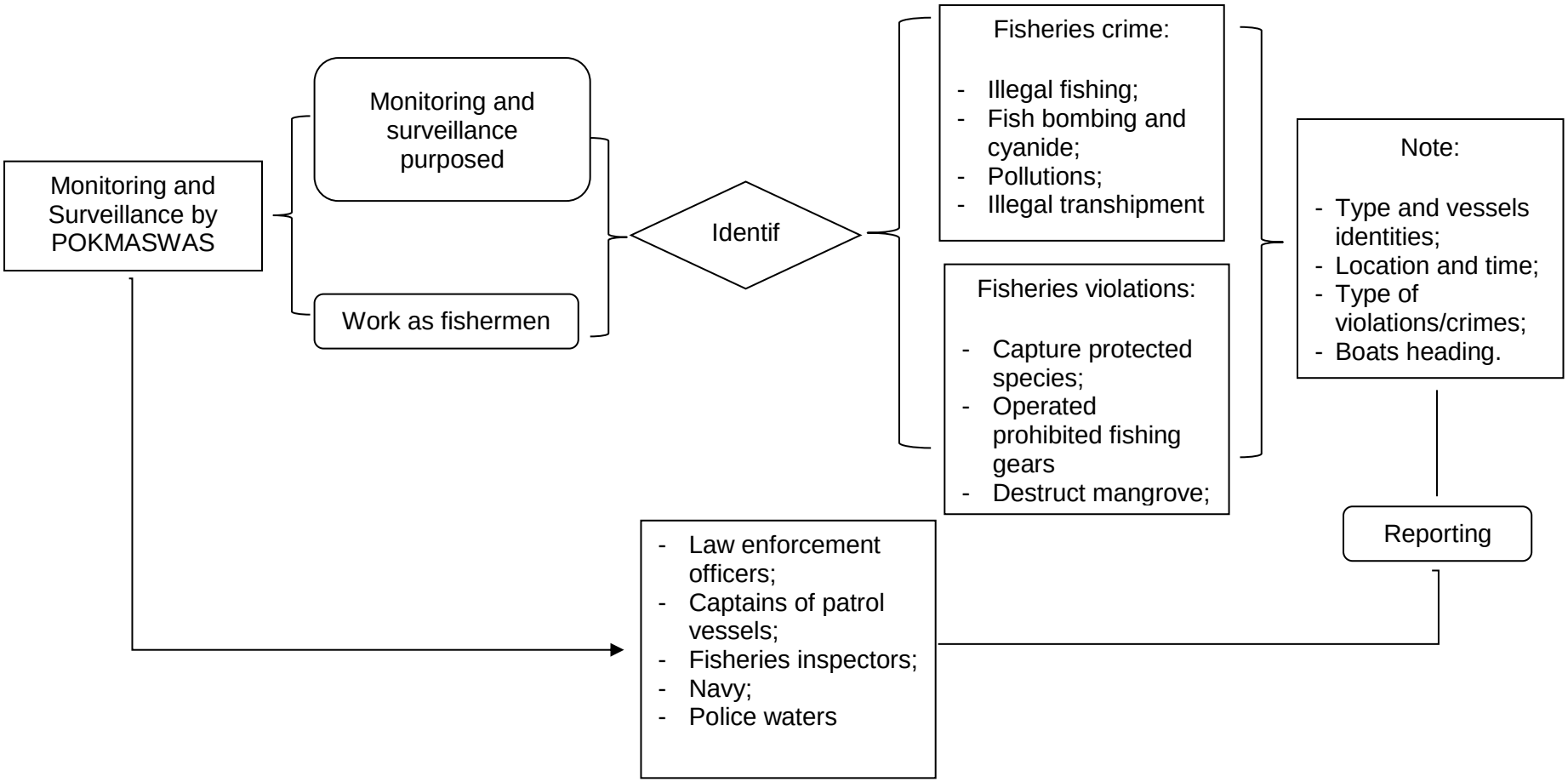


Figure 7. Standard Operating Procedures of monitoring and surveillance by POKMASWAS

Source: Renyaan (2015, p. 10)

There are two types of monitoring and surveillance activities conducted by POKMASWAS members:

a) Planned monitoring and surveillance: POKMASWAS members plan monitoring and surveillance activities including deciding the location, time, coordinating with fisheries agencies and preparing the boats and communication equipment.
b) Unplanned monitoring and surveillance: POKMASWAS members are also local fishermen who conduct fishing daily. This is an *ad hoc* activity.

The procedures of monitoring and surveillance by POKMASWAS members follow the steps below:

1) POKMASWAS members collect information on fisheries crime and violation at sea either with planned or unplanned monitoring and surveillance. Information of fisheries crimes/violations includes illegal fishing, destructive fishing (fish bombing and cyanide), illegal transhipments of marine pollutants, capture of protected species, and destruction of mangroves and operating of prohibited fishing gear.
2) When POKMASWAS finds fishing vessels or individuals who break the fisheries law, members record key information about:
    - vessel identities (name, flag state, fishing gear, and estimated crews);
    - type of violations/crime conducted by illegal fishermen;
    - location and time of fisheries crimes/violations;
    - heading i.e. direction of boats.
3) Information recorded by POKMASWAS should be reported to government agencies including captains of patrol vessels, fisheries inspectors, navy, and water police. The procedure of reporting is explained in Figure 8.

Figure 8 describes standard operating procedures of reporting the result of monitoring and surveillance. Overall, there are three methods to report including:

1) Reporting through the SMS gateway system. POKMASWAS can send information on the result of monitoring and surveillance to the SMS gateway contact centre (+6285888884171) and the report will be accepted by the system. It is then circulated to relevant agencies to be followed up immediately.
2) POKMASWAS members can come to Surveillance Units and report to fisheries inspectors by filling out the surveillance reports forms.
3) POKMASWAS members can report verbally to law enforcement officers by using Radio SSB or mobile phones. POKMASWAS members usually have the communication channel for Captains of Patrol Vessels.

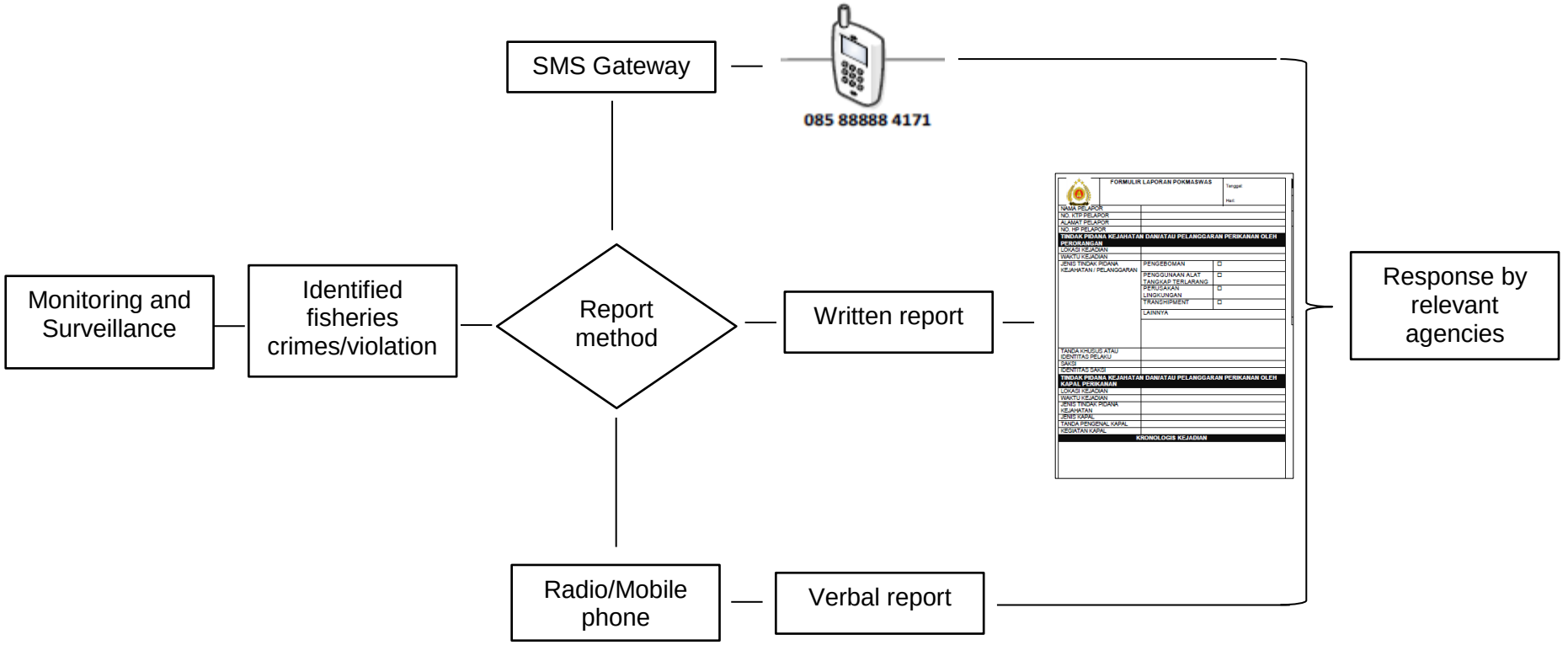


Figure 8. Standard Operating Procedures of Reporting by POKMASWAS

Source: Renyaan (2015, p. 13)

Governments, either central or local, are also allocated funding annually to support community-based surveillance through empowerment programs. For instance, in 2016, the Directorate of Fisheries Resources Surveillance allocated USD$320,623 (over half of the total funding of the Directorate of Fisheries Resources Surveillance) to support community-based surveillance through various programs including (1) supervising and capacity building, (2) evaluation of community-based surveillance to know which POKMASAS can be categorized as the best POKMASWAS in conducting monitoring, (3) developing an information system of community-based surveillance, (4) joint patrols with community-based surveillance (see Figure 9).

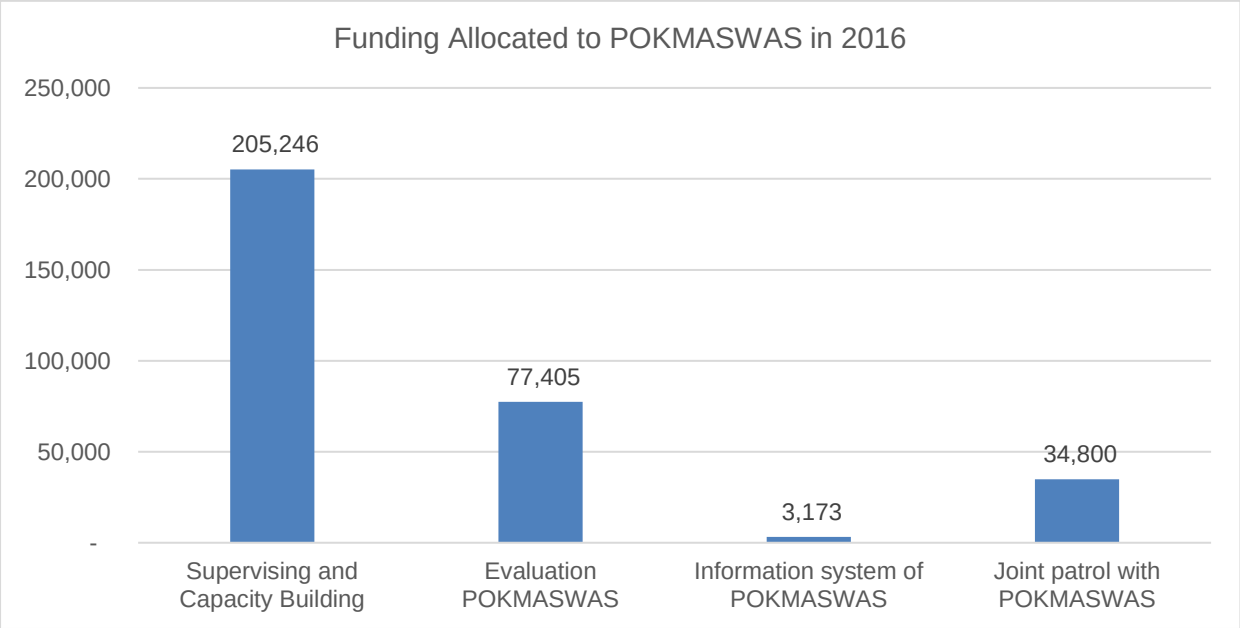


Figure 9. Funding Allocated to POKMASWAS in 2016
Source: Ministry of Marine Affairs and Fisheries (2016c)

Second, the central Indonesian government also supports the use of communication equipment for community-based surveillance. In 2016, the Directorate General of Marine and Fisheries Resources Surveillance provided communication equipment (i.e. Mobile phone, SIM Card with voucher) to 150 POKMASWAS groups (see Figure 10).

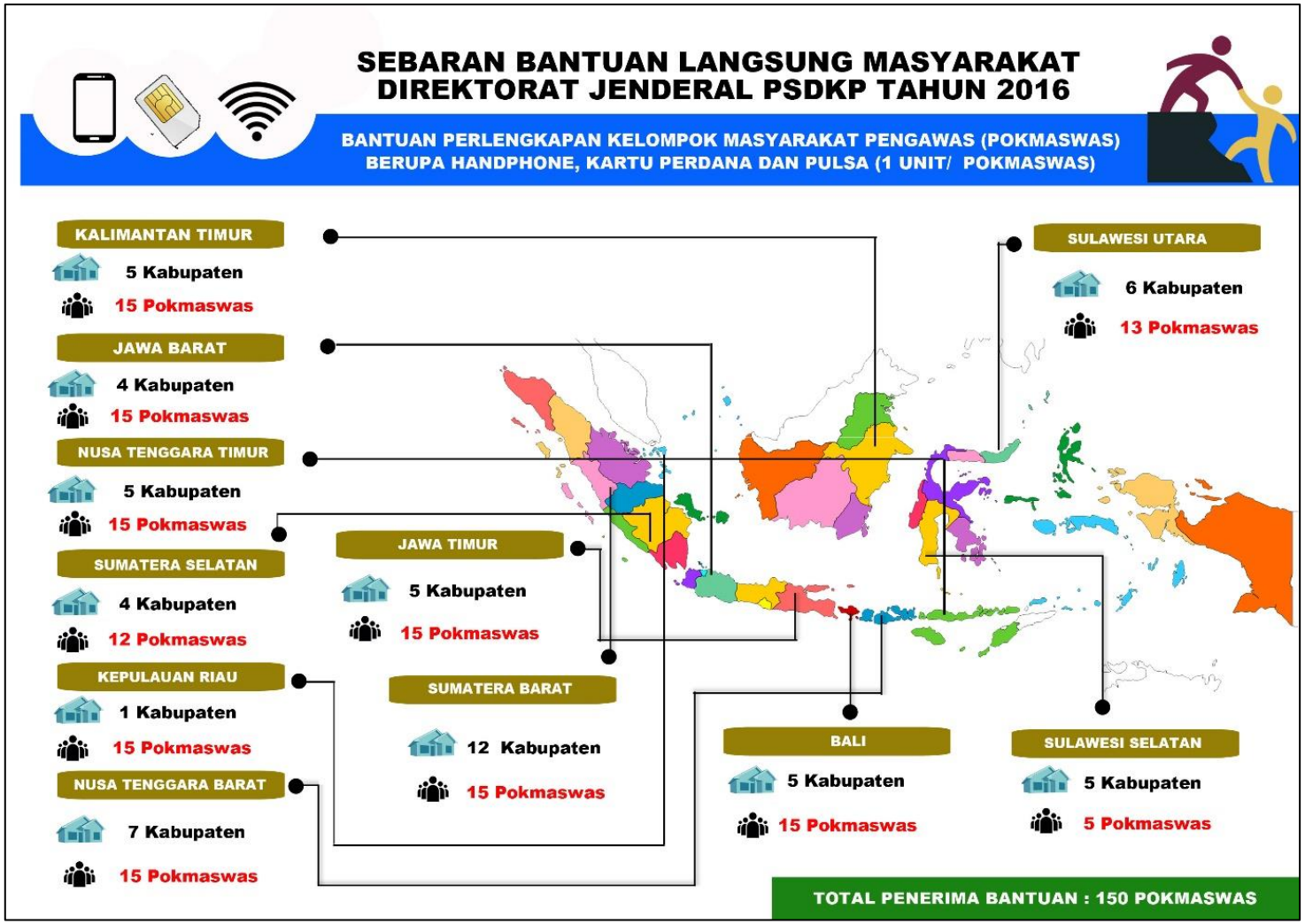


Figure 10. Mobile phone for 150 POKMASWAS
Source: Ministry of Marine Affairs and Fisheries (2016a)

Mobile phones are used as supporting equipment for the SMS Gateway System which is designed to collect and process all information from community-based surveillance. Mobile phones were distributed to POKMASWAS groups in Kalimantan, West Java, East Nusa Tenggara, South Sumatera, Riau Island, West Nusa Tenggara, East Java, West Sumatera, Bali, South Sulawesi and North Sulawesi.

2.9 Conclusion

In conclusion, illegal fishing is a serious problem worldwide including for Indonesia because it has significant ecological, social and economic impacts. The effort to combat illegal fishing has been conducted - through many approaches at global, regional and national levels. Fisheries management reforms by strengthening Monitoring, Controlling and Surveillance (MCS) of illegal fishing, and strong law enforcement have been conducted to combat illegal fishing. Local communities are also involved in contributing to combating illegal fishing. POKMASWAS is one of the Indonesian government initiatives to engage local communities and fisheries stakeholders in cooperating in combating illegal fishing. Community participation through POKMASWAS is highly valuable to combat illegal fishing effectively by providing information concerning illegal fishing to law enforcement agencies. It is assumed that this information is helpful for law enforcement officers to take quick action on illegal fishermen, including inspections and arrests and reducing operational costs for patrols. However, research about the role of POKMASWAS in combating illegal fishing has not yet been elaborated adequately. Other studies about POKMASWAS have mainly focussed on the role of community-based surveillance in protecting coastal areas, as opposed to combating illegal fishing. This study works towards filling this gap by investigating the role of community-based surveillance in combating illegal fishing in Indonesia with a focus on the Natuna Sea.

3. RESEARCH METHOD

A social survey has been designed to investigate the perceptions of both government regulators and the members of POKMASWAS. This perception included the nature of the problem of IUU fishing in Indonesia (the nature of the problem) and the role of community-based surveillance (its characteristics and performance) in combating illegal fishing in Indonesia.

This study considered that perception of respondents is essential in evaluating illegal fishing trends, the POKMASWAS role in combating illegal fishing and POKMASWAS capacity to conduct monitoring and surveillance of illegal fishing. According to Tubb and Moss (2006, p. 38):

> Perception is an active process as one selectively perceives, organizes and interprets what one experiences. Interpretations are based on the perceiver's past experiences, assumptions about human behaviour, knowledge of the other circumstances, present moods/wants/desires and expectations.

Perception also needs to be considered in deciding public policy (Procopiuck & Rosa 2015). Lee et.al. (2005) emphasize that decision makers need to consider the attitudes, perceptions, and opinions of stakeholders to ensure that public policy is acceptable and will be relevant to a wide audience. The use of perception in this study is aimed at capturing how the issues of illegal fishing, role and capacity of POKMASWAS are perceived by respondents from a wide range of backgrounds. Bailey (2008) points out that perception has a value in representing either group or personal interests and points of view. According to Hyman (1981) validity and reliability of perception can be enhanced by involving more representative samples, avoiding personal-oriented questions, familiarization with data gathering procedures and checking other data indicators (e.g. data published, and statistical analysis). Perception is often used in social research to help understand different perspectives about the environmental impacts of human activities.

Secondary data has been used to assess trends and related information on the role of community-based surveillance on monitoring and surveillance of illegal fishing including institutional documents, newspapers, books, internet sources and other related documents.

According to Creswell (2013), social surveys can be used to describe trends, attitudes, and seek opinions of the population under study. Questions and structured interviews are two methods regularly used. Conducting a social survey is relevant to describing the role of community-based surveillance on monitoring and surveillance of IUU fishing; the existing achievements of community-based surveillance, and to identify problems and limitations of POKMASWAS and to develop potential strategies to improve the role of community-based surveillance in combating illegal fishing in Indonesia.

This research design allowed acquisition of opinions from a variety of respondents from the population. This design can help obtain a clearer perspective of the role of community-based surveillance on combating IUU fishing in Indonesia. The study used qualitative approaches to gather opinions about the nature of the problem of Illegal fishing, the benefits of POKMASWAS, institutional capacity of POKMASWAS such as the performance of POKMASWAS and government support to improve POKMASWAS capacity, and also the role of POKMASWAS on monitoring and surveillance of IUU fishing in Indonesia.

The procedures used in this study are described in the flow chart in Figure 11.

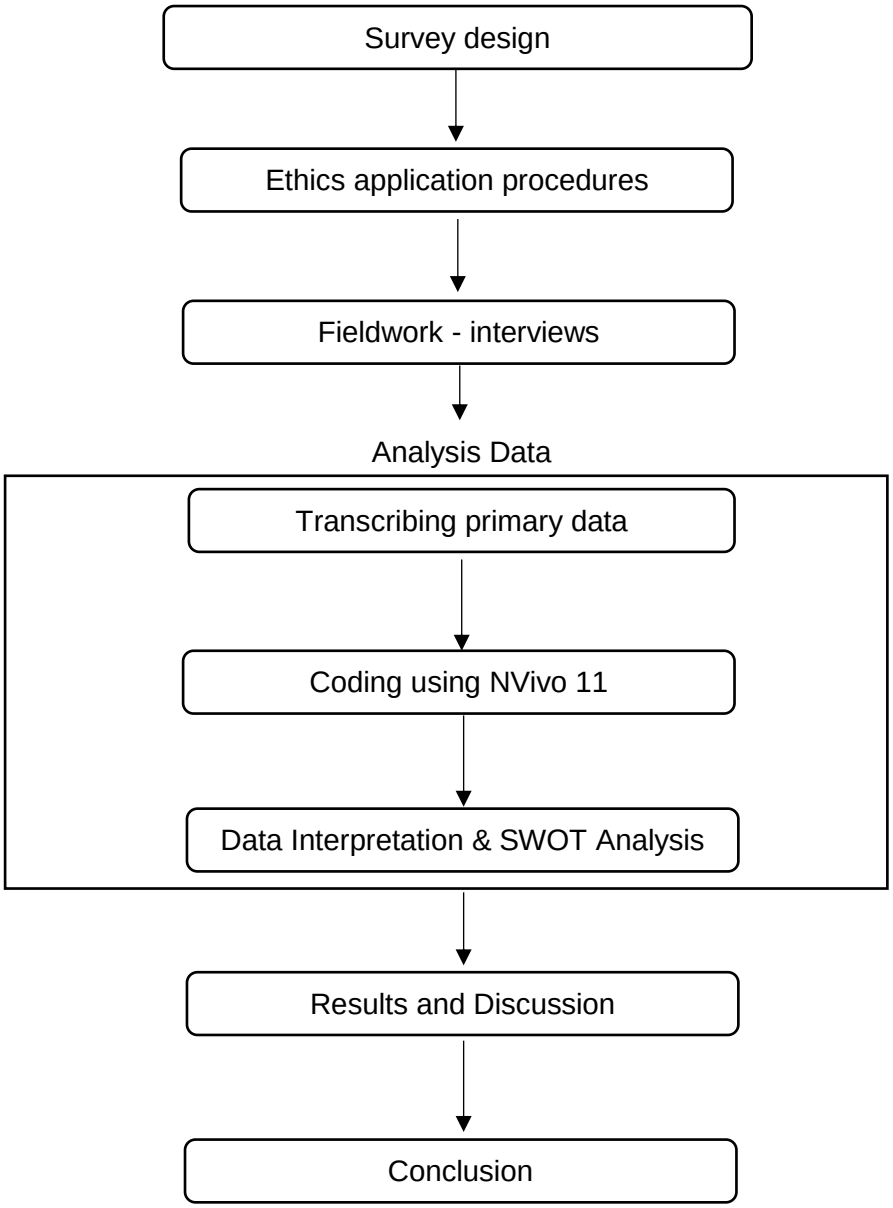


Figure 11. Research flow chart

Figure 11 shows the flow chart of this study. The survey was designed by preparing a set of questions and a method to collect data. This study also presented an application for ethics approval and received approval from the Social Behaviour and Ethics Committee (SBRC). Fieldwork was conducted by interviewing respondents from government staff and POKMASWAS members. Analysis of data was conducted by following several steps including

transcribing interviews from audio to text, coding using NVivo 11 and interpreting data. The results are presented and discussed to conclude this study.

3.1 Survey design

3.1.1 Interview schedule

The interview schedule was comprised of both closed and open ended questions (Appendix 1). In this study, closed questions allowed respondents to rate their opinions about a number of aspects of IUU including the scale of the problem and whether there was a change in the trend of illegal fishing, and their satisfaction with the monitoring conducted by POKMASWAS. On the other hand, open ended questions provided an opportunity for respondents to give the reason for their choices selected in the closed questions. Both closed and opened ended questions have benefits. According to Edwards et al. (1996) opened ended questions have some advantages including:

a. Respondents can explain information which is often not covered in closed ended question including sensitive, controversial and taboo information.
b. Respondents are allowed to respond to questions based on their own perspective without influence from alternative references.
c. Respondents can express emotion and feelings which cannot be acquired from closed ended questions.
d. Respondents with different backgrounds and positions may respond to questions differently and this can improve study perspectives.

Conversely, closed ended questions also have some advantages including:

a. Respondents can answer the questions quickly because alternative answers have been provided which can reduce interview time.
b. Answers are limited and can be set to achieve the goal and framework of the study.
c. Type of memory questions are very suitable in open ended questions because the choice is really helpful for respondents to remember.

In this study, questions were divided into three parts to gather information about the following:

1) Perceptions of the nature of the problem illegal fishing

   All respondents, either government staff or community-based surveillance members, were asked the same questions about illegal fishing including: perception of scale and trends of illegal fishing in Indonesia and the Natuna Sea; perceptions of ecological, economic and social impacts of illegal fishing. The perspectives of the scale and trends of illegal fishing were also gained from secondary data of illegal fishing records from government reports and other publications.

2) Perceptions of the benefits of community based surveillance

   Respondents from government agencies were asked about the benefits of the community-based surveillance role in monitoring and surveillance of IUU fishing in the Natuna Sea. This gave perceptions of how the output of POKMASWAS was used by government agencies in decision making and operational strategy on combating IUU fishing in Indonesia.

3) Community monitoring and surveillance

   Respondents from POKMASWAS were asked about their role in monitoring and surveillance of IUU fishing in Indonesia. They were asked about their understanding of the process of collecting and reporting information about illegal fishing, the use of equipment and facilities, and coordination and cooperation with other POKMASWAS and government agencies.

The perceptions of each respondent from government officers and POKMASWAS were expected to explain illegal fishing trends in Indonesia and the Natuna Sea, the role of community-based Organizations in combating illegal fishing in Indonesia, problems and limitations of POKMASWAS and developing a potential strategy to improve the role of POKMASWAS in combating illegal fishing in Indonesia.

3.1.2 Sample selection

The research targeted government officers and law enforcement agencies, fisheries Inspectors and patrol vessels officers who used surveillance information from POKMASWAS as well as the members of the community engaged in POKMASWAS surveillance. Purposive sampling was used to identify appropriate candidates for the study. According to Teddlie and Yu (2007) purposive sampling selected certain units or cases based on a specific purposes rather than chosen randomly. Purposive sampling can be used to achieve representativeness and comparability when the researcher expected to select purposive sampling which closely represent broader groups or cases; and design comparison among different groups or cases. In this study, purposive sampling was conducted by several steps including:

1) Identify the government agencies with duties related to POKMASWAS (e.g. law enforcement officers):
2) Identify POKMASWAS members based on their background (e.g. fishermen, local leader, private, and other backgrounds):
3) Invite each group to participate in this study either from government staff and POKMASWAS members. This study only targeted 23 respondents due to limitation of time, however respondents had represented key government agencies and members of community-based surveillance.

Some groups involved in this research represent expertise on community-based surveillance including:

1) Director/Vice Director fisheries of monitoring and petrol vessels who are familiar with the policy and plans for further development of community-based surveillance;
2) Operator of the SMS gateway who accepts and analyses all the reports from POKMASWAS delivered through Short Message Services (SMS);
3) Fisheries Inspectors and Captains of Patrol Vessels who accept reports from POKMASWAS and follow up the reports;

4) Local government agencies who supervise POKMASWAS members and develop empowerment programs for POKMASWAS;
5) POKMASWAS members who conduct monitoring and surveillance of illegal fishing.

This study was approved by the Social and Behavioural Research Ethics Committee (SBREC) of Flinders University on 20th December 2017 (see in Appendix 2).

An invitation to participate in the study was sent by email to the Directorate of Monitoring and Operational Patrol Vessels and Directorate of Fisheries Resources Surveillance through the Secretarial/administrative staff. The email asked for the invitation to participate in the research to be forwarded on to the appropriate individuals (e.g. the Vice Director and SMS gateway operator and the captains of patrol vessels, staff and fisheries inspectors). Information Sheets and Consent Forms were attached to the invitation email. These participants had the return email address and telephone contact details of the principal researcher.

Interviews with respondents from government staff required permission from the Directorate of Fisheries Resources Surveillance and Directorate of Monitoring and Patrol Vessels. Permission was granted by the Director of Fisheries Resources Surveillance on 14th December 2014 which permitted staff under this directorate to be interviewed, including fisheries inspectors. Permission to interview SMS gateway operators and Captain of Patrol Vessels was granted by the Directorate of Monitoring and Patrol Vessels on 18th December 2017.

At a community meeting a local government fisheries inspector, on behalf of the researcher, was asked to distribute an invitation to the community-surveillance group. At the meeting the invitation was circulated along with the information sheet and consent form. A box was placed in an accessible place at the meeting. Individuals who agreed to participate could register their interest by placing their contact details in the box. The fisheries officer was to deliver the box to the researcher. Consent was obtained immediately prior to interviews being conducted with

members of the community-surveillance group. No government permission was required to invite community-based surveillance members to participate in this research. The researcher contacted participants by mobile phone to arrange for the fieldwork in Natuna and contacted respondents face-to-face to arrange interview times when visiting Natuna Island. Table 2 provides a list of the respondents who agreed to take part in the study.

Overall 31 people were approached to participate. The number who actually participated was 23. Several people did not participate in this study for reasons including not having time (very busy), personal reasons (discomfort) and still at the sea. The details of the participants are shown in Table 2.

Table 2. List of Respondent

No	Institution/Position	Population Pool	Targeted
1.	Director/Vice of Monitoring and Operational Patrol Vessels	5	4
2.	SMS Gateway operator	1	1
3.	Fisheries Inspectors (central government) and Captain of patrol vessels	12	10
4.	Local government agency	2	1
5.	Members of Community-based surveillance group (Natuna)	11	7
	Total	**31**	**23**

3.2 Fieldwork – interview procedures

Structured interviews were conducted to collect primary data from respondents. This method was chosen because according to De Franzo (2014) collecting data by the face-to-face method has several advantages compared with postal or online surveys, such as:

1) accurate screening to avoid false information about respondents;

2) interviews have a good ability to capture verbal and nonverbal information from

respondents, and are useful in data analysis;

3) the interviewer has the ability to keep control and focus the interviews, which is crucial in controlling the answer to keep order;
4) face-to-face interviews also capture emotional and behavioural aspects of the interviewee.

Interviews for this study were conducted from 26th December 2017 to 26th January 2018 in three locations in Indonesia: Interviews were conducted with respondents in government agencies – the Ministry of Marine Affairs and Fisheries, the Directorate of Fisheries Resources Surveillance and Directorate of Monitoring and Patrol Vessel – in Jakarta (from 27th December 2017 to 15th January 2018). Interviews with the captains of patrol vessels and the head of the Fisheries Surveillance Based in Western Area in Batam (from 15th January 2018 to 17th January 2018); and interviews were held with local government, fisheries inspectors and members of POKAMSWAS in the Natuna sea (from 17th January 2018 to 19th January 2018). Collecting secondary data in the Ministry of Marine Affairs and Fisheries took place from 18th January 2018 to 26th January 2018.

All the interviews were recorded using Sony Recorder ICD PX470. The researcher also noted key point of respondents' answers. The interview questions were asked in the prescribed order.

3.3 Data Analysis

3.3.1 Transcribing Procedures

Interview results were saved in MP3 file form or audio format using Sony Recorder ICD PX470 and stored in the laptop computer. Audio data was transcribed verbatim to a word document from Bahasa Indonesia to English by the principle researcher. According to van Nes et al. (2010) translation of act may lost the meaning in the translation process, therefore, it recommends to focus in the thinking and reflection process, avoiding the use of fix – one word

– translation, and rich description with quotes of participants are considered to contribute to trustworthiness.

3.3.2 Coding

Data analysis was conducted using QSR International NVivo 11 a program designed to assist in the analysis of textual data.

The translated transcripts were uploaded into NVivo for coding and thematic analysis. According to Neuman (2014, pp. 481-4) coding is an integral part of data analysis in qualitative research which follows a sequence process including (1) open coding, (2) axial coding, and (3) selective coding.

Box 5. Coding Procedure

(1) Open coding: The first coding of qualitative data that examines the data to condense them into preliminary analytic categories or codes.
(2) Axial coding: A second stage of coding of qualitative data during which the researcher organizes the codes, links them, and discovers key analytic categories.
(3) Selective coding: The last stage in coding qualitative data that examines previous codes to identify and select data that will support the conceptual coding categories that were developed.

Source: Neuman (2014, pp. 481-5)

Coding procedures as shown in Box 5 were implemented in this study. Preliminary coding was conducted by highlighting the issues in each respondent's answers. For instance, respondents' answers were highlighted based on the ecological, social and economic impacts of illegal fishing. Then, answers were grouped into major themes. For instance, grouping ecological impacts into several themes such as decreasing fish stocks, destruction of marine environments and ghost fishing. The last step in coding is building the framework based on the open and axial coding. Coding procedures in this research using NVivo 11 were undertaken using the following steps: (Figures 12, 13, and 14)

1) Grouping respondents' answer based on questions

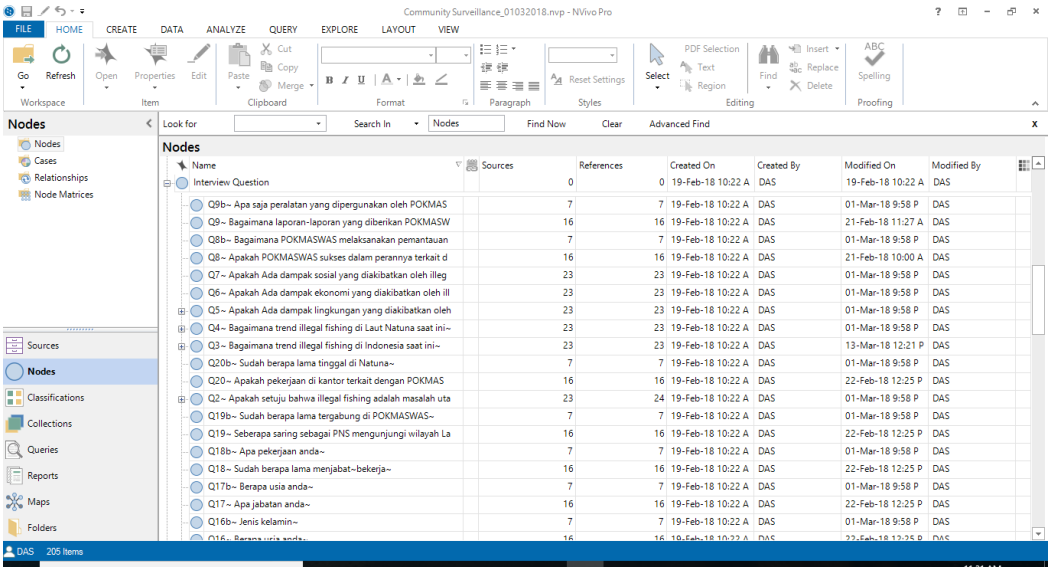


Figure 12. Grouping respondents answer

2) Assigning themes to answers

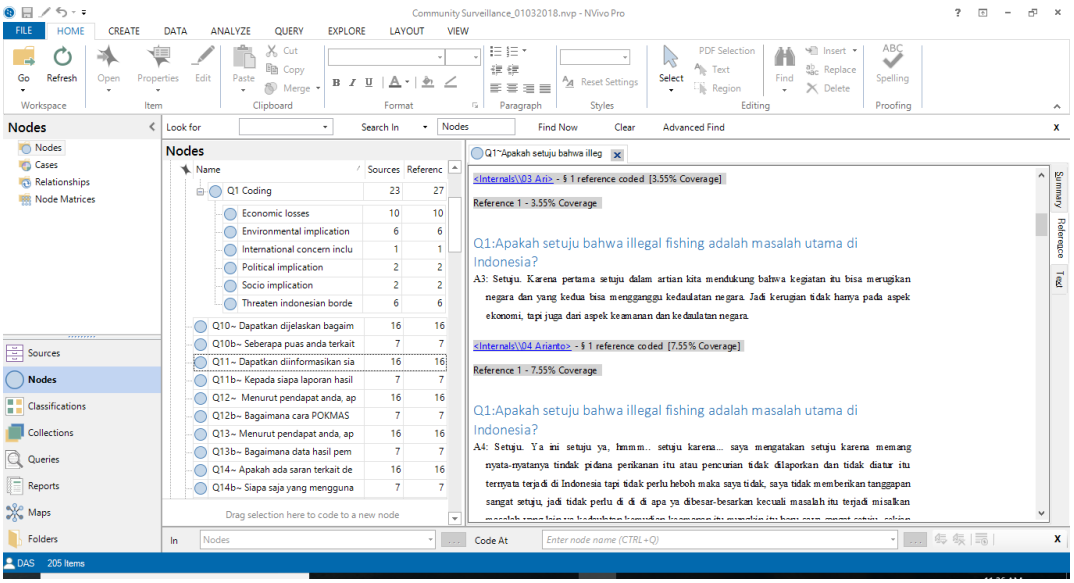


Figure 13. Grouping answer' themes

3) Elaborating interviews data

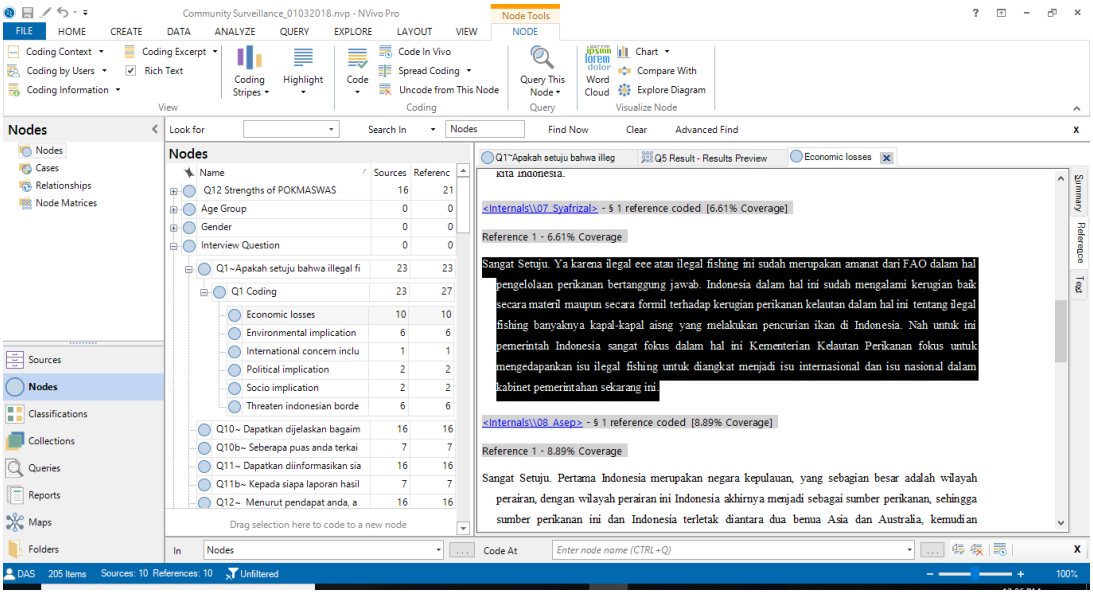


Figure 14. Interpreted data

3.3.3 Data Interpretation

Interview data was separated into three sections: (1) Perception of illegal fishing (scale and impacts), (2) perceived benefits of community-based surveillance, and (3) POKAMSWAS community monitoring and surveillance activities. The researcher analysed interlinks between each aspect to map the role of community based surveillance on monitoring and surveillance of illegal fishing in Indonesia. The research analysis framework on the role of community-based surveillance can be seen in Figure 15.

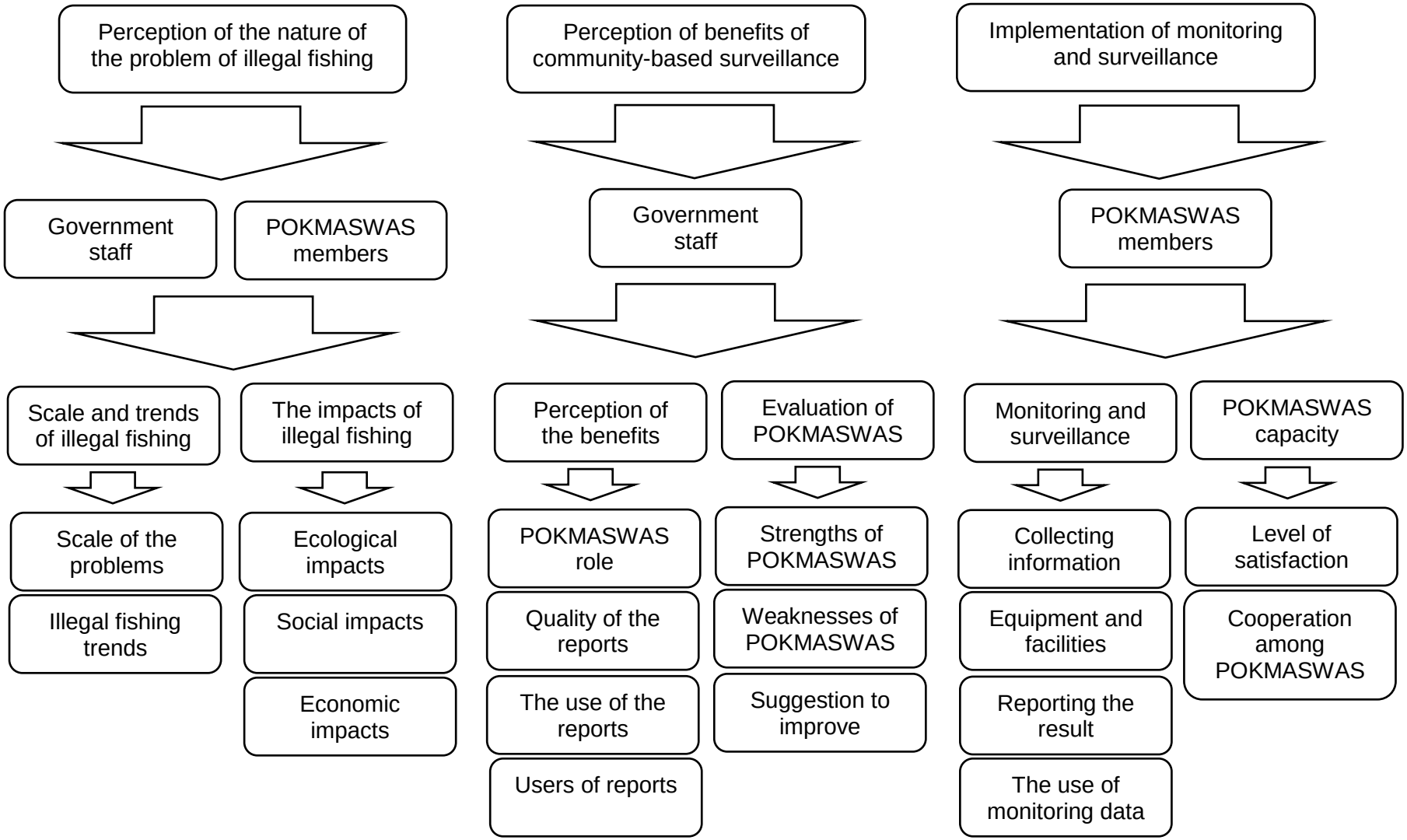


Figure 15. Research analysis frameworks

Figure 15 describes research analysis frameworks. The analysis is based on the perspective of key stakeholders of community-based surveillance. Perception of the nature of the problem of illegal fishing including the scale, trends and the impacts of illegal fishing are gained from government and POKMASWAS members. Their perception explained how illegal fishing as a main issue in this study is perceived either by the government and POKMASWAS members. This study used government staff perception to understand the benefit and performance of POKMASWAS because the government staff used monitoring and surveillance reports from POKMASWAS. The government perceptions about the performance of POKMASWAS in combating illegal fishing covered the role of POKMASWAS, quality of the report, strengths, weaknesses, and suggestions. This study also elaborated implementation of monitoring and surveillance conducted by POKMASWAS to gain balance perspectives about the performance of POKMASWAS not the only based on of government perception, but also technical aspect of monitoring and surveillance such as how information collected and reported, what equipment used, how monitoring data used, and cooperation with other groups.

This research also developed a Strengths Weaknesses Opportunities Threats (SWOT) analysis. According to Samset (2010) SWOT analysis is a useful approach to creating a strategy based on information including internal and external aspects and the strengths, weaknesses, opportunities, and threats associated with them (See Figure 16). Using SWOT analysis, internal and external aspects should be acquired from dialogue, interviews etc. and the results should consider:

(1) a clear and brief formula regarding the strategy,

(2) strengths and weaknesses should be related to critical success factors,

(3) the information should be factual and not able to be manipulated,

SWOT offers a means by which to consider possible strategies to improve the role and capacity of community-based surveillance in monitoring and surveillance of illegal fishing in

Indonesia. In this research SWOT analysis was conducted in two steps. First, by collecting information on internal and external aspects of community-based surveillance including strengths, weaknesses, opportunities and threats. Second, developing strategies based on SWOT dimensions. According to Richards (2001) SWOT analysis emphasizes minimizing or avoiding the weaknesses and threats. Weaknesses need to be converted to strengths and threats should be converted into opportunities.

	Positive	**Negative**
Internal aspect	**Strengths (S):** goals, expertise, motivation, experience	**Weaknesses (W):** costs, internal conflicts, technologies, process
External aspects	**Opportunities (O):** Needs, demands, political priorities	**Threats (T):** competition, challenges, public response

S-O: Exploit
S-T: Confront
W-T: Avoid
W-O: Search

Figure 16. SWOT analysis aspects
Sources: Samset (2010) and Richards (2001)

This study developed a social survey using structured interviews both open and closed ended questions to explore perceptions about the nature of the problem of illegal fishing, the role of community-based surveillance and implementation of monitoring and surveillance conducted by POKMASWAS. Twenty-three respondents were interviewed in this study representing various positions of the government staff and POKMASWAS members. The wide range of respondents involved in this research aimed to give broader perspectives about the role of community-based surveillance in Indonesia.

4. RESULTS

This chapter presents the results of the interviews with 23 respondents from government employees and community-based surveillance members. The chapter is divided into three main parts including the perspectives of study participants about the nature of IUU, the perspectives of government employees and the findings generated from community members participating in POKMASWAS.

4.1 Respondent profile

Table 3 shows the wide range of respondents who participated in interviews in this research. There were 16 government respondents from various positions including three representing top/middle management Directors of Fisheries Resources Surveillance and Head of Planning and Programs. Top/Middle Management decides blue print and policy frameworks of community-based surveillance policy in the Ministry of Marine Affairs and Fisheries. Two respondents represented lower Management (i.e. Heads of Section) and five respondents were government staff from both senior and junior level. Six respondents were the government officers who worked around the Natuna Sea (i.e. Local Government, Fisheries Inspectors and Captains of Patrol Vessels). The wide range of respondents was expected to give a comprehensive overview of community-based surveillance from the government perspectives.

Moreover, this research also involved community-based surveillance members. Seven respondents from POKMASWAS were interviewed to get information on monitoring and surveillance of illegal fishing activities in the Natuna Sea. Participants from community-based surveillance included four local fishermen, a local leader, a surveillance coordinator and a private businessman. People from different backgrounds of community based surveillance members were interviewed to describe monitoring and surveillance schemes and the role of each member in combating illegal fishing in the Natuna Sea.

Table 3. Respondents

No	Position/Role	Number of Respondents
A.	**Government Staff**	
1.	Central government—Executive Management	3
2.	Central government—Head of Section Management	2
	Central government— General Staff (Senior)	2
2.	Central government—General Staff (Junior)	3
3.	Central government—Captains of Patrol Vessels	3
6.	Central government—Fisheries Inspectors	2
7.	District government—Head of Section Management	1
	TOTAL Government	**16**
B.	**POKMASWAS Members**	
1.	Local Fishermen	4
2.	Private Businessman	1
3.	Local Village Leader	1
4.	POKMASWAS Surveillance Coordinator	1
	TOTAL POKMASWAS	**7**
	TOTAL RESPONDENTS	**23**

3.4.3.2 Respondents based on age

Respondents profile based on age groups is presented in Table 4: see below

Table 4. Respondents based on age groups

No.	Aged Group	Number of Respondents
1.	25-34 years	5
2.	35-44 years	10
3.	45-54 years	6
4.	55-64 years	2
	Total	**23**

Table 4 identifies the number of participants in this research based on age groups. The most dominant age group in this research were 35-44 years old with ten of the 23 respondents participating in this research in this age group. Six of the 23 participants were 45-54 years old. The youngest aged group (23-34 years old) was represented by five respondents, while two respondents were aged between 55 and 64 years old. This range of age groups of respondents in this research represented knowledge, experiences and engagement about community-based surveillance. This may influence respondents' perspectives on illegal fishing, benefits of POKMASWAS and monitoring and surveillance activities by POKMASWAS. This research acquired wide range perspectives by involving respondents from many aged groups.

3.4.3.3 Respondents based on gender

Respondents profile based on age groups is presented in Table 5: see below

Table 5. Respondents based on gender

No.	Gender	Number of Respondents
1.	Male	21
2.	Female	2
	Total	23

Table 5 gives details of respondents based on gender. Respondents of this research consisted of 21 males and 2 females. Two of sixteen respondents from government officers were female, while all respondents from POKMASWAS were male. POKMASWAS and its activities in monitoring and surveillance is often associated with males, however it is interesting to acquire perspectives from females about community-based surveillance.

4.2 Perceptions about the scale, extent and impacts of illegal fishing – all respondents

All participants were asked whether they thought that illegal fishing is a problem for Indonesia and the Natuna Sea (see Appendix 1 to view the interview questions). Several questions

asked to participants explored scale, extent and impacts of illegal fishing. The findings related to these questions are discussed in the following section.

4.2.1 Illegal fishing as a major problem for Indonesia and also the Natuna Sea

Respondents were asked to rate on a scale of 1 to 5, (1 being 'strongly disagree' to 5 being 'strongly agree') if illegal fishing was a major problem for Indonesia, and then they were asked to rate the problem for the Natuna Sea. All respondents either agreed or strongly agreed that illegal fishing is a problem for Indonesia as a whole and also for the region of the Natuna Sea. In explaining why illegal fishing is a major problem for Indonesia, respondents considered that it depletes fish stocks which then has knock-on effects including decreasing local catch which then directly impacts on the economy, which has subsequent social impacts. They also cited environmental consequences. These points will be elaborated below.

4.2.1.1 Geographic vulnerability

More than half of all respondents (sixteen of 23) explained that the Natuna Sea in particular is highly vulnerable to illegal fishing because it is remote and on the periphery of the Indonesian Exclusive Economic Zone (EEZ). Its neighbours are several other SE Asian countries, some of which claim Indonesian waters as their own.

> Illegal fishing is a major problem for Natuna because Natuna borders with many countries such as Malaysia, Vietnam, and Thailand. Moreover, China claims this area as one of the traditional fishing ground for their fishermen through "nine dot lines" which plot the Natuna Sea as one their waters area. Many illegal fishing vessels from neighbour countries operate in Natuna Sea (Respondent 13-Central government—Captain of Patrol Vessel).

> I strongly agree that illegal fishing is a major problem for the Natuna Sea because the Natuna Sea is an entry gate for illegal foreign fishing vessels to catch fish in Indonesian waters. We should be concerned to protect the Natuna Sea as our

> strategic border with neighbouring countries (Respondent 07-Central government—Executive Management).

Geographic vulnerability was mentioned by six of the 23 respondents as a reason as to why IUU is a major problem for Indonesia. Indonesia's EEZ is adjacent to several other countries that also fish. Respondents also highlighted the fact that Indonesian capacity to control and undertake surveillance in areas such as the Natuna Sea, North Sulawesi Sea and the Arafura Sea is limited.

> I agree that illegal fishing is a major problem for Indonesian fisheries, especially in the vulnerable areas such as Natuna, Sulawesi, and Arafura which become the entry point waters. These areas are very vulnerable to illegal fishing activities from neighbouring countries (Respondent 09-Central government—Head of Section Management).

> We have many limitations from geographical aspects as an archipelagic country with many islands, including lack of human resources to conduct surveillance in the remote areas. It [geographical situation] is used by illegal foreign fishing vessels to catch fish in Indonesian waters (Respondent 02-Central government—General Staff (Senior)).

4.2.1.2 Economic impacts of IUU

Economic impacts of illegal fishing were also frequently cited reason as to why IUU was a problem for Indonesia (ten of 23 respondents). For example:

> I have experiences in combating illegal fishing in Indonesia. I strongly agree that this is a major problem for Indonesia. We should eradicate illegal fishing. We can imagine our economic losses caused by illegal fishing. For instance, we have huge fisheries resources in Indonesia's Fisheries Management Area, we can calculate how many billions of our resources and the economic loss as a result of fish taken by illegal

> foreign fishing vessels. It impacts on the state's revenue (Respondent 16-District government—Head of Section Management).

Small scale fishermen said they were directly affected by illegal fishing as their catch rates have significantly declined and this has affected their income.

> We only get a minimum catch when many illegal foreign fishing vessels operate in our sea. It causes our income to be significantly reduced and it has direct impacts on our economy (Respondent 20-Local Fisherman).

4.2.1.3 Environmental Impacts

Environmental impacts of illegal fishing were cited as problems for both Indonesia (six of 23 respondents) and the Natuna Sea (five of 23 respondents). Respondents considered that illegal fishing has serious environmental impacts including decreasing fish stocks and overfishing.

> I strongly agree that illegal fishing is a major problem for Indonesia because it destroys the marine environment and causes declines in our fish stocks (Respondent 15-Central government—Fisheries Inspector).

> From a fisheries resources perspective, if we cannot stop illegal fishing vessel activities in Natuna Sea, we will lose our fisheries resources (Respondent 08-Central government—Captain Patrol Vessel).

Respondents also claimed that the activities of illegal foreign fishing vessels are extremely harmful to the marine environment because the majority of the foreign vessels use trawling methods. Trawling destroys the marine habitat because it captures all marine species and damages benthic communities, i.e. it is a non-selective method of fishing.

> I strongly agree [that illegal fishing is a major problem for Indonesia]. Most illegal foreign fishing vessels use trawls and that is prohibited in Indonesia. Trawlers lack

> selectivity, they catch all the fish and destroy the marine environment especially bottom waters (Respondent 14-Central government—Fisheries Inspector).

The same problem of trawling was mentioned by respondents in explaining the destructive fishing practices in the Natuna Sea.

> I strongly agree that illegal fishing is a major problem for the Natuna Sea because illegal foreign fishing vessels who operate in Natuna use destructive fishing gear such as trawls. These damages the carrying capacity of the environment and destroy the bottom of the Natuna Sea (Respondent 14-Central government—Fisheries Inspector).

4.2.1.4 Social impacts of IUU

Social impacts were also mentioned by five of the 23 respondents in explaining illegal fishing as a major problem for the Natuna Sea. Respondents thought that local fishermen feel anxious due to many illegal fishermen operating in the area. The existence of illegal fishermen in Indonesian waters creates pressures on local fishermen. Social conflict also happened because illegal fishermen operated trawl nets which often destroy local fishermen's fishing gear such as long lines and traps.

> This is a serious problem for us. We hope the government can solve this problem. Illegal foreign fishermen pressure us, we cannot go to sea safely. They [illegal fishermen] often destroy our fishing gear (Respondent 18-Local Fishermen).

4.2.1.5 Political impacts of IUU

Three of 23 respondents mentioned that there were political ramifications associated with illegal fishing. Respondents said that large numbers of illegal fishing vessels operating in Indonesian waters signals to the people of Indonesia that their Government lacks the power to protect Indonesian territory. The consequences of this lack of confidence in the government by the people may result in self-regulation and an *ad hoc* approach to management of the

problem negatively impacts on Indonesian performance both in the domestic and international arena.

> There will be political impacts if we cannot solve it. If too many fishermen from Vietnam, China, Thailand and Malaysia operate illegally in the Natuna Sea, Indonesian sovereignty becomes blurred and this situation is not good politically for the Indonesian government (Respondent 08-Central government—Captain Patrol Vessel).

4.2.2 Illegal fishing trends in Indonesia and the Natuna Sea

Respondents were asked to indicate from their perspective whether current IUU fishing trends were getting worse or better. The results show a divergence of opinion in terms of whether the trend of IUU is getting worse or improving. This divergence is the same for Indonesia and also for the Natuna Sea as shown in Figure 17. Just over half of all participants (12 of 23) across a range of stakeholder groups thought that IUU trends were somewhat better (meaning that the problem was not as bad as it has been in the past). This was true for both Indonesia and for the Natuna Sea. However, the remainder of respondents thought the trends of IUU had either remained consistent over time or were getting worse.

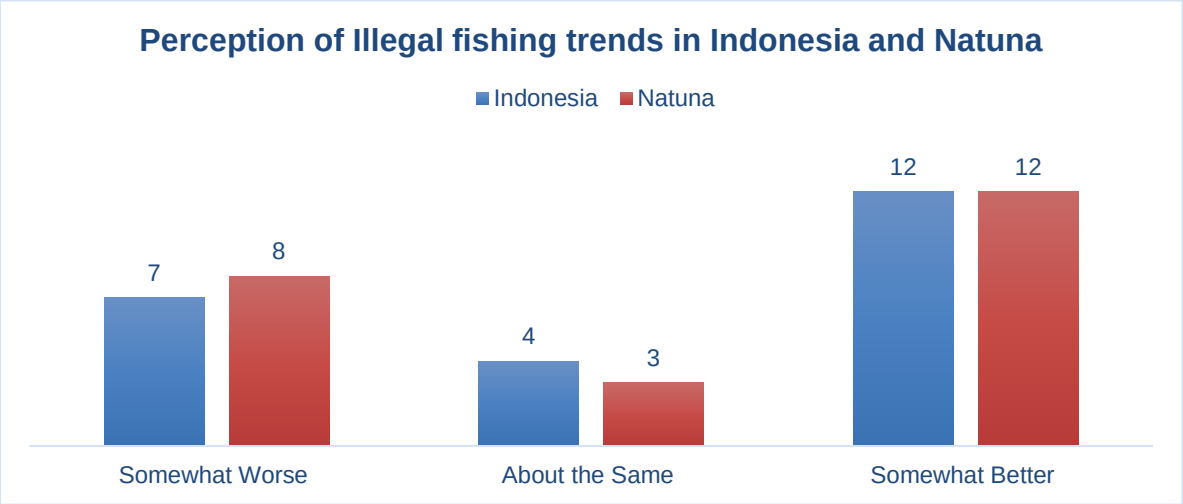


Figure 17. Respondents' Perception of illegal fishing trends in Indonesia and Natuna

Ten of the 13 respondents who thought the situation had improved explained that the Indonesian government had introduced powerful policies and followed up with law enforcement which had improved trends in lowering the activity of IUU fishing. Respondents also considered that there was good cooperation among Indonesian law enforcement agencies in combating illegal fishing in Indonesia.

> We can see that illegal fishing vessel sinking policy has had a deterrent effect on illegal fishing actors. [Strong law enforcement] was one of the reasons for decreasing trends of illegal fishing in the Arafura Sea, North Sulawesi Sea and the Natuna Sea. These areas were the centre of illegal fishing in Indonesia (Respondent 15-Central government—Fisheries Inspector).

> Overall, illegal fishing trends in Indonesia have slightly decreased. There was an improvement of our law enforcement agencies especially in cooperation to combat illegal fishing. Indonesian Coast Guard (Bakamla), Indonesian Navy, Police Waters, Directorate General Marine and Fisheries Resources Surveillance (DJPSDKP) and Indonesian Task Force for combating Illegal Fishing cooperate together to protect our seas. We did not see this cooperation before (Respondent 08-Central government—Captain Patrol Vessel).

> I think illegal fishing decreased especially in territorial waters. We did not see illegal fishermen again below 12 nautical miles. I think the government has taken on strong law enforcement by sinking illegal fishing vessels (Respondent 20-Local Fishermen).

Indonesian policy (e.g. sinking illegal fishing and strong law enforcement) is not the only initiative that has resulted in the perception of a decrease in illegal fishing in Indonesia. Two of 23 respondents claimed that international pressures have also played an important role. For instance, the European Union (EU) has placed pressure on countries exporting fish products to strengthen their Monitoring, Controlling, and Surveillance (MCS) regulations. The

EU has introduced a warning and penalty system that controls countries' exports capability. Countries that do not comply with the EU conditions are banned from exporting their products. In this instance, Thailand has been warned by the EU to adopt better control on Thai fishing vessels entering into foreign waters in SE Asia, including Indonesia (European Union 2015). This action by the EU may account for the perception of respondents in this study of reduced IUU activity in Indonesian waters.

> Illegal fishing trends have slightly decreased because some illegal actors get a 'yellow card' from European Union. Therefore a country [e.g. Thailand] implemented strong control on their vessels to not trespass into Indonesian waters (Respondent 14-Central government—Fisheries Inspector).

> When we see statistical data especially in Indonesian Fisheries Management Area 711 (South China and the Natuna Sea), illegal fishing vessels, especially from Thailand, significantly decreased. No Thai fishing vessels were arrested this year. Thailand also improved their control of fishing vessels because of the pressures from the European Union and this has good impacts on Indonesia especially in the Natuna Sea (Respondent 15-Central government—Fisheries Inspector).

Nevertheless five of the 23 respondents were of the opinion that there was a moderate increase in the trend of illegal fishing in Indonesia (eight of 23 respondents for the Natuna Sea). The reasons given by respondents were based upon statistical data about illegal fishing vessels arrested both in Indonesia and the Natuna Sea.

> According to statistical data on fisheries crime in Indonesia, the number of illegal foreign fishing vessels arrested gradually increases every year. This was one indication of high illegal fishing in Indonesian waters. We may argue about the indications of decreases or increases, while the number of illegal fishing vessels

> arrested clearly shows that the situation was getting worse (Respondent 04-Central government—General Staff (Junior)).

Two of 23 respondents also claimed that illegal fishers had taken to new methods that helped to hide their activities, such as presenting as Indonesian vessels through the flag system, or naming foreign vessels with Indonesian names to deceive Indonesian patrol vessels at sea.

> Illegal fishing vessel trends gradually increased because illegal fishers developed new *modus operandi* to do illegal fishing activities in Indonesian waters including the Natuna Sea. They use double flags, change their vessel's name and other ways to deceive our patrol vessels (Respondent 01-Central government—Executive Management).

Four respondents mentioned that illegal fishing trends in Indonesia remain high, as is also occurring in the Natuna Sea (three of 23 respondents). Respondents quoted the Ministry of Marine Affairs and Fisheries (MMAF) reports about illegal fishing vessels arrested from 2010 to 2017 which shows that the number of illegal fishing vessels arrested by patrol vessels remained stable annually. The number arrested was also influenced by the number of operation days of patrol vessels. Respondents highlighted that more illegal fishing vessels can be arrested when patrol vessels had more time to conduct surveillance at sea.

> Based on the MMAF Report, the number of illegal foreign fishing vessels arrested remains high annually. Many foreign fishing vessels still operate in the Natuna Sea. If the Indonesian government enhanced operational days for patrol vessels, I think more illegal fishing vessels will be arrested (Respondent 14-Central government—Fisheries Inspector).

Two respondents claimed that a reduction of illegal Thai fishers has not resulted in a decline of illegal fishing vessels in the Natuna Sea. Illegal fishermen from neighbouring countries still operate illegally in the Natuna Sea. For instance, based on annual report of Directorate Patrol

Vessels in 2017, the number of illegal fishing vessels arrested from Vietnam increased significantly, while the number of illegal fishing vessels from Thailand decreased.

> I am not sure that illegal fishing activities in the Natuna Sea decreased. I think that there is a shift regarding the dominant actor in illegal fishing. Thailand fishing vessels were the most dominant actor in illegal fishing in the Natuna Sea for many years, but now many illegal fishing vessels from Vietnam are arrested (Respondent 10-Central government—Captain Patrol Vessel).

4.2.3 Environmental impacts of illegal fishing

Participants were asked about environmental impacts of illegal fishing. All the respondents agreed that illegal fishing had harmful impacts on the environment, especially the marine environment. Respondents used examples such as depletion of fish stocks, destruction of coral reefs, habitat, and sea floor. Ghost fishing gear thrown away at sea is also polluting and entangling some species.

Depletion of fish stocks was mentioned by 14 of 23 respondents as the most significant impact of illegal fishing. Respondents explained that illegal fishing activities in Indonesian waters increased fishing pressures on certain waters. -Large numbers of illegal fishing vessels in Indonesian waters created big pressures on carrying capacity of marine and fisheries resources. As a result, overfishing and reducing fish stocks threatens fisheries sustainability. This pressure caused overfishing and reducing fish stocks in certain waters including the Arafura Sea and the Natuna Sea.

> I think if many illegal fishermen still operate in our waters, it will reduce Maximum Sustainable Yield (MSY) of our fisheries resources. Of course, fish stocks will be significantly depleted and we may lose some fish species from our waters (Respondent 16-District government—Head of Section Management).

> It is very clear that illegal fishing has direct impacts on depletion of fish stocks and illegal fishing threatens the sustainability of fisheries resources. Regarding how illegal fishermen use trawl nets, we can imagine if many small fish and juveniles are captured, sustainability of fisheries resources will be threatened (Respondent 05-Central government—General Staff (Junior)).

Ten respondents also mentioned that it was the use of destructive fishing gear such as trawl nets that caused serious environmental destruction. Trawl nets were considered as active fishing gear operated by being dragged in mid or bottom waters and can capture all the marine biota because the nets open with a large area and the size of nets means there is a lack of selectivity and very small fish are caught. This fishing method also destroys coral reefs.

> There were significant impacts of illegal fishing on the marine environment. Illegal foreign fishermen destroyed our Marine Protected Area (MPA) and many coral reefs were damaged by their fishing gear (Respondent 01-Central government—Executive Management).

> Illegal fishing in the Natuna Sea had negative impacts on the environment because of pair trawling methods used by foreign fishermen. A trawl net was dragged by two fishing boats and the net swept the bottom of the waters. All the marine biota, including soft coral reefs, were carried away by nets (Respondent 15-Central government—Fisheries Inspector).

Respondents (three) highlighted the fact that illegal fishing had a strong association with *ghost fishing*. ‘The term "ghost fishing" is used to describe the capture of marine organisms by lost or abandoned fishing gear’ (Food and Agriculture Organization 2002a). Respondents considered that ghost fishing threatened the sustainability of fisheries resources because it can be stopped and it is difficult to identify the area where the fishing gear was discarded.

There was an indication that illegal foreign fishing vessels released their old nets at sea. It disturbed the navigational line and created ghost fishing (Respondent 01-Central government—Executive Management).

4.2.4 Economic impacts of illegal fishing

Participants were asked about the economic impacts of illegal fishing. All the respondents agreed that illegal fishing had negative impacts on the economy. Decreasing incomes for fishermen, loss of state's revenue, and multiplying impacts on fisheries business were mentioned by respondents in explaining the economic impacts of illegal fishing.

More than half of the respondents (14) stated that income had declined significantly due to illegal fishing activities. Respondents considered that local fishermen were unable to compete with illegal fishermen which had higher vessel capacity and better fishing gear technology. Conversely, fish stocks in shore areas also declined and local fishermen needed to go further out to sea to capture fish.

Our catch declined significantly when many illegal fishing vessels operated in the Natuna Sea. Foreign fishermen operated trawl nets, while we only used hand line or long line. Let's imagine they can capture more than one ton each setting and we only get ten fish. We lost our income (Respondent 17-Local Village Leader).

The economic impacts of illegal fishing in the Natuna Sea were inevitable. Local fishermen cannot capture fish near the shore, they have to go far away to find new fishing grounds and of course, fishing trips became longer and petrol costs also increased. The economic cost for food also reduced the fishermen's income (Respondent 15-Central government—Fisheries Inspector).

There was loss of State's revenue caused by illegal fishing activities which was discussed by five participants. Respondents explained that the fisheries sector was one of the contributors to Indonesian revenue through Gross Domestic Product (GDP). Illegal fishing reduced the

amount of GDP because it triggered the decline of fisheries production. Moreover, illegal fishing fishermen did not pay any dues for fishing vessels (e.g. taxes, retribution and fees).

> There were negative consequences from an economic side. Catch landed should be our national income to drive the local and national economy. However, this income goes to illegal foreign countries (Respondent 04-Central government—General Staff (Junior)).

> [There was] direct impact [of illegal fishing] to State revenue. First, we lost retribution income from catch landing at fisheries ports because foreign fishermen directly landed the fish in their countries. Second, we lost our income from taxes including registration taxes and operational documents fees (Respondent 03-Central government—General Staff (Senior)).

In a broad perspective, economic impacts of illegal fishing affect all fisheries business. Four respondents also considered that illegal fishing influences the performance of fisheries business in Indonesia. They emphasized that fishing industries underpinned other fisheries business. For instance, fishing industries support raw material for processing units which results in good quality of fisheries products. Without a sustainable raw material supply from fishing industries, processing industries can collapse due to lack of raw materials.

> If illegal fishing can be solved, fisheries business will grow because the whole process from fishing, landing, processing and marketing the product can be run securely (Respondent 02-Central government—General Staff (Senior)).

4.2.5 Social impacts of illegal fishing

Participants were asked about their opinion on social impacts of illegal fishing to acquire understanding of how illegal fishing activities had impacted local communities. Thirteen of the respondents answered that illegal fishing activities triggered intense competition and conflict at sea. Respondents were concerned that conflicts between local and foreign fishermen

occur at sea. Illegal foreign fishing vessels destroy local fishers' gear triggering conflict. Moreover, illegal fishing also increased competition among local fishermen to capture fish. As the number of fishermen increased, fishermen from other regions also came in, however, fish stocks decreased as an impact of illegal fishing. As a result, frequent conflicts among local fishermen occurred in coastal areas.

> We had an experience a few years ago. We had a conflict with illegal foreign fishermen. They dragged our fishing gear (i.e. long line) and local fishermen overran their vessel but they bumped our boats (Respondent 20-Local Fishermen).

> Yes, there are social impacts of illegal fishing to local fishermen. Illegal fishing activities reduce opportunities to capture fish, then this situation creates conflict in many coastal areas (Respondent 05-Central government—General Staff (Junior)).

Eight respondents considered that illegal fishing resulted in declining economic capability of local fishermen to achieve better living standards so satisfaction with quality life also decreased because of limited access to resources and decreasing income. Many fishermen also have high dependency on debt to operate their fishing vessels.

> Declining catch directly impacted on their economy. They become less prosperous and had to fight for basic daily needs. They still go to sea but the results are insufficient to support their life and families (Respondent 07-Central government—Executive Management).

> We are concerned that illegal fishing can reduce our prosperity level especially local fishermen in the Natuna Sea. We are really worried about the future of our children if illegal fishing activities cannot be solved (Respondent 19-POKMASWAS Surveillance Coordinator).

Two respondents noted that local fishermen felt discomfort with the existence of illegal fishermen on their island. They explained that illegal foreign fishermen anchored close to the island and spent time at the port and in the hotel and bar. Illegal fishermen using Indonesian establishments created pressures within local communities and made local fishermen uncomfortable.

> When we see what happened in the Pulau Tiga-Natuna few years ago, we find foreign fishermen anywhere. They stayed and conducted their activities there securely. Natuna Island is like their own land. I think this was not good psychologically for the Indonesian people in Pulau Tiga (Respondent 03-Central government—General Staff (Senior)).

One respondent also stated that there was bad experience of the interaction of foreign fishermen with people in remote islands especially regarding the spreading of the sexual infected diseases and HIV/AIDS. According Harahap (2011) the spread of HIV/AIDS in early 2000 in some regions in West Kalimantan indicated transmission by foreign fishermen. A high number of individuals also suffered from the spread of HIV in Anambas Island several years ago.

> Several years ago, illegal fishing had negative impacts in spreading HIV from foreign fishermen to local people. Foreign fishermen often visited the island to find prostitutes in the area (Respondent 13-Central government—Captain of Patrol Vessel).

4.3 Results from government interviews – perceptions about community-based surveillance

Government staff respondents were asked about their perspectives of the advantages of community-based surveillance in monitoring and surveillance of illegal fishing especially in the Natuna Sea. Participants were asked several questions about community-based

surveillance including its overall success and its contribution to monitoring and surveillance of illegal fishing, the use of monitoring reports, users, and quality of POKMASWAS' reports. Respondents were also asked their opinions about the strengths and weaknesses of community-based surveillance and for suggestions to improve the role of community-based surveillance in combating illegal fishing in Indonesia. The findings related to these questions are discussed in the following section.

4.3.1 Success of community-based surveillance

Respondents were asked to rate on a scale of 1 to 5, (1 being 'not at all successful' to 5 being 'extremely successful') if community-based surveillance was successful in making a contribution to monitoring and surveillance of illegal foreign vessels. All respondents confirmed that community-based surveillance was either 'moderately successful' or 'very successful in conducting monitoring and surveillance of illegal fishing both in Indonesia and in the Natuna Sea. Respondents considered that community-based surveillance had provided accurate information regarding illegal fishing and presented active participation in combating illegal fishing. However, respondents also considered that community-based surveillance did not use the Short Messages Service (SMS) Gateway effectively, and there was a lack of coordination with the local government. These points are discussed below.

Nine respondents considered that community-based surveillance provided accurate information on illegal fishing activities. Respondents thought that community-based surveillance members were fishermen who directly witnessed illegal fishing activities at sea. Community-based surveillance members can provide clear information related to the size and number of illegal fishing vessels, type of fishing gear being used and the location of illegal fishing. Moreover, respondents also answered that the members of community-based surveillance were local people who understand the characteristics of the sea including currents, waves and location of illegal fishing. This information is highly useful for law enforcement units.

> [community-based surveillance] is an effective way for government to acquire information about illegal fishing. Many illegal fishermen can be caught because of the information from community-based surveillance members. They went to sea as fishermen and reporting to the nearest patrol vessels when they find illegal fishing activities at sea. This was accurate information and it can be followed up by the Captains of Patrol vessels (Respondent 06-Central government—Head of Section).

> In my opinion, community-based surveillance was very helpful because POKMASWAS members were in the similar location as the illegal foreign fishermen. They reported useful information to support our operations. For instance, they told us the longitude and latitude of illegal foreign vessels and we can intercept the vessels. They also informed us about the characteristics of the sea (e.g. waves and currents) to fisheries inspectors and other law enforcement units. (Respondent 10-Central government—Captain Patrol Vessel).

Three respondents felt that the successes of community-based surveillance indicated active participation of local communities in combating illegal fishing in Indonesia. In this context, respondents thought that community-based surveillance was an initiative which enhanced the spirit of local communities to be actively involved in monitoring and surveillance of illegal fishing. Moreover, respondents also considered that participative surveillance can be one of the best methods to deal with the limitation of fisheries surveillance in Indonesia (e.g. limited human resources and lack of surveillance technology).

> Community-based surveillance has a vital function to support surveillance systems in Indonesia. Government needs their role on monitoring and surveillance of illegal fishing because we have a limited number of fisheries inspectors and patrol vessels which cannot cover all Indonesian waters. Therefore, governments need their participation to protect our fisheries resources from illegal fishing (Respondent 07-Central government—Executive Management).

However, three respondents were concerned that there were some technical issues which hampered the role of POKMASWAS in monitoring and surveillance of illegal foreign fishing vessels. For instance, two reported that there was not too much information about illegal fishing reported through the Short Messages Service (SMS) Gateway. POKMASWAS members often report directly to captains of patrol vessels by phone or radio Single Signal Band (SSB). The reports of monitoring and surveillance from POKMASWAS were not well-documented and cannot be considered in policy making. Respondents thought that POKMASWAS' reports could be followed up quickly, however these reports did not influence illegal fishing policy significantly because only a few POKMASWAS reported through written reports or SMS.

> I think it is moderately successful. I used the SMS Gateway as one of the indicators. This application was designed by the Ministry of Marine Affairs and Fisheries to accept reporting from POKMASWAS. Unfortunately, there were a only a few incidents of illegal fishing reported. Local fishermen called Captain Patrol Vessels directly (Respondent 04-Central government—General Staff (Junior)).

One respondent mentioned that strong intervention from the local government to establish community-bases contrasted with the value of POKMASWAS. Ideally, POKMASWAS was established by local community initiatives based on self-awareness to become involved in monitoring and surveillance of illegal fishing. The respondent claimed that many local governments initiated establishment of POKMASWAS to get funding from the central government. When more POKMASWAS were available, local government could acquire more funding to supervise POKMASWAS. Local governments were often more focused on the number of community-based surveillance groups. The respondent thought that local government intervention to establish POKMASWAS can reduce the value of volunteerism which should be the root of all community-based surveillance.

> The basic value of community-based surveillance is self-awareness of local communities to become involved in surveillance of illegal fishing by providing relevant information. It is a part of voluntary activities. Strong intervention from the government to increase the number of POKMASWAS can reduce voluntary spirit. Local communities thought that reporting was an obligation to government (Respondent 03-Central government—General Staff (Senior)).

4.3.2 Community-based surveillance reports

Respondents were asked to rate on a scale of 1 to 5, (1 being 'not at all useful to 5 being 'extremely useful') if the reports of community-based surveillance were useful for combating illegal fishing in Indonesia. All respondents agreed that the reports were very useful in combating illegal fishing both for Indonesia and also for the Natuna Sea. Respondents considered that information provided by community-based surveillance was highly accurate, reducing governments' cost for operational surveillance, effective in designing preventive action for illegal fishing, although some information reported by POKMASWAS members needed to be clarified before follow up action was taken.

Eight found the information reported by community-based surveillance was very useful to assist in developing an effective strategy to arrest illegal foreign fishermen. There were two main reasons why this needed to be developed for Indonesian waters. First, Indonesia needed to anticipate new *modus operandi* practiced by foreign fishermen by collecting information about illegal activities at sea and community-based surveillance can help collect this information. Second, Indonesia is required to optimize operational patrol vessels by supplying useful information concerning illegal fishing at sea to Captains of patrol vessels. Respondents explained that without sufficient information (e.g. location of illegal fishing, number of illegal fishing vessels, etc.), the operational cost of patrol vessels was higher because they sailed into a large area of Indonesian Exclusive Economic Zones without a clear target (i.e. illegal fishing vessels).

> Reports from community-based surveillance were very useful. We have a limited number of fisheries inspectors and patrol vessels. Information from POKMASWAS helped us to design a low cost operation by intercepting foreign vessels in targeted areas at sea (Respondent 05-Central government—General Staff (Junior)).

> Reports from community-based surveillance were vital for the Ministry of Marine Affairs and Fisheries. Their reports can be one of the considerations in arranging surveillance strategies in remote areas such as the Natuna Sea (Respondent 07-Central government—Executive Management).

Six respondents confirmed that information provided from community-based surveillance was very useful because the quality of the information was highly accurate and up to date. Respondents explained that local fishermen directly called Captains of patrol vessels by SSB Radio when they witnessed illegal fishing. This information usually informed the nearest patrol vessels of the location of the illegal fishing activities. Therefore, patrol vessels were able to take necessary action quickly, including inspection and arresting foreign fishermen after they found overwhelming evidence (e.g. fish, location of operation illegal fishermen and fishing gear).

> I think that the reports from community-based surveillance were very useful because they reported in real time or when illegal fishing activities were happening at sea. They informed the fisheries inspectors or captains of patrol vessels and we can go directly to the location (Respondent 15-Central government—Fisheries Inspector).

> Information from community-based surveillance were ‘A1’ (reliable information) because local fishermen became the witnesses of illegal fishing activities at sea. We made a good relationship with them to get information on illegal fishing in the Natuna Sea. They usually informed us when they found illegal fishing (Respondent 13-Central government—Captain of Patrol Vessel)

However, two respondents also highlighted that some information from community-based surveillance reported through Short Messages Services (SMS) Gateway needed to be classified based on the level of accuracy. Not all the information can be used by Captains of patrol vessels as consideration for operations at sea. Respondents claimed that some reports on the SMS gateway only gave general information (e.g. weather conditions, catch landings at port etc.). General information should be separated from information about illegal fishing activities which need necessary action from fisheries inspectors or patrol vessels.

> In general, information provided by local communities was very useful. However, there were some reports which were not associated directly with monitoring illegal fishing. We should educate local communities to consider whether information needs to be reported to a law enforcement agency or not (Respondent 04-Central government—General Staff (Junior)).

4.3.3 The use of community-based surveillance reports

Participants were asked how government agencies (e.g. law enforcement units, technical directorate, and local government) used monitoring data reported by community-based surveillance. Respondents answered that monitoring data were used in wide range activities for combating illegal fishing and through different government institutions. The use of monitoring data from community-based surveillance used to intercept illegal fishermen, forwarded to relevant agencies, and used to map fisheries violations at sea was highlighted. However, one respondent also criticized the fact that POKMASWAS monitoring data were not well stored or processed by government institutions.

Seven respondents explained that monitoring data from community-based surveillance were used by fisheries inspectors and captains of patrol vessels to detect and intercept illegal foreign fishermen at sea. Local fishermen usually directly inform (e.g. by phone or Single Signal Band/SSB radio) fisheries inspectors or Captains of patrol vessels when find illegal fishing activities at sea. Fisheries inspectors and Captains of patrol vessels are law

enforcement officers under the Ministry of Marine Affairs and Fisheries who have authority to inspect and arrest illegal fishing vessels. Respondents highlighted Fisheries Inspectors and captains of patrol vessels follow up of information about illegal fishing (e.g. time, location and number of fishing vessels) from community-based surveillance.

> We responded quickly when we acquired information about illegal fishing activities from the local fishermen. They usually called us, “Sir, there were illegal fishermen here, the location was in this longitude and latitude”. We directly go there to conduct hot pursuit to catch the illegal fishermen. We thank them for their information (Respondent 13-Central government—Captain of Patrol Vessel).

The importance of monitoring data from community-based surveillance used to map vulnerable locations of illegal fishing and fisheries violations was identified by three respondents. The Directorate of Monitoring and Patrol Vessels collected information from community-based surveillance, law enforcement agencies and the Vessel Monitoring System (VMS) to produce comprehensive information (e.g. maps of vulnerable areas of illegal fishing in Indonesian waters) which can be used by law enforcement agencies. Respondents claimed that information provided by community-based surveillance was one of the most important sources used to create illegal fishing maps.

> We compiled information from community-based surveillance. We mapped the locations of the vulnerable areas of illegal fishing, fish bombing and other fisheries violations. This information helped us to focus on particular areas (Respondent 02-Central government—General Staff (Senior)).

However, one respondent also thought that monitoring data from community-based surveillance was not well managed. They claimed that data management (i.e. SMS Gateway) in the Ministry of Marine Affairs and Fisheries was not designed to give a quick response. Respondents thought that manual correspondence (i.e. letters) among Directorates to follow

up the reports also hampered fast action. For instance, letters and correspondence among Directorates (e.g. Directorate Monitoring and Patrol Vessels to Directorate of Fisheries Surveillance) took at least one day or maybe longer. This was inefficient because some reports needed immediate action.

> I think we did not use the monitoring data from community-based surveillance effectively. This was still far from good if we compared it with how private sectors manage data and information. Our responses to POKMASWAS reports were very slow and consuming a long time. We need to improve our service in responding community reports (Respondent 04-Central government—General Staff (Junior)).

4.3.4 The users of community-based surveillance' reports

Participants were asked about institutions, agencies and organizations which used monitoring data reported by community-based surveillance. Respondents mentioned that community-based surveillance data were used by several institutions including law enforcement agencies, marine and fisheries surveillance units, local government and Non-Government Organizations (NGO).

Thirteen of the respondents identified that law enforcement agencies were the institution which most frequently used monitoring data from community-based surveillance. Law enforcement agencies consisted of the Ministry of Marine Affairs and Fisheries (i.e. fisheries inspectors, fisheries investigators and captain patrol vessels) and other agencies including the Navy, Coast Guard and Water Police. All the institutions were mandated to conduct law enforcement (e.g. inspection, arrest and detain) of illegal fisherman based on the Fisheries Act 2009. Monitoring data from POKMASWAS were used by these institutions as one of the considerations before conducting operations to arrest illegal fishermen at sea. Besides monitoring data from POKMASWAS, law enforcement officers also used radar and visual observation. Monitoring data from community-based surveillance were extremely useful

because the information was reported by local fishermen directly from the location of illegal fishing activities.

> [Monitoring data from community-based surveillance] was used by Fisheries Inspectors at Surveillance Units and Captains of Patrol Vessels. Other law enforcement agencies including Navy and Water Police also used information from community-based surveillance (Respondent 04-Central government—General Staff (Junior)).

> Monitoring data from community-based surveillance was forwarded to the Water Police, Navy and Coast Guards. These institutions had similar duties with those of the Ministry of Marine Affairs and Fisheries to conduct surveillance of illegal fishing activities at sea (Respondent 12-Central government—Executive Management).

Monitoring data from community-based surveillance also were used by Directorate which supported surveillance activities according to seven respondents. Information from POKMASWAS (i.e. SMS gateway) was collected by the Directorate of Monitoring and Patrol Vessels then circulated to the surveillance units. All information related to fisheries was forwarded to the Directorate of Fisheries Resources Surveillance; and all information related to marine issues was forwarded to the Directorate of Marine Resources Surveillance. Both Directorates considered monitoring data from POKMASWAS before taking marine and fisheries surveillance policy.

> Monitoring data from community-based surveillance was used by the Directorate of Fisheries Resources Surveillance, Directorate of Marine Resources Surveillance and Directorate of Monitoring and Patrol Vessels (Respondent 06-Central government—Head of Section).

As noted by four respondents local governments also used monitoring data from community-based surveillance. These agencies have a responsibility to manage waters areas up to 12

nautical miles from the shore. Local governments manage fishing licenses for fishing vessels below 30 gross tonnes and protect territorial waters from illegal fishing activities. It was explained by the respondents that data from community-based surveillance monitoring were used by local government as a data input in creating empowerment programs for POKMASWAS including capacity building and providing surveillance facilities and capacity building. The reports were also used to communicate with law enforcement agencies including Navy, Water Police, and Fisheries Inspectors.

> Community-based surveillance reports were also used by Marine and Fisheries Agencies in Districts and Provinces. They also followed up POKMASWAS reports and informed the law enforcement agencies (Respondent 07-Central government—Executive Management).

> We also gave support to community-based surveillance. We provided small boats with engine capacity up to 40 Horse Power (HP) which can sail up to 4 nautical miles. We also assisted them to run the group as an organization (e.g. manage funding, member and enhance voluntarism) (Respondent 16-District government—Head of Section Management).

One respondent also mentioned that a Non-Government Organization used monitoring data from community-based surveillance to develop empowerment programs for community groups and for research. it was stated that some NGOs expressed serious interest in promotion of community-based surveillance as support for POKMASWAS to conduct monitoring and surveillance of illegal fishing.

> As far I know, MMAF is not the single user of monitoring data from community-based surveillance. POKMASWAS had good relations with enforcement agencies (e.g. navy and water police) and also Non-Government Organizations such as the World-

Wide Fund (WWF), the Wildlife Conservation Society (WCS) and other NGOs (Respondent 05-Central government—General Staff (Junior)).

4.3.5 Strengths of community-based surveillance

Participants were asked about the strengths of POKMASWAS as an initiative to involve local communities in combating illegal fishing in Indonesia. All the respondents agreed that community-based surveillance had enormous strengths in monitoring and surveillance of illegal fishing. They highlighted some strengths of community-based surveillance including enhanced community awareness to protect the marine and fisheries resources, involving 'real' fisheries stakeholders (e.g. local fishermen) who understand about illegal fishing, having a large number of members, providing useful information about illegal fishing activities, and reducing government cost for surveillance. These points are discussed.

Community-based surveillance was seen as an excellent initiative in combating illegal fishing in Indonesia by seven respondents. Local communities, local fishermen, local and religious leaders, and Non-Governmental Organizations should be involved in combating illegal fishing in Indonesia. Respondents thought that many people with different backgrounds were involved voluntarily in community-based surveillance because of the strong awareness to protect marine and fisheries resources. This awareness was a social capital which can be useful to combat illegal fishing in Indonesia. Respondents emphasized that strong awareness to protect fisheries resources motivates local fishermen and local communities to conduct patrols, collect information and report to law enforcement officers. POKMASWAS members were not paid for their contribution, but conducted their work sincerely. This presented community spirit to combat illegal fishing.

> Community-based surveillance is based on voluntary spirit. This means that participation from the community is the key factor. Communities are aware of marine and fisheries environments and that they should be protected from many challenges

(e.g. illegal fishing, and destructive fishing) and they established surveillance groups (Respondent 09-Central government—Head of Section Management).

Community-based surveillance members thought that giving information about illegal fishing to the government was a part of their social responsibility to protect their area. This is about nationalism and the way to show their love for this country (Respondent 01-Central government—Executive Management).

They feel that sea is their assets. They should protect it [from illegal fishing activities]. They give information about illegal fishing because they want to protect their area from many negative consequences. This is a part of their social responsibility to protect their sea and land (Respondent 10-Central government—Captain Patrol Vessel).

Five respondents mentioned that community-based surveillance provided useful, real and accurate information and that accurate information played a vital role in combating illegal fishing. The Indonesian government had a limited number of patrol vessels, technology capacity and human resources to cover all Indonesian waters. Therefore accurate information provided by POKMASWAS can help deal with these limitations. Respondents thought that community-based surveillance can provide accurate and up to date information because POKMASWAS members are fishermen who are directly informed about illegal fishing and able to give the location and number of the vessels. Clear information (location, number of illegal vessels and fishing gear) were only obtained when patrol vessels stayed at sea and patrol surrounding waters, but this information also came from POKMASWAS members who were fishing.

In my opinion, community-based surveillance provided real information. They informed us about illegal activities when they were seen. This was helpful for us to take follow up action (Respondent 06-Central government—Head of Section).

> I got perfectly accurate information. I accepted information [illegal fishing activities] from local fishermen and went to the location directly. The information was highly accurate (Respondent 13-Central government—Captain of Patrol Vessel).

Three of sixteen respondents explained that the enormous number of community-based surveillance in coastal area in Indonesia were the strengths of POKMASWAS. Respondents considered that Indonesia had big challenges to monitor and survey large areas of Exclusive Economic Zones and territorial waters, however lack of technology capacity, limited surveillance facilities (e.g. patrol vessels) and few surveillance officers, remained a classic problem for Indonesia. This limitation influenced monitoring and surveillance conducted by governments. In this context, community-based surveillance becomes one of the alternative solutions to deal with the limitation. Respondents claimed that POKMASWAS had important members who can help government to provide information about illegal fishing.

> Many people are involved in community-based surveillance. Of course, this helped the government who only had limited human resources (i.e. fisheries inspectors or patrol vessel' crews) to conduct monitoring and surveillance activities in our waters including the Natuna Sea. The existence of POKMASWAS assisted me in supplying human resources for surveillance (Respondent 01-Central government—Executive Management).

Similarly, respondents saw that members of community-based surveillance were dominated by local fishermen who fish every day and understand the real conditions at the sea including illegal fishing activities. They considered that local fishermen were an effective 'spy' at sea because illegal fishermen did not think that local fishermen reported illegal fishing activities to law enforcement officers. Illegal fishermen are often unaware that local fishermen monitor illegal fishing activities by recording the location (e.g. longitude and latitude) and reporting to the Captains of Patrol Vessels. It was thought that community-based surveillance worked effectively because of the 'spying' approach on illegal foreign fishing vessels.

> Local fishermen were not suspicious to illegal foreign fishermen. Local fishermen went to the sea and reported to government officers directly when they saw illegal fishing activities happening (Respondent 14-Central government—Fisheries Inspector).

Two respondents also explained that the role of community-based surveillance helped the governments to reduce the operational cost for monitoring and surveillance. From the government perspectives, community-based surveillance was a successful initiative with a low-cost budget. There were three reasons which can explain the effectiveness of POKMASWAS. First, governments are not required to recruit new government officers which means reducing the budget for officer's salaries. Second, government can reduce its budget to build offices or surveillance facilities. Third, patrol vessels can reduce operational costs because they do not need to spend a long time on patrol. Captains of patrol vessels used information from POKMASWAS members to intercept illegal foreign fishermen.

> From the government perspective, community-based surveillance was a low cost program with great advantages. Governments do not need to pay the community but government get many advantages including information of illegal fishing in Indonesian waters (Respondent 04-Central government—General Staff (Junior)).

4.3.6 Weaknesses of community-based surveillance

Respondents were then asked about the weaknesses of community-based surveillance as an initiative to involve local communities in combating illegal fishing in Indonesia. All agreed that community-based surveillance also had fundamental weaknesses, including limited facilities used by community-based surveillance, limited support from the governments, and lack of education and knowledge of community-based surveillance members. These points will be elaborated below.

Ten respondents considered that community-based surveillance used only limited facilities in conducting monitoring and surveillance, and were concerned that limited facilities hamper POKMASWAS operations. For instance, many local fishermen operate their own vessels and cannot reach far distances. Moreover, operating small boats in Exclusive Economic Zones was a high safety risk. Another issue concerned communication equipment. Some local fishermen had SSB radios to communicate with law enforcement officers, while the majority only used hand phones and Handy Talky which can only be operated over limited distances.

> Community-based surveillance had limited facilities to conduct monitoring and surveillance. For instance, local fishing boats usually only reach up to 12 nautical miles. Equipment to communication was also limited. Mobile Phones only reach up to 3 nautical miles from shore. When they use hand-talky, we cannot guarantee confidentiality of reports (Respondent 08-Central government—Captain Patrol Vessel).

> Government should provide communication equipment which is easy for local fishermen to use. I imagined that we supported local fishermen with equipment which connected with our monitoring centre. We can learn from East Timor which provides this equipment to local fishermen. Local fishermen only need to push the button and this information can be sent directly to fisheries inspectors, captains of patrol vessels and law enforcement officers (Respondent 13-Central government—Captain of Patrol Vessel).

Limited support from the governments was one of the weaknesses of community-based surveillance according to five respondents. They emphasized that governments did not provide sufficient support for community-based surveillance, either surveillance equipment or soft-skilled programs (e.g. capacity building and training). Lack of supports from local government influenced POKMASWAS capacity in conducting monitoring and surveillance. Respondents also highlighted that there was significant a change after implementation of the

Autonomous Act 23 Year 2014. All the obligation to supervise and guide POKMASWAS came under the authority of provincial governments. This authority was conducted by district governments before 2013. This change reduced supervising programs because the distance of provincial government from the districts and limited human resources in provincial offices to conduct supervising of community-based surveillance.

> We realize that guiding and empowerment programs from local and central government were very limited (Respondent 04-Central government—General Staff (Junior)).

> Coordination and guidance from local government were very limited. Moreover, under the Local Government Act 23 year 2013, the authority to educate and coordinate community-based surveillance was taken over by provincial government. This is a big problem because provincial government has limited resources (e.g. officers and agency) at the district level (Respondent 09-Central government—Head of Section Management).

Just two respondents mentioned that low education level and knowledge were one of the fundamental weaknesses of community-based surveillance. Local fishermen are not usually well-educated in Indonesia and do not understand the laws and regulations. Community-based surveillance members were often thought of as law enforcement officers who can inspect and arrest illegal fishermen. Respondents also considered that community-based surveillance had limited capacity to conduct administration tasks such as writing reports, recording and storing results of regular meetings and recording the number of people who join POKMASWAS.

> Community-based surveillance members usually only graduated from elementary school or even did not finish yet. They often thought [of themselves] as enforcement officers and ask for to equipment such as guns. They also had a problem to manage

POKMASWAS as an organization (Respondent 16-District government—Head of Section Management).

4.3.7 Suggestions to improve community-based surveillance

Respondents were asked for their suggestions to improve the role of community-based surveillance. All agreed that the role needed to be improved and suggested some necessary action which needed to be taken including increasing supervision from government (e.g. capacity building programs), providing supporting facilities, designing intelligence systems and improving regulations.

Eight respondents considered that the government role was to guide and supervise community-based surveillance to improve POKMASWAS capacity in combating illegal fishing. They thought that guidance from the government could help by providing the procedures to conduct monitoring, reporting the result, and coordinating with government agencies. Respondents also considered that transferring soft skills through training and capacity building would enhance POKMASWAS capacity. For instance, the government need to train community-based surveillance to conduct effective observation and use office equipment such as computers, printers and internet. This training will be helpful to improve POKMASWAS capacity.

> Governments need to supervise community-based surveillance. Coordination between institutional governments including local governments, law enforcement agencies, and central government with community-based surveillance should be established. Government attention to community groups can enhance POKMASWAS spirit and motivation to be more active on monitoring and surveillance illegal fishing activities (Respondent 12-Central government—Executive Management).

> I think community-based surveillance needs to be given capacity building to conduct monitoring effectively. For instance, they need to be educated about monitoring techniques and reporting the results. They require administrative skills to use computers and the internet (Respondent 07-Central government—Executive Management)

It was felt by seven people that governments should provide facilities and equipment to community-based surveillance as the limited facilities, such as boat and communication equipment, can hamper monitoring and surveillance conducted by community-based surveillance. Coverage of monitoring areas could be improved by providing facilities such as fibreglass boats to local fishermen. Community-based surveillance could then sail further from the shore and reach larger areas, including Exclusive Economic Zones. Furthermore, respondents also thought that the quality of monitoring reports can be improved by using modern equipment. The use of Single Sideband (SSB) Radio may be more relevant to support community-based surveillance because the distance coverage can reach 75 to 250 nautical miles (Brown 2008). SSB Radio would improve the quality of the monitoring reports.

> We should support community-based surveillance with facilities, equipment and tools. They need our support to conduct monitoring and surveillance of illegal fishing activities at sea (Respondent 01-Central government—Executive Management).

> I suggest governments support community-based surveillance with communication tools. For instance, the government can provide SSB which would help fishermen to report illegal fishing activities confidentially in Exclusive Economic Zone/EEZ because communication tools were the actual problem (Respondent 08-Central government—Captain Patrol Vessel).

The government needs to accommodate community-based surveillance in a ‘fisheries intelligence board’. Three respondents thought Indonesia should design a comprehensive

intelligence system by involving community-based surveillance to combat illegal fishing as data and information management are critically important. The Ministry of Marine Affairs and Fisheries can establish a ‘fisheries intelligence board’ to manage all information and data on illegal fishing including data reported by POKMASWAS and distributing information to law enforcement agencies. This board can integrate all information concerning illegal fishing from a wide range of sources such as satellite imagery, Vessel Monitoring System, POKMASWAS and patrol vessels.

> We can create an intelligence system and involve community-based surveillance as one of the parts of this system. We can manage information from group members, build networking among one group to others and connect to law enforcement units. Intelligence systems can help us in combating illegal fishing because many data and information can be used (Respondent 03-Central government—General Staff (Senior)).

One respondent also suggested that regulations about community-based surveillance need to be amended. The Ministry of Marine Affairs and Fisheries Regulation 58/2001 on Community-based surveillance was out of date and not suitable for the actual situation. Many aspects and issues were not covered under the Ministry of Marine Affairs and Fisheries Regulation 58/2001, such as coordination among community groups, the role of local governments in supervising community groups, and procedures to report monitoring and conducting surveillance activities. It was considered that Amendments of this regulation should explain clear procedures of monitoring and reporting and the relationship of community-based surveillance with government agencies.

> I think Ministerial Regulation 58/2001 was one of the weaknesses of the community-based surveillance system. This regulation is not suitable for with current situation because social conditions have changed and it needs to be accommodated under new regulations (Respondent 06-Central government—Head of Section).

4.4 Results from POKMASWAS participants interviews: Monitoring and surveillance

Seven participants from community-based surveillance were asked about the process of monitoring and surveillance conducted by POKMASWAS. This research was designed with different questions (see Appendix 1) for community based surveillance to explore monitoring and surveillance of illegal fishing by POKMASWAS including the monitoring and surveillance process, equipment used, level of satisfaction, to whom reports were given, reporting procedures, the use of reporting, data users and cooperation among community-based surveillance.

4.4.1 Monitoring and surveillance process

POKMASWAS members were asked about the process of monitoring and surveillance of illegal fishing in the Natuna Sea based on their experiences to explore who was involved in monitoring and surveillance, data collected and method, stored and compiled information and reporting procedures.

4.4.1.1 Who is involved in collecting data

All POKMASWAS members confirmed that local fishermen are directly involved in monitoring and collecting data of illegal fishing activities in the Natuna Sea. POKMASWAS members also stated that local fishermen were the key actors in collecting information because they go to sea every day and witnessed the illegal fishing activities. POKMASWAS members thought that all the information about the situation at sea including illegal fishing activities, came from local fishermen.

> We have SSB radio to call local fishermen in the Natuna Sea. Local fishermen conduct monitoring not only for illegal fishing but also the general situation such as weather, fish and safety issues (Respondent 19-POKMASWAS Surveillance Coordinator).

> We approach local fishermen who go to sea. Local fishermen knew the situation at sea and we collected all the information from them (Respondent 18-Private Businessman).

Over half (four) POKMASWAS members stated that there was a radio operator/surveillance coordinator and local leaders on land who were involved in the data collection process. Both local leaders and radio operator/surveillance coordinators called local fishermen to ask for information in the Natuna Sea. The members explained that the local leader and radio operator/surveillance coordinator forwarded information from local fishermen to fisheries inspectors, Navy and Water Police.

> We are not brave enough to approach illegal fishermen. We call the radio operator/surveillance coordinator on land to forward information about illegal fishing to law enforcement officers (Respondent 22-Local Fishermen).

4.4.1.2 Method to collect store and compile data,

Five respondents stated that monitoring and surveillance of illegal fishing activities were conducted by community-based surveillance members when they went fishing. POKMASWAS members were local fishermen and did not allocate special time to conduct monitoring and surveillance of illegal fishing. When they observed illegal fishing activities, the local fishermen collected relevant information and reported through SSB radio to operators.

> When we found illegal fishermen in the Natuna Sea, we tried to find information about the flag state, estimate the position and direction of illegal fishing vessels, crews, and fishing gears. Then we reported directly through the SSB Radio to operator (Respondent 20-Local Fishermen).

Only two respondents allocated special time to conduct monitoring and surveillance. Generally, this activity is conducted irregularly by community-based surveillance. The monitoring cannot reach far and only operated in territorial waters (up to 12 nautical miles

even less) because of their engine capacity and limited petrol. While the surveillance acquired the boat from the local government, operational costs were not supplied by the local governments. Operational costs were one of the problems for community-based surveillance to conduct regular operations.

> Local government provided a small boat with the engine power 40 HP. We used to patrol and collect information only around shores. Then we send the reports through SMS gateway. We did not store the information (Respondent 18-Private Businessman).

4.4.1.3 Type of information and reporting method

Almost all (6) POKMASWAS members explained that information on illegal fishing was verbal. They explained that the information was transferred directly through communication equipment such as SSB Radio and hand phones. Verbal reports were chosen because this was a faster way to deliver information to law enforcement agencies. POKMASWAS members also thought that audio communication can be followed quickly by law enforcement officers.

> If we saw illegal fishermen, we called directly (e.g. radio operator/surveillance coordinator) to ask for help from Navy or patrol vessels. Law enforcement officers gave quick response and arrested illegal fishermen (Respondent 23-Local Fishermen).

However, POKMASWAS members mentioned that the monitoring reports were given irregularly and were only delivered when local fishermen found illegal fishermen in the Natuna Sea. Monitoring and surveillance activities were an additional duty because they went to sea for fishing, while communication with the surveillance coordinator was conducted intensively every day.

> We did not report [illegal fishing] regularly. When local fishermen did not see illegal fishing activities, we did not report anything. But, we always keep in contact with our surveillance officers on the Island (Respondent 20-Local Fishermen).

One POKMASWAS member also thought that information on illegal fishing in the Natuna Sea also delivered through SMS. The Ministry of Marine Affairs designed the SMS Gateway to receive reports (in short-text) from POKMASWAS members. MMAF also provided hand phones and SIM Cards for each POKMASWAS to report their results. A POKMASWAS member explained that the SMS gateway is also used to report information of illegal fishing and other general information (e.g. conditions on the island, weather, season and fishermen lost).

> We also reported to the Ministry of Marine Affairs and Fisheries through SMS gateway (Respondent showed SMS to interviewer). This equipment (hand phone and SIM Card) were provided hand phones for us. We usually reported general information on the Island (Respondent 19-POKMASWAS Surveillance Coordinator).

Moreover, POKMASWAS members confirmed that communication with the SMS gateway from the Ministry of Marine Affairs and Fisheries was conducted regularly. SMS gateway operators regularly asked POKMASWAS leaders about the conditions in the Natuna Sea and also by reporting actual information such as weather, season and safety conditions at sea.

> [Respondent only showed communication with SMS gateway operator in his hand phones] (Respondent 18-Private Businessman).

4.4.2 Equipment for community-based surveillance

POKMASWAS members were asked about the equipment used to conduct monitoring and surveillance of illegal fishing in the Natuna Sea. They stated that surveillance facilities (i.e. fishing boats) and communication equipment (e.g. radio SSB, handy-talkie and Mobile Phones) were used to report the result of monitoring.

Five stated that fishing boats were used as transportation to conduct monitoring and surveillance. They used fishing boats to go fishing and monitor illegal fishing at the same time. They also used communication equipment (i.e. SSB radio) and binoculars, but SSB radio was usually only used to communicate with radio operator/surveillance coordinator or local leader.

> We use fishing boats to go to sea and we monitor the area surrounding the Natuna Sea using binocular (Respondent 18-Private Businessman).

> We use SSB radio to collect information from local fishermen at sea and forwarded the information to the Captain of Patrol Vessels or Navy (Respondent 19-POKMASWAS Surveillance Coordinator).

However, three members used hand phones to distribute information concerning illegal fishing to law enforcement officers because they thought that this was safer than SSB radio. POKMASWAS members used SSB radio only to accept reports from local fishermen which was then delivered to law enforcement officers.

> We used hand phones because it was easy to use and no one can monitor our reports to Captains of patrol vessels, Fisheries Inspectors or other law enforcement officers (Respondent 17-Local Village Leader).

4.4.3 Community-based surveillance capacity to conduct monitoring and surveillance of illegal fishing

POKMASWAS members were asked to rate on a scale of 1 to 5, (1 being 'very dissatisfied' to 5 being 'very satisfied') whether community-based surveillance had a good capacity to conduct monitoring and surveillance of illegal fishing in the Natuna sea. All POKMASWAS members felt either satisfied or very satisfied. They explained that their satisfaction level in conducting monitoring and surveillance of illegal fishing was influenced by the quick responses from law enforcement officers and strong cooperation among local fishermen.

However, one member also considered that supporting facilities from the government could improve community-based surveillance capacity.

Five people stated that they felt very satisfied with the capacity of community-based surveillance to conduct monitoring and surveillance of illegal fishing and considered that community-based surveillance was underpinned by voluntary spirit. Local fishermen used their own facilities including fishing boats, communication equipment and binoculars and paid for petrol and oil themselves. They were satisfied about using their own properties to support the government in combating illegal fishing. Moreover, they explained that the quick follow up from law enforcement officers to arrest illegal fishermen was the most important aspect.

> We tried to do the best. We have tried to use our resources to collect information about illegal fishing activities and reported to it to law enforcement officers. We were very satisfied with the follow up from Fisheries Inspectors, Captains of Patrol Vessels and other law enforcement officers (Respondent 19-POKMASWAS Surveillance Coordinator).

Only one respondent mentioned that they were satisfied due to strong collaboration among local fishermen in conducting monitoring and surveillance of illegal fishing. He thought that many limitations of community-based surveillance including facilities and budget can be solved because all local fishermen cooperated to conducting surveillance. This cooperation enhanced community-based surveillance capacity. For instance, local fishermen shared information about illegal fishing with the local leader and POKMASWAS members on land. Therefore, information concerning illegal fishing can be forwarded to fisheries inspectors or law enforcement officers quickly and reduce the operational cost of community-based surveillance.

> We collected information on illegal fishing from local fishermen at the Natuna Sea. This was really helpful for us because we only had a small boat and cannot sail far away (Respondent 18-Private Businessman).

However, one member also mentioned that supporting facilities from the government were needed. Monitoring and surveillance of illegal fishing conducted by POKMASWAS was often hampered by limited facilities such as boats and communication equipment. It was considered that community-based surveillance could be improved with supporting facilities. Monitoring can be conducted up to Economic Exclusive Zones (EEZ) safely and quality of monitoring data can be improved.

> We need a big boat and support with communication equipment. We only sailed a small boat which only reached 4 nautical miles. We can sail further if we used a big fishing boat (Respondent 17-Local Village Leader).

4.4.4 Reporting to relevant agencies

POKMASWAS members were asked to whom community-based surveillance reported the result of monitoring and surveillance of illegal fishing. They stated that the reports were delivered to relevant stakeholders including Radio Operator/Surveillance Coordinator, Captains of Patrol Vessels, Navy and Water Police and Fisheries Inspectors.

Four of the seven POKMASWAS members claimed that the result of monitoring and surveillance was reported to Radio Operator/Surveillance Coordinators who stayed on the island. Radio Operator/Surveillance Coordinators were community-based members who communicated with local fishermen at sea and forward the information to law enforcement officers. It was considered that they had a good relationship with law enforcement officers and can collect information from other local fishermen in different spots. The reports contained comprehensive information because this information was collected from many sources.

> We reported information about illegal fishing activities in the Natuna Sea to Radio Operator/Surveillance Coordinators and this information was forwarded to enforcement agencies (Respondent 20-Local Fishermen).

Three POKMASWAS members reported the result of monitoring and surveillance of illegal fishing to the Captains of patrol vessels. Direct reports to Captains were given when the position of patrol vessels was closed to local fishermen. Captains of patrol vessels often contacted local fishermen at sea through SSB Radio. Some local fishermen knew the special channel used.

> We reported to the Captain of Patrol Vessels. We knew S***on [name of Captain] and we gave information to him when we found illegal fishing activities in the Natuna sea (Respondent 19-POKMASWAS Surveillance Coordinator).

Similarly, three members also answered that the reports were delivered to Navy and Water Police. POKMASWAS members considered that the number of patrol vessels under the Ministry of Marine Affairs and Fisheries were also limited. Support from other law enforcement officers such as Navy and Water Police were required which was the reason why community-based surveillance reported to them.

> We also reported to Navy and Water Police because they also played a significant role in combating illegal fishing in Indonesia. They also operated patrol vessels to protect the Natuna Sea (Respondent 19 POKMASWAS Surveillance Coordinator).

Two members reported to Fisheries Inspectors at the fisheries port to report the result of monitoring. These reports were usually delivered by surveillance coordinators or local leaders based on the information collected by local fishermen.

> We also communicated with Fisheries Inspectors and reported information about illegal fishing in the Natuna Sea (Respondent 17-Local Village Leader).

4.4.5 Reporting procedures

POKMASWAS members were asked about the procedures of reporting the results of monitoring and surveillance of illegal fishing in the Natuna Sea. This question covered several

aspects including reporting steps and time, type of information reported and reporting method.

4.4.5.1 Steps and time of reporting

All POKMASWAS members confirmed that community-based surveillance reported the result of monitoring directly however they did not explain a clear procedure of reporting from community-based surveillance to law enforcement agencies or other user data. Reports were given incidentally, based on the result of monitoring and surveillance.

> We called enforcement officers and reported directly when we acquired information of illegal fishing at the Natuna Sea (Respondent 19-POKMASWAS Surveillance Coordinator).

Nevertheless, there was a reporting pattern based on respondents' answers. First, POKMASWAS members (i.e. local fishermen) collected information about illegal fishing. Second, the results were reported to local leaders or radio operator/surveillance coordinators living on the island. These reports were then forwarded to the relevant law enforcement agencies.

4.4.5.2 Content of information reported

Six of seven POKMASWAS members said that community-based surveillance reported illegal fishing activities including the location of illegal fishing activities, number of illegal fishing vessels, type fishing gear and estimation of crew numbers. Location was an information key and community-based surveillance informed the latitude and longitude or waters area. The names of some waters were commonly used in delivering the reports and usually referred to the name of a nearby island such as Pulau Tiga, Tarempa and Kesambi.

> We informed them that there were illegal fishing vessels here. We identified the accurate location and number (Respondent 20-Local Fishermen).

4.4.5.3 Reporting methods

Four used SSB Radio to deliver the reports. SBB radio was commonly used by local fishermen to report illegal fishing at the Natuna Sea because it can reach distant locations and there was low-cost for communication. SSB also connected with many local fishermen who accessed the same channel to communicate with each other.

Three of seven POKMASWAS members reported illegal fishing by phone. Community-based surveillance was reported by phone when the location of illegal fishing was still on the mobile phone network or in the surrounding island (under 4 nautical miles). Mobile phones were used because community-based surveillance patrolled with small boats without communication equipment (e.g. SSB radio).

> We called Navy, Fisheries Inspectors and Water Police to inform them that there were illegal fishing vessels in the Natuna Sea (Respondent 19-POKMASWAS Surveillance Coordinator).

One POKMASWAS member also stated that information of illegal fishing in the Natuna Sea was reported by SMS. Written reports either paper-based or SMS were rarely used by community-based surveillance because they thought that the SMS gateway need a longer time to be followed up by government officers. However, respondents thought that the Ministry of Marine Affairs had provided mobile phones for POKMASWAS to report illegal fishing and community-based surveillance should use this application to help the government.

> We also reported by SMS gateway to give feedback to government (Respondents showed some messages which contained reports from community-based surveillance to MMAF) (Respondent 18-Private Businessman).

4.4.6 The use of monitoring and surveillance data

All the POKMASWAS members stated that community-based surveillance only reported the results of monitoring and surveillance to government agencies and information was not used

for any other purposes. They thought that community-based surveillance was an initiative to help government collect information concerning illegal fishing and they did not store information which in general was only reported orally to government agencies. From community-based surveillance perspectives, quick follow up from government was the most necessary action.

> We as the fishermen only reported illegal fishing. We were happy when governments arrested illegal fishermen. But if this information was not followed up, we cannot do anything (Respondent 22-Local Fishermen).

4.4.7 Data users of monitoring and surveillance

POKMASWAS members were asked about institutions, agencies and organizations which used monitoring data reported by community-based surveillance. They stated that the organizations included the Directorate General of Marine and Fisheries Resources Surveillance-MMAF, Navy and Non-Government Organizations.

Five members noted that data was used by the Directorate General of Marine and Fisheries Resources Surveillance (MMAF). This Directorate General supervises Fisheries Inspectors and Captains and Patrol Vessels and had a specific duty to combat illegal fishing in Indonesia including in the Natuna Sea.

> Directorate General of Marine and Fisheries Resources Surveillance-MMAF especially Captains of Patrol Vessels used the result of our monitoring and surveillance (Respondent 22-Local Fishermen).

Other law enforcement agencies (i.e. Navy and Water Police) also used the monitoring data and the Navy and Police were mandated to combat illegal fishing besides their major duty as defence institutions (Navy) and social security (Police). Both organizations supported MMAF to eliminate illegal fishing.

> Navy and Water Police also used our monitoring data because we reported illegal fishing to them (Respondent 20-Local Fishermen).

One respondent also answered that Non-Government Organizations used the data from community-based surveillance. He explained that the NGO used monitoring data to create empowerment programs and research about community-based surveillance. In others area, some NGOs are directly involved in community empowerment such as in campaigning for the prohibition of destructive fishing using bombs in East Kupang.

> Some Non-Government Organizations for coral protection [respondent forgot the name] also ask for information from community-based surveillance (Respondent 18-Private Businessman).

4.4.8 Cooperation among community-based surveillance

POKMASWAS members were also asked how they cooperate/communicate with other POKMASWAS groups. They all members mentioned that cooperation among community-based surveillance was conducted by sharing information about illegal fishing activities in the Natuna Sea. They usually used the same channel when conducting monitoring and surveillance and communicate frequently during collecting information of illegal fishing. POKMASWAS members explained that they usually informed other members when they saw illegal fishermen in the Natuna Sea. Therefore, information on illegal fishing becomes known by all community-based surveillance surrounding the Natuna Sea. One also explained that intensive communication at sea can prevent risks such as conflict with foreign fishermen. For instance, when one member tells others about the existence of illegal fishermen, other POKMASWAS fishing vessels usually come to anticipate conflict or threats from foreign fishermen.

> We did not work for our group only. We cooperated with other POKMASWAS. We share information about illegal fishing and they also informed us when they found

illegal fishermen in the Natuna Sea. We communicated intensively (Respondent 17-Local Village Leader).

We cooperated at sea. Illegal fishermen often destroyed our fishing gear [i.e. long line] with their trawl nets. When our friends informed us about illegal fishermen, we usually came, just to make sure that illegal fishermen did not disturb and destroy our fishing gear (Respondent 23-Local Fishermen).

This chapter has identified the major points made by all the respondents concerning the scale of illegal fishing and its impacts on Indonesia, the advantages of community based surveillance and how monitoring and surveillance were conducted by POKMASWAS members in contributing to combat illegal fishing in Indonesia.

5. DISCUSSION AND CONCLUSION

One of the central objectives of this thesis was to understand the performance of POKMASWAS (based on the perceptions of a range of different stakeholders) in combating illegal fishing in Indonesia and from this analysis develop a strategy to improve the role of community-based surveillance in Indonesia.

This chapter discusses the implications of the results of the face-to-face interviews in relation to the objectives of the research by focusing on some key issues including:

1) The nature of the problem of illegal fishing;
2) The role of community-based surveillance in combating illegal fishing in Indonesia;
3) Characteristics of community-based surveillance;
4) Performance and capacity of community-based surveillance.

5.1 Discussion

5.1.1 Scale, impacts and trends of illegal fishing in Indonesia and the Natuna Sea

Perceptions about illegal fishing as a major problem for Indonesia as a whole and for the Natuna Sea were clearly expressed by respondents. Multiple reasons were offered as to why illegal fishing is a major problem. Decreasing fish stocks have negative consequences for the Indonesian economy; it has social impacts and negatively affects local ecology. These findings resonate with previous studies of the impacts of illegal fishing (as presented in the literature review) by Srinivasan et al. (2010), Johns (2013) and Petrossian (2015) the Food and Agriculture Organization (2016), Liddick (2014) and Schmidt (2005). These are the common issues often associated with illegal fishing activities and which impact directly on Indonesia and local fishermen at Natuna Island.

Surprisingly, perceptions about illegal fishing impacts also concerned the spreading of Human Immunodeficiency Viruses (HIV) AIDS in Natuna which was associated with foreign illegal

fisherman. This is a public health issue which needs to be considered as a negative impact of the interaction between foreign fishermen with local communities when foreign fishermen are landing at ports. Muninjaya (1999, p. 64) mentions foreign fishermen (i.e. Thai fishermen) as high-risk HIV transmitters. Moreover, investigation of HIV cases in Kalimantan and Anambas seem to strengthen the theory that foreign fishermen transmitted HIV AIDS to local people especially prostitutes. Harahap (2011) also claims that the spread of HIV AIDS in early 2000 in some regions in West Kalimantan indicated transmission by foreign fishermen and also in Anambas Island several years ago. This is serious public health issue in the remote islands which are far from the surveillance and control of government officers.

Respondents have varied opinions about illegal fishing trends in Indonesia and the Natuna Sea. POKMASWAS members claim that illegal fishing trends significantly decreased based on their visual observations at sea. However, their claim is based on their experiences within Indonesia's territorial waters (to 12 nautical miles). The trends of IUU in Indonesia however, are based on the arrests made by Indonesian officials in the Exclusive Economic Zones (EEZ). POKMASWAS members have limited capacity to sail to EEZ due to the size and condition of their boats. Their perceptions of illegal fishing trends in Indonesia, especially the Natuna Sea, are therefore limited to their geographical experience. The influence of media especially television also significantly influence POKMASWAS members perceptions of illegal fishing trends in the Natuna Sea.

The findings of the research also show that some government staff point out that illegal fishing in Indonesia slightly decreased during last five years. Strong law enforcement by the Indonesian government is the most frequent argument behind decreasing illegal fishing trends. The perception of decreasing illegal fishing among government staff is likely influenced by media which advertises the success of the Indonesian government in combating illegal fishing as reported by Fajriah (2017), Medistiara (2016), and Azizah (2017). Respondents probably do not consider statistical data of illegal fishing reported by the government. On the

other hand, other government staff stated that illegal fishing in Indonesia remains high and has gradually increased. Government staff referred to the report on illegal fishing vessels arrested between 2010 and 2017 (see Figure 4 in Literature Review) which shows that there was a gradual increase in arrests of fishing vessels between 2014 and 2017.

Perceptions of illegal fishing trends are influenced by how respondents interpreted references (statistical data, media and television) and also experience to illegal fishing. Some government staff thought that if the number of fishing vessels arrested increased, it means that the number of illegal fishing vessels at sea decreased because some fishing vessels have been arrested. On the other hand, some thought that increasing the number of fishing vessels arrested means that illegal fishing vessels at sea remain high because the number of arrested increased. In this context, perception of illegal fishing trends in Indonesia are differen t by the respondents of this study.

5.1.2 Explain the role of community-based surveillance in combating Illegal fishing in Indonesia

Findings of this study show that that POKMASWAS members from Natuna Island were actively involved in combating illegal fishing in the Natuna Sea by conducting monitoring and surveillance to collect information of illegal fishing activities then report these to relevant agencies. Respondents affirmed that community-based surveillance plays a vital role in combating illegal fishing. POKMASWAS members collect information on illegal fishing then report to relevant agencies to be followed up. Accurate information, including position and time, number of boats, fishing gear and crews can help law enforcement agencies arrive and arrest foreign illegal fishermen effectively.

However, there are some limitations on monitoring and surveillance activities conducted by POKMASWAS. The methods of collecting information on illegal fishing are unstructured. The characteristics of collecting information lack ‘formulated standards’. POKMASWAS seems to

be conducting ’surveillance’ rather than ‘monitoring’ because monitoring strongly emphasizes the ’formulated standard’ of gathering data (Alexander 2008). Moreover, standard operating procedures of monitoring and surveillance (see Figure 7 in Literature Review) and reporting (see Figure 8 in Literature Review) are not well-implemented by POKMASWAS members. For instance, coordination with law enforcement in preparation before monitoring is not conducted. In terms of reporting, POKMASWAS members rely on verbal reports by SSB radio and do not record the monitoring reports.

Another limitation of POKMASWAS is the method of reporting information on illegal fishing. In practice, information is not recorded by POKMASWAS and report verbally. Verbal communication has some advantages, including time and cost saving, more powerful and effectiveness, and immediate feedback. However, verbal communication also has the disadvantages of no record, lack of secrecy, and inaccuracy (The Business Communication 2016). Verbal reports of illegal fishing in the Natuna Sea are not documented either by POKMASWAS or Captains of patrol vessels. As a result, this information cannot be considered in decision making of operational patrol vessels and only used for simultaneous action (i.e. arrest illegal fishermen reported by POKMASWAS). A more secure and easy reporting system should be designed by government to improve POKMASWAS reports.

An important lesson learned regarding the reporting system is given by Regional Fisheries Livelihoods Programme (RFLP) for South and Southeast Asia as one of the regional bodies under the Food Agriculture Organisation (FAO) which developed program assistance in several South and Southeast Asian countries such as East Timor. RFLP has developed a Personal Locator Beacon (PLB) to help artisanal fishermen record the location of illegal fishing which can be tracked by government officers (see Figure 18).

Figure 18. Spot Tracker – Personal Locator Beacon (PLB)
(Source: Food and Agriculture Organization 2012)

The Food and Agriculture Organization (2012) states that this device works like a handy Global Positioning System (GPS) which can track and transmit the current position every 15 minutes in near real time via satellite. The devices have two buttons: the first (911) is used to notify the emergency services. The second button (ILLEGAL) has been reconfigured for fishermen to anonymously report illegal fishing activities. When fishermen press the ILLEGAL button, law enforcement agencies will accept notification and it can be tracked in the monitoring centre (see Figure 19).

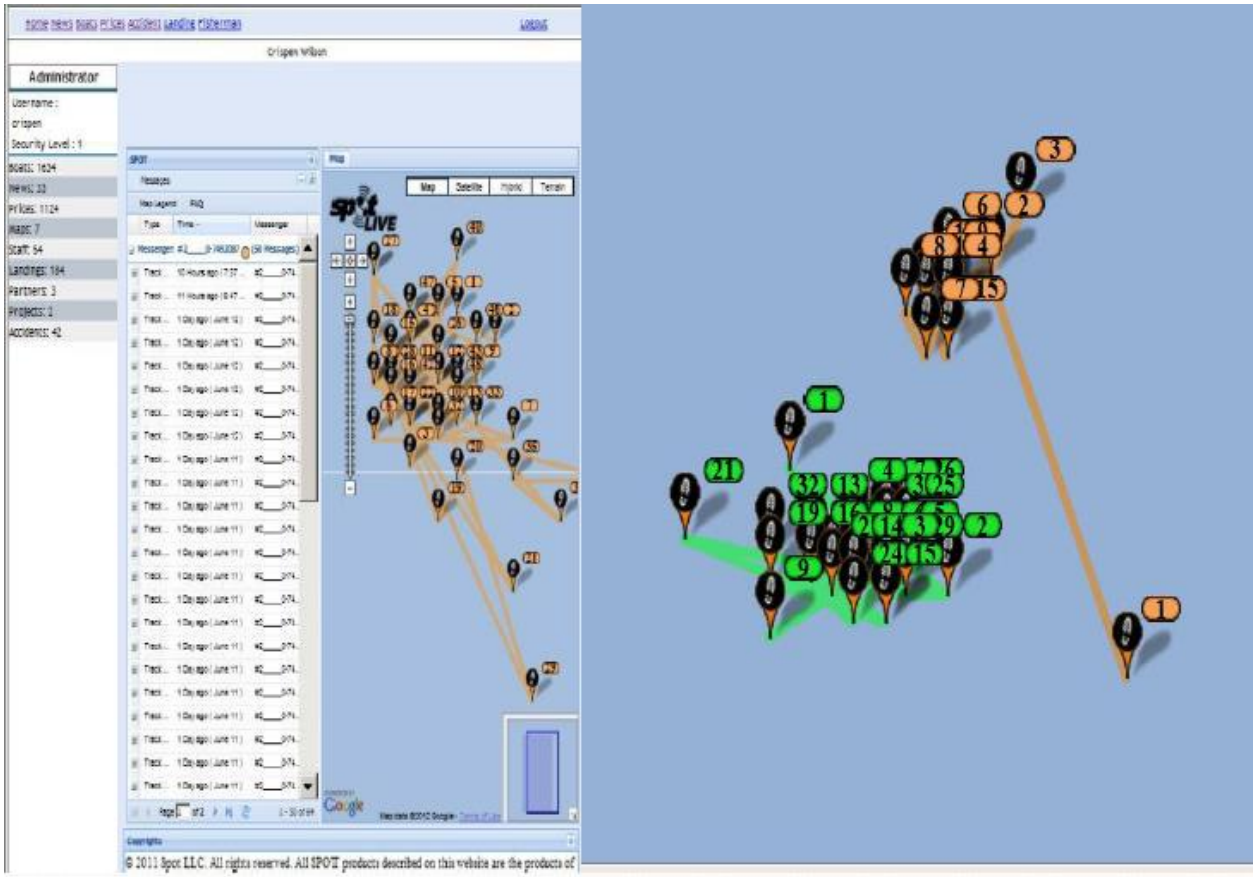


Figure 19. Tracking from Fishermen Report
Source: Food and Agriculture Organization (2012)

This technology is expected to solve the limitations of POKMASWAS in collecting and reporting illegal fishing activities at sea. There are some advantages including:

1) This device is easy to use by fishermen because they only need to press the button;
2) Location of illegal fishing can be recorded and this data can be used to map vulnerable areas of illegal fishing;
3) Law enforcement agencies can monitor tracking and take immediate action when POKMASWAS members report illegal fishing.

The operational cost of patrol vessels can be reduced because operations at sea are conducted effectively based on reports from POKMASWAS members.

5.1.3 Understanding the Performance of POKMASWAS

This study explained the performance of community-based surveillance based on the perceptions of (1) government and (2) POKMASWAS members.

5.1.3.1 Government perceptions about POKMASWAS performance

The findings of this study show that government staff have a positive perception about the role of POKMASWAS on monitoring and surveillance of illegal fishing in Indonesia. Government staff affirmed that the quality of POKMASWAS reports and participation in MCS are considered of great value. However, respondents also perceived that lack of coordination with the local government is still an unresolved problem of POKMASWAS.

Information on illegal fishing is a vital component for law enforcement agencies for patrolling and operation at sea and POKMASWAS assists the government staff to access this information freely. In this context, POKMASWAS has addressed the problem of data collection by governments, such as limited number of staff and budget to collect data, described by Sugiyama (2005) in the literature review. Moreover, POKMASWAS is a good example of how community can participate in combating illegal fishing: it reflects the adaptive management approaches (Conroy 2013) in Monitoring, Controlling and Surveillance (MCS) of illegal fishing (Food and Agriculture Organization 1994) which encourages public engagement at each step of MCS. These are some positive aspects of POKMASWAS as perceived by government staff as a valuable instrument in combating illegal fishing in Indonesia.

Nevertheless, respondents also perceive that there is a lack of communication and coordination between POKMASWAS and the local governments. The main issue is the loss of district government authority to supervise and guide POKMASWA under the establishment of the Autonomous Act 13 year 2014 (Ministry of Home Affairs 2014) when provincial governments took over the role of district governments in supervising POKMASWAS (as described in the literature review). This change has had negative impacts on the supervision programs of POKMASWAS especially for the districts with geographical challenges (i.e.

remote areas). For instance, Natuna Island (District) is separated from Riau Island (Province) by an extensive sea and provincial representative offices, called Technical Implementing Unit (UPT), are not available on Natuna Island. This is a big problem because provincial officers cannot do their duty properly and this impacts on POKMASWAS. Moreover, Riau Island Province also has 1,796 separate islands which need to be supervised (The Government of Riau Island Province 2016). This is highly challenging considering the limited number of provincial government officers. In the context of Indonesia as a whole, the loss of supervisory authority of district government may have significant impacts on the communication and coordination between POKMASWAS and local governments.

5.1.3.2 POKMASWAS members perceptions about their capacity to conduct monitoring and surveillance of illegal fishing

POKMASWAS members affirmed that they feel satisfied with their capacity to conduct monitoring and surveillance of illegal fishing in the Natuna Sea. Of course, POKMASWAS members acknowledge that there are some limitations to conducting monitoring and surveillance of illegal fishing including poor facilities and lack of equipment. These limitations do not obstruct the spirit of POKMASWAS members to collect information on illegal fishing and report it to law enforcement agencies. As a voluntary-based organisation (Ministry of Marine Affairs and Fisheries 2016b), POKMASWAS has raised awareness of local communities to combat illegal fishing and this a great inclusion in social capital for Indonesia.

However, this study raises concerns about the institutional capacity of POKMASWAS including management capacity, limited facilities and equipment to support POKMASWAS in monitoring and surveillance of illegal fishing. A set of empowerment programs and communication equipment provided by governments, as explained by the Ministry of Marine Affairs and Fisheries (2016c) and the Ministry of Marine Affairs and Fisheries (2016a) in the literature review have failed to overcome the limitations. The role of Non-Government Organizations may be need to improve POKMASWAS capacity to conduct effective

monitoring and surveillance. Lessons learned concerning the collaborative approach between fisheries stakeholders and NGOs in combating illegal fishing in the Southern Ocean managed by the Commission for the Conservation of Antarctic Marine Living Resources (Osterblom et al. 2015) are a good example to develop in Indonesia.

5.1.4 Recommendation to improving the role of community-based surveillance in Indonesia.

This study uses SWOT analysis to formulate potential strategies to improve the role of community-based surveillance in combating illegal fishing in Indonesia. Internal and external aspects (Samset 2010) of POKMASWAS including Strengths, Weaknesses, Threats and Opportunities are presented in Table 6 below.

Table 6. SWOT aspects of POKMASWAS

	Positive	Negative
Internal aspect	**Strengths:** 1) POKMASWAS is established based on strong community awareness- to protect marine and fisheries resources; 2) POKMASWAS involves 'real' fisheries stakeholders (e.g. local fishermen) who understand about illegal fishing, having a large number of members; 3) POKMASWAS provides useful information about illegal fishing activities.	**Weaknesses:** 1) POKMASWAS has access to only limited facilities and equipment for monitoring and surveillance; 2) POKMASWAS members do not have high levels of education and knowledge; 3) Legal frameworks and regulations for community-based surveillance are insufficient to support POKMASWAS.
External aspects	**Opportunities:** 1) Combatting Illegal fishing is identified by the Indonesian government as a priority; 2) Government agencies, NGOs and law enforcement agencies have a positive perspective about POKMASWAS; 3) Government can provide funding and empowerment programs for POKMASWAS.	**Threats:** 1) Illegal fishing trends in Indonesian waters remains high; 2) Foreign fishermen intimidate POKMASWAS members at sea; 3) POKMASWAS members face natural challenges such as high waves and storms at sea. 4) Supervising from local governments is limited;

The basic dimensions of SWOT (Richards 2001), in the literature review are used to create recommendations to improve the role of POKMASWAS in combating illegal fishing in Indonesia.

Key recommendations:

Recommendation 1: Involving more fisheries stakeholders in POKMASWAS

More fisheries stakeholders (e.g. fishermen, local leaders, religious leaders, NGOs and private businessmen) should be involved and join in POKMASWAS. This can improve the coverage area of monitoring and surveillance of illegal fishing. The number of POKMASWAS groups needs to be increased in vulnerable area of illegal fishing such as the Natuna Sea, the Arafura Sea and North of Sulawesi Sea.

Recommendation 2: Local Government should support POKMASWAS

Governments are required to allocate funding to support POKMASWAS with capacity building programs such as how to conduct effective monitoring and surveillance effectively, implementing standard operating procedures and safety procedures at sea while conducting monitoring and surveillance, and providing safety equipment.

Recommendation 3: Revising POKMASWAS legal frameworks

Central government is required to revise the Ministry of Marine and Fisheries Decree 58 year 2001 on Community Surveillance Systems as the legal framework of POKMASWAS. Revision of this regulation is needed to accommodate the role of local government in supervising, monitoring and surveillance procedures, and the role of Non-Governmental Organizations. Institutional arrangement between Provincial and District Government also need to be designed to delegate Provincial government authority in supervising POKMASWAS to District Government.

Recommendation 4: Improving coordination between POKMASWAS and local government

Lack of coordination is one of the main issues in monitoring and surveillance of illegal fishing. POKMASWAS and local government must communicate intensively. For instance, POKMASWAS needs to inform local government before, while and after POKMASWAS members conduct monitoring and surveillance at sea. By good coordination, information of illegal fishing can be followed up comprehensively involving not only the law enforcement agency but also supported by local governments.

Recommendation 5: Developing reporting system:

Government needs to develop a reporting system to enhance quality of monitoring and surveillance of POKMASWAS. For instance, communication equipment is one of the most important pieces of equipment for POKMASWAS to deliver information on illegal fishing at sea. Personal Locator Beacons (see discussion) are one of the recommended pieces of equipment for POKMASWAS because they are safe and handy-used for local fishermen. Information also can be tracked by law enforcement agencies online.

5.2 Conclusion

This study has explored the role of POKMASWAS in combating illegal fishing in Indonesia.

Synthesis of empirical findings

This research affirmed that POKMAWAS community-based monitoring and surveillance is a significant support by making a contribution to the collection of data and dissemination of information about illegal fishing activity to law enforcement agencies in Indonesia. POKMASWAS is a powerful instrument which can solve the limitations of governments regarding human resources and technology capacity to monitor large areas of Indonesian EEZ. POKMASWAS is a low-cost monitoring system, but it provides accurate and useful

information on illegal fishing which can be followed up quickly by law enforcement agencies. Quick reporting and follow up of illegal fishing will save marine and fisheries resources, avoiding loss to the economy and preventing more detrimental social impacts. POKMASWAS assists the government to deal with these issues.

However, this research has also shown that POKMASWAS needs more support by way of equipment so as to be able to deliver information in a timely and user-friendly manner. Existing processes such as verbal reporting by POKMASWAS have limitations. There is a lack of security of verbal reporting and a lack of documented records. Governments need to develop more secure reporting systems and provide handy-use devices such as Spot Tracker-Personal Locator Beacons. By providing appropriate equipment to POKMASWAS, the government can improve the quality of monitoring reports of illegal fishing which means improving the efforts on combating illegal fishing.

Broader relevance of the findings

Some areas in Indonesia are geographically challenged such as the Natuna Sea which the waters adjacent to other countries including the Arafura Sea and the North of Sulawesi Sea. Those areas also have significant impacts from foreign illegal fishing activities. POKMASWAS can be developed also in those areas as an effort to strengthen the effort to combat illegal fishing.

The findings of the research also emphasize that policy frameworks and directions of POKMASWAS need to be revised to deal with the challenges of illegal fishing and improving the role of POKMASWAS. There are some key issues including the role of district governments, monitoring and surveillance procedures, coordination of POKMASWAS with relevant agencies and supporting facilities of POKMASWAS.

Limitations of study and recommendation for future research

This study has some limitations including the absence of the voice of more law enforcement officers who use the monitoring data from POKMASWAS (i.e. Navy, Water Police and Coast Guards). Ideally, other law enforcement officers should be interviewed because they use monitoring data from POKMASWAS when considering operations at sea. This study also did not ask respondents specifically about the role of local wisdom/value associated with POKMASWAS. This can be explored by further study.

This research focussed on the role of POKMASWAS in combating illegal fishing conducted by *foreign* fishermen because illegal fishing in the Natuna Sea is dominated by foreign fishermen. Further research needs to consider illegal fishing conducted by local fishermen in other areas. Further research is also required to explore not only 'illegal' but also 'Unreported and Unregulated' issues in Indonesia. 'Unreported' and 'Unregulated' is a term associated with local fishermen which is not discussed in this study.

Conclusion

Illegal fishing is still a major problem for Indonesia due to its detrimental impacts on ecology, economy and social activities. Indonesia has taken serious action to combat illegal fishing through fisheries management reforms, strong law enforcement, and also involving the local community through community-based surveillance (POKMASWAS). This study has demonstrated that POKMASWAS plays a significant role in quickly collecting information concerning illegal fishing which can be followed up by law enforcement agencies by inspecting, arresting and apprehending foreign illegal fishermen. If this is extended further the fisheries will be protected and the fishermen will be able to continue their livelihoods.

BIBLIOGRAPHY

Aceves-bueno, E, Adeleye, AS, Bradley, D, Tyler Brandt, W, Callery, P, Feraud, M, Garner, KL, Gentry, R, Huang, Y, McCullough, I, Pearlman, I, Sutherland, SA, Wilkinson, W, Yang, Y, Zink, T, Anderson, SE & Tague, C 2015, 'Citizen Science as an Approach for Overcoming Insufficient Monitoring and Inadequate Stakeholder Buy-in in Adaptive Management: Criteria and Evidence', *Ecosystems*, vol. 18, no. 3, pp. 493-506.

Agnew, DJ & Barnes, CT 2004, 'Economic aspects and drivers of IUU fishing: Building a framework', in *Fish Piracy: combating illegal, unreported and unregulated fishing*, OECD Publishing, Paris, pp. 169-200.

Agnew, DJ, Pearce, J, Pramod, G, Peatman, T, Watson, R, Beddington, JR & Pitcher, TJ 2009, 'Estimating the Worldwide Extent of Illegal Fishing', *PLoS One*, vol. 4, no. 2, pp. 1-8.

Alexander, M 2008, 'Survey, Surveillance, Monitoring and Recording', in *Management Planning for Nature Conservation: A Theoretical Basis & Practical Guide*, Springer Netherlands, Dordrecht, pp. 49-62.

Aranda, M, Murua, H & de Bruyn, P 2012, 'Managing fishing capacity in tuna regional fisheries management organisations (RFMOs): Development and state of the art', *Marine Policy*, vol. 36, no. 5, pp. 985-92.

Ásmundsson, S 2016, 'Regional Fisheries Management Organisations (RFMOs): Who are they, what is their geographic coverage on the high seas and which ones should be considered as General RFMOs, Tuna RFMOs and Specialised RFMOs?', paper presented to Sustainable Ocean Initiative (SOI) Global Dialogue, Seoul, South Korea.

Azizah, K 2017, *Ini Rangkaian Dampak Positif dari Kebijakan Pemberantasan "Illegal Fishing" (This is the positive impacts of government policy on combating illegal fishing)*, Kompas, 15 January 2018, <https://ekonomi.kompas.com/read/2017/06/17/153558326/ini.rangkaian.dampak.positif.dari.kebijakan.pemberantasan.illegal.fishing>.

Bailey, K 2008, *Methods of social research*, The Free Press Mc Millan Inc., New York.

Baird, RJ 2006, 'Legal Factors Contributing to the Development of IUU Fishing', in *Aspects of Illegal, Unreported and Unregulated Fishing in the Southern Ocean*, Springer Netherlands, Dordrecht, pp. 35-64.

Beddington, J, R, Agnew, D, J & Clark, C, W 2016, 'Current Problems in the Management of Marine Fisheries', *Science*, vol. 316, pp. 1713-6.

Borit, M & Olsen, P 2012, 'Evaluation framework for regulatory requirements related to data recording and traceability designed to prevent illegal, unreported and unregulated fishing', *Marine Policy*, vol. 36, no. 1, pp. 96-102.

Brown, M 2008, *The Skinny on SSB*, Power and Motoryatch, viewed 3 April 2018, <https://www.powerandmotoryacht.com/electronics/skinny-ssb>.

Cabral, RB, Mayorga, J, Clemence, M, Lynham, J, Koeshendrajana, S, Muawanah, U, Nugroho, D, Anna, Z, Mira, Ghofar, A, Zulbainarni, N, Gaines, SD & Costello, C 2018, 'Rapid

and lasting gains from solving illegal fishing', *Nature Ecology & Evolution*, vol. 2, no. 4, pp. 650-8.

Christensen, J 2016, 'Illegal, Unreported and Unregulated Fishing in Historical Perspective', in K Schwerdtner Máñez & B Poulsen (eds), *Perspectives on Oceans Past*, Springer Netherlands, Dordrecht, pp. 133-53.

Clark, B & Clausen, R 2008, 'The Oceanic Crisis: Capitalism and the Degradation of Marine Ecosystems', *Monthly Review*, vol. 60, no. 3, pp. 91-111.

Conroy, MJ 2013, *Decision making in natural resource management a structured, adaptive approach*, John Wiley & Sons, Ltd, New Jersey.

Creswell, J 2013, *Qualitative, Quantitative, and Mixed Methods Approaches*, SAGE Publications, Inc California.

Daliri, M, Kamrani, E, Jentoft, S & Paighambari, SY 2016, 'Why is illegal fishing occurring in the Persian Gulf? A case study from the Hormozgan province of Iran', *Ocean & Coastal Management*, vol. 120, pp. 127-34.

Detik 2018, *Pasang Iklan di Detikcom ? Berikut Ulasan Singkat Mengenai Info Pembaca Web Detik.com (Preview of Readers in Detik.com)*, Detik.com, 15 January 2018, <https://pusatpemasanganiklan.com/artikel/detail/76-pasang_iklan_di_detik.com_klik_disini_info_pembacanya#.WwTtUUiFPIU>.

Dharmawan, B, Böcher, M & Krott, M 2017, 'Endangered Mangroves in Segara Anakan, Indonesia: Effective and Failed Problem-Solving Policy Advice', *Environmental Management*, vol. 60, no. 3, pp. 409-21.

Dirhamsyah 2005, 'Maritime Law Enforcement and Compliance in Indonesia: Problems and Recommendations', *Maritime Studies*, no. 144, pp. 1-16.

Dirhamsyah, D 2006, 'Indonesian legislative framework for coastal resources management: A critical review and recommendation', *Ocean & Coastal Management*, vol. 49, no. 1–2, pp. 68-92.

Edwards, JE, Thomas, MD, Rosenfeld, P & Booth-Kewley, S 1996, *How To Conduct Organizational Surveys: A Step-by-Step Guide*, SAGE Publications.

European Union 2015, *EU acts on illegal fishing: Yellow card issued to Thailand while South Korea & Philippines are cleared*, European Union, viewed 20 March 2018, <http://europa.eu/rapid/press-release_IP-15-4806_en.htm>.

—— 2017, *Commission warns Vietnam over insufficient action to fight illegal fishing*, European Union, viewed 20 March 2018, <http://europa.eu/rapid/press-release_IP-17-4064_en.htm>.

Fajriah, R 2017, *Pemberantasan Illegal Fishing di Indonesia Ditiru Banyak Negara (Indonesian efforts in combating illegal fishing become role model in many countries)*, Sindonews, 15 January 2018, <https://ekbis.sindonews.com/read/1195391/34/pemberantasan-illegal-fishing-di-indonesia-ditiru-banyak-negara-1491645276>.

Fikri, F 2013, 'Pelaksanaan Perlindungan Terhadap Sumberdaya Perikanan dalam Laut Teritorial dan Zona Ekonomi Ekslusif Indonesia di Provinsi Aceh', *Kanun: Jurnal Ilmu Hukum*, vol. 15, no. 3, pp. 415-35.

Flewwelling, P 2003, *Recent trends in monitoring control and surveillance systems for capture fisheries*, Food and Agriculture Organization, Rome.

Food and Agriculture Organization 1994, *FAO Fisheries Technical Paper No. 338: An introduction to monitoring, control and surveillance for capture fisheries*, FAO, Rome, <http://www.fao.org/docrep/003/v4250e/v4250e00.htm#toc>.

—— 2001, *International Plan of Action to Prevent, Deter and Eleminate Illegal, Unreported and Unregulated Fishing*, FAO, Rome, <ftp://ftp.fao.org/docrep/fao/012/y1224e/y1224e00.pdf>.

—— 2002a, *Chapter 2: The use of technical measure in responsible fisheries: regulation of fishing gear* Fisheries and Aquaculture Department, viewed 30 April 2017, <http://www.fao.org/docrep/005/y3427e/y3427e04.htm>.

—— 2002b, *Stopping illegal, unreported and unregulated fishing*, Food Agriculture Organisation, Rome.

—— 2009, *International Plan of Action on Port State Measures to Prevent, Deter and Eleminate Illegal, Unreported and Unregulated Fishing*, FAO, Rome, <ftp://ftp.fao.org/docrep/fao/012/y1224e/y1224e00.pdf>.

—— 2012, *Lesson learned notes: Information and communications technology for small-scale fishers and fishing administrations*, Regional Fisheries Livelihoods Programme for South and Southeast Asia (RFLP), viewed 20 April 2018, <http://www.fao.org/3/a-ar470e.pdf>.

—— 2016, *The State of World Fisheries and Aquaculture : Contributing to food security and nutrition for all*, Food and Agriculture Organization, Rome.

Fox, HE & Caldwell, RL 2006, 'Recovery from blast fishing on coral reefs: a tale of two scales', *Ecological Applications*, vol. 16, no. 5, pp. 1631-5.

Gallic, BL & Cox, A 2006, 'An economic analysis of illegal, unreported and unregulated (IUU) fishing: Key drivers and possible solutions', *Marine Policy*, vol. 30, no. 6, pp. 689-95.

Glaser, M, Breckwoldt, A, Deswandi, R, Radjawali, I, Baitoningsih, W & Ferse, SCA 2015, 'Of exploited reefs and fishers – A holistic view on participatory coastal and marine management in an Indonesian archipelago', *Ocean & Coastal Management*, vol. 116, pp. 193-213.

Google Earth 2015, *The Natuna Island 3°12'53.40'' N 120°32'07.05'' E Elevation 3954 m*, viewed 18 May 2018, <https://www.google.com/earth/index.html>.

Hamzah, B 2015, *Sinking the ships: Indonesia's foreign policy under Jokowi*, 20 January edn, RSIS Commentary, Singapore, <http://hdl.handle.net/10220/38622>.

Harahap, S 2011, *Penanganan Epidemi HIV/AIDS Di Kalimantan Barat Tidak Realistis (Management Epidemic HIV in West Kalimantan is not realistic)*, Kompas, 20 March 2017, <https://www.kompasiana.com/infokespro/penanganan-epidemi-hiv-aids-di-kalimantan-barat-tidak-realistis_55007933a333113772510f61>.

Herminia, CT & Valerio, CT 2009, 'Institutional aspects of local participation in natural resource management', *Field Actions Science Reports*, vol. 3, pp. 1-6.

Hyman, EL 1981, 'The uses, validity, and reliability of perceived environmental quality indicators', *Social Indicators Research*, vol. 9, no. 1, pp. 85-110.

Indonesia Geospatial Information Agency 2017, *Indonesian National Map*, 1:250.000, Indonesia Geospatial Information Agency, Indonesia.

International Media and Newspapers 2016, *Top 200 Newspapers in the World in 2016*, viewed 18 May 2018, <https://www.4imn.com/top200/>.

IUCN Red List of Threatened Species 2012, *IUCN Red List of Threatened Species*, IUCN Red List of Threatened Species, viewed 1 December 2017, <http://www.iucnredlist.org/about/overview#redlist_criteria>.

Jackson, JBC, Kirby, MX, Berger, WH, Bjorndal, KA & et al. 2001, 'Historical overfishing and the recent collapse of coastal ecosystems', *Science*, vol. 293, no. 5530, pp. 629-37.

Jaelani, AQ & Basuki, U 2014, 'Illegal, Unreported and Unregulated (IUU) Fishing. Upaya Mencegah dan Memberantas Illegal Fishing dalam Membangun Poros Maritim Indonesia', *Jurnal Supremasi Hukum*, vol. 3, no. 1, pp. 168-92.

Johns, M 2013, 'Enhancing responsible fishing practices in South East Asia to combat Illegal, Unreported and Unregulated (IUU) fishing', *Australian Journal of Maritime & Ocean Affairs*, vol. 5, no. 3, pp. 112-9.

Kristian Erdianto 2017, *Ini Faktor Penyebab Maraknya "Illegal Fishing" di Wilayah Perairan RI (Driving forces of illegal fishing in Indonesian Waters)*, 1, Kompas, 20 January 2018, <https://nasional.kompas.com/read/2017/04/18/19452311/ini.faktor.penyebab.maraknya.illegal.fishing.di.wilayah.perairan.ri>.

Lee, C-S, Thad Barnowe, J & McNabb, DE 2005, 'Environmental perceptions, attitudes and priorities: cross-cultural implications for public policy', *Cross Cultural Management: An International Journal*, vol. 12, no. 1, pp. 61-83.

Liddick, D 2014, 'The dimensions of a transnational crime problem: the case of iuu fishing', *Trends in Organized Crime*, vol. 17, no. 4, pp. 290-312.

Lindley, J & Techera, EJ 2017, 'Overcoming complexity in illegal, unregulated and unreported fishing to achieve effective regulatory pluralism', *Marine Policy*, vol. 81, pp. 71-9.

Medistiara, Y 2016, *Susi: PDB Perikanan Tumbuh Hampir 40% (Susi: Fisheries Gross Domestic Product Grew 40%)*, Detik.com, 15 January 2018, <https://finance.detik.com/berita-ekonomi-bisnis/d-3351676/susi-pdb-perikanan-tumbuh-hampir-40>.

Miller, DD & Sumaila, UR 2014, 'Flag use behavior and IUU activity within the international fishing fleet: Refining definitions and identifying areas of concern', *Marine Policy*, vol. 44, pp. 204-11.

Ministry of Home Affairs 2014, *Undang-Undang Nomor 23 Tahun 2014 tentang Pemerintahan Daerah (Local Government Act No 23 year 2014)*, Kementerian Dalam Negeri, Jakarta, <http://www.kemendagri.go.id/media/documents/2014/10/15/u/u/uu_23_tahun_2014.pdf>.

Ministry of Marine Affairs and Fisheries 2001, *Code of Conduct of Community-Based Surveillance Sysytem on Marine and Fisheries Resources*, Ministry of Marine Affairs and Fisheries, Jakarta.

—— 2009, *Undang-Undang Nomor 45 Tahun 2009 tentang Perubahan Undang-Undang Nomor 31 Tahun 2004 tentang Perikanan (Fisheries Act 45/2009 on Amandement of Fisheries Act 31/2004 concerning Fisheries)*`, Kementerian Kelautan dan Perikanan, Jakarta, <http://infohukum.kkp.go.id/index.php/hukum/c/10/?type_id=1&produk_id=1>.

—— 2012, *National Plan of Action to Prevent, Deter and Eliminate IUU Fishing*, Ministry of Marine Affairs and Fisheries, Jakarta.

—— 2015a, *Kelautan dan perikanan dalam angka tahun 2015 (Marine and fisheries in figures 2015)*, Ministry of Marine Affairs and Fisheries, Jakarta.

—— 2015b, 'Rekapitulasi Hasil Operasi 2015 (Data of patrol vessels operation results 2015)', Ministry of Marine Affairs and Fisheries, 10 October 2017.

—— 2016a, *150 Pokmaswas Terima Bantuan Alat Komunikasi (150 POKMASWAS Accepted Communication Equipment*, Ministry of Marine Affairs and Fisheries, viewed 23 April 2018, <http://djpsdkp.kkp.go.id/arsip/c/408/150-Pokmaswas-Terima-Bantuan-Alat-Komunikasi/?category_id=39&sub_id>.

—— 2016b, *150 Pokmaswas Terima Bantuan Alat Komunikasi (150 POKMASWAS accepted communication equipment)*, Ministry of Marine Affairs and Fisheries, Jakarta <http://djpsdkp.kkp.go.id/2014/arsip/c/408/150-Pokmaswas-Terima-Bantuan-Alat-Komunikasi/>.

—— 2016c, *Petunjuk Operasional Kegiatan: Daftar Isian Pelaksanaan Anggaran (DIPA) (Operational Guide Programs: Ministerial Budget in 2016)*, Ministry of Marine Affairs and Fisheries, Jakarta.

—— 2017a, *Data Tindak Pidana Kelautan dan Perikanan 2018 (Fisheries Crime Data 2017)*, Ministry of Marine Affairs and Fisheries, viewed 23 January 2018, <http://kkp.go.id/an-component/media/upload-gambar-pendukung/Penanganan%20Awak%20Kapal%20Dalam%20TPP.pdf>.

—— 2017b, *Info Hukum (Information of Law)*, Ministry of Marine Affairs and Fisheries, viewed 10 October 2017, <http://infohukum.kkp.go.id/>.

—— 2017c, *Laporan Tahunan Kementerian Kelautan dan Perikanan (Annual Report of Ministry of Marine and fisheries in 2017)*, Ministry of Marine Affairs and Fisheries, Jakarta.

—— 2017d, *Tenggelamkan kapal di ambon, menteri susi : perairan ambon harus punya lambang kedaulatan (Sinking Illegal Fishing Vessel in Ambon, Indonesian Minister: Ambon waters should have sovereignty)*, 1 April 2017, Ministry of Marine Affairs and Fisheries, Jakarta <http://kkp.go.id/wp-content/uploads/2017/04/SP44-TENGGELAMKAN-KAPAL-DI-AMBON-MENTERI-SUSI-PERAIRAN-AMBON-HARUS-PUNYA-LAMBANG-KEDAULATAN.pdf>.

Ministry of State Secretary 2015, *Presidential Regulation 115/2015 on Illegal Fishing Task Force*, Ministry of State Secretary, Jakarta.

Muninjaya, G 1999, *AIDS di Indonesia: Masalah dan Kebijakan Penanggulangannya (AIDS in Indonesia: Problems and Policy Frameworks to Solving)*, Buku Kedoteran EGC, Jakarta.

National Agency on Survey and Mapping 2009, *Survei dan Pemetaan Nusantara (Survey and Mapping of Indonesian States)*, Bakosurtanal & LIPI, Jakarta.

Neuman, W 2014, *Social Research Methods: Qualitative and Quantitative Approaches*, Pearson Education Limited, Edinburgh.

Organization for Economic Cooperation and Development 2006, *Closing the Net: Stopping illegal fishing on the high seas*, OEDC, Canada.

Osterblom, H, Bodin, O, Rashid Sumaila, U & Press, AJ 2015, 'Reducing illegal fishing in the Southern Ocean: a global effort', *Solutions*, vol. 4, no. 5, pp. 72-9.

Pauwelussen, A 2016, 'Community as network: exploring a relational approach to social resilience in coastal Indonesia', *Maritime Studies*, vol. 15, no. 1, pp. 1-19.

Petrossian, GA 2015, 'Preventing illegal, unreported and unregulated (IUU) fishing: A situational approach', *Biological Conservation*, vol. 189, pp. 39-48.

Pomeroy, R, Parks, J, Courtney, K & Mattich, N 2016, 'Improving marine fisheries management in Southeast Asia: Results of a regional fisheries stakeholder analysis', *Marine Policy*, vol. 65, no. Supplement C, pp. 20-9.

Procopiuck, M & Rosa, A 2015, 'Evaluation of communities' perception on public policies, urban rivers functions, and qualities: the Belém River case in Curitiba', *Urban Water Journal*, vol. 12, no. 7, pp. 597-605.

Renyaan, T 2015, *Prosedur operasional standar (pos) pelaporan, pemantauan, pengawasan dan peran serta pokmaswas terhadap tindak pidana kejahatan dan pelanggaran perikanan (Standard operational procedures of monitoring, reporting and surveillance of fisheries violation)*, USAID Indonesia, Jakarta.

Richards 2001, *Modeling and decision support tools.* , Cambridge University: Department of Engineering, viewed 23 October 2018, <https://www.ifm.eng.cam.ac.uk/research/dstools/swot/>.

Rizky, F 2017, *Sindonews.com Kian Digemari, Sehari Dikunjungi 5 Juta Pembaca (Sindonews become more popular and visited 5 million readers daily)*, Sindonews, 30 January 2018, <https://news.okezone.com/read/2018/01/19/337/1847649/sindonews-com-kian-digemari-sehari-dikunjungi-5-juta-pembaca>.

RPOAIUU 2007, *The Regional Plan of Action (RPOA) to Promote Responsible Fishing Practices including Combating Illegal, Unreported and Unregulated Fishing* viewed 10 October 2017, <http://www.rpoaiuu.org/>.

Samset, K 2010, 'SWOT Analysis', in *Early Project Appraisal: Making the Initial Choices*, Palgrave Macmillan UK, London, pp. 182-7.

Schmidt, C-C 2005, 'Economic drivers of illegal, unreported and unregulated (IUU) fishing', *The International Journal of Marine and Coastal Law*, vol. 20, no. 3, pp. 479-507.

Sodik, DM 2009, 'Analysis of IUU Fishing in Indonesia and the Indonesian Legal Framework Reform for Monitoring, Control and Surveillance of Fishing Vessels', *The International Journal of Marine and Coastal Law*, vol. 24, no. 1, pp. 67-100.

Srinivasan, UT, Cheung, WW, Watson, R & Sumaila, UR 2010, 'Food security implications of global marine catch losses due to overfishing', *Journal of Bioeconomics*, vol. 12, no. 3, pp. 183-200.

Sugiyama, S 2005, 'Information requirements for policy development, decision-making and responsible fisheries management: what data should be collected?', *Women in fisheries information bulletin*, no. 15, pp. 24-9.

Sumaila & Pauly 2006, *Catching more bait: a bottom-up re-estimation of global fisheries subsidies*, Fisheries Centre Research, University of British Columbia, Canada.

Sumaila, UR, Alder, J & Keith, H 2006, 'Global scope and economics of illegal fishing', *Marine Policy*, vol. 30, no. 6, pp. 696-703.

Sumaila, UR & Jacquet, J 2008, *When Bad Gets Worse: Corruption and Fisheries*, University of British Columbia, <http://www.imcsnet.org/imcs/docs/corruption_fisheries_sumaila.pdf>.

Sunyowati, D 2014, 'Dampak Kegiatan IUU Fishing di Indonesia (The Impacts of IUU Fishing in Indonesia)', paper presented to Seminar Nasional " Peran dan Upaya Penegak Hukum dan Pemangku Kepentingan Dalam Penanganan dan Pemberantasan IUU Fishing di Wilayah Perbatasan Indonesia". Kerjasama Kementerian Luar Negeri Republik Indonesia dengan Universitas Airlangga, Surabaya.

Teddlie, C & Yu, F 2007, 'Mixed Methods Sampling:A Typology With Examples', *Journal of Mixed Methods Research*, vol. 1, no. 1, pp. 77-100.

Thamrin, T 2015, *Penegakan Hukum Laut Terhadap Illegal Fishing (Law Enforcement on Illegal Fishing)*, Academia, viewed 31 October 2017, <https://www.academia.edu/13120162/PENEGAKAN_HUKUM_LAUT_TERHADAP_ILLEGAL_FISHING>.

The Business Communication 2016, *Advantages and disadvantages of oral communication*, The Business Communication, viewed 20 April 2017, <https://thebusinesscommunication.com/advantages-and-disadvantages-of-oral-communication/>.

The Government of Riau Island Province 2016, 'Jumlah Pulau di Kepri Alami Perubahan (Number of Island in Riau Island Change)', *Info Rakyat*, 17 May 2016.

Thomas, AS, Milfont, TL & Gavin, MC 2016, 'A New Approach to Identifying the Drivers of Regulation Compliance Using Multivariate Behavioural Models', *PLoS One*, vol. 11, no. 10, pp. 1-12.

Tubb, SL & Moss, S 2006, *Human Communication: Principles and Contexts*, McGraw-Hill Humanities/Social Sciences/Languages, Iowa.

van Nes, F, Abma, T, Jonsson, H & Deeg, D 2010, 'Language differences in qualitative research: is meaning lost in translation?', *European Journal of Ageing*, vol. 7, no. 4, pp. 313-6.

Wibowo, A 2016, 'Rekonstruksi fungsi pers dalam undang-undang nomor 40 tahun 1999 terhadap penegakan hukum tindak pidana korupsi di indonesia berbasis nilai keadilan

(Reconstruction the role of media in Corruption Act 40 year 1999 based on fairness)', *Jurnal Pembaharuan Hukum*, vol. 2, no. 1, pp. 67-73.

Widayatun, N 2016, 'Peran masyarakat dalam pelestarian terumbu karang dan dampaknya terhadap peningkatan kesejahteraan (The role of communities on coral reef conservation and the impact on prospherity)', *Jurnal Kependudukan Indonesia*, vol. 6, no. 2, pp. 1-19.

Williams, MJ 2013, 'Will New Multilateral Arrangements Help Southeast Asian States Solve Illegal Fishing?', *Contemporary Southeast Asia*, vol. 35, no. 2, pp. 258-83.

Williams, MJ & Staples, D 2010, *Southeast Asian fisheries*, Oxford University Press, New York (USA).

Wilson, C & Linkie, M 2012, 'The Panglima Laot of Aceh: a case study in large-scale community-based marine management after the 2004 Indian Ocean tsunami', *Oryx*, vol. 46, no. 04, pp. 495-500.

Yuliana, E & Winata, A 2012, 'Pengaruh karakteristik dan persepsi terhadap tingkat partisipasi anggota dalam kelompok masyarakat pengawas (pokmaswas) sumber daya kelautan dan perikanan (The influence of characteristic and perception on POKMASWAS member participation)', *Bumi Lestari*, vol. 12, no. 2, pp. 251-9.

APPENDICES

Appendix 1A. Interview Questions for Government Staff

Structured Interview Questions
This research is focussing on foreign IUU in Indonesia.

Opening script:

Thank you for agreeing to participate in this study. Please be assured that I do not want you to directly disclose any specific details or specific cases (individuals) that may be under current legal or criminal investigation. I am interested in general concepts and trends.

Section One – Perception as the Nature of the Problem of IUU Fishing

1. Do you agree that IUU fishing is a major problem for Indonesia?

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please give a reason for your choice

2. Do you agree that IUU fishing is a major problem for Natuna Sea?

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please give a reason for your choice

3. In terms of the trends of IUU Fishing in Indonesia, please tell me if you think it is improving or getting worse?

Much Worse	Getting Somewhat Worse	About the Same	Getting Somewhat Better	Getting Much Better

Please give a reason for your choice

4. In terms of the trends of IUU Fishing in Natuna Sea, please tell me if you think it is improving or getting worse.

Much Worse	Somewhat Worse	About the Same	Somewhat Better	Much Better

Please give a reason for your choice

5. Do you think IUU fishing has had direct environmental impacts in this area?

No	Yes

If Yes, Please explain the impacts

6. Do you think IUU fishing has had direct economic impacts in this area?

No	Yes

If Yes, Please explain the impacts

7. Do you think IUU fishing has had direct social impacts in this area?

No	Yes

If Yes, Please explain the impacts

Section Two – Perceptions about the benefits of POKMASWAS

8. How successful do you think POKMASWAS is in terms of making a contribution to the monitoring and surveillance of foreign IUU fishing?

Not at all successful	Slightly successful	Moderately Successful	Very Successful	Extremely successful

Please explain your answer

9. How useful do you think the reports are provided by POKMASWAS?

Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful

Please explain your answer

10. Can you tell me in what ways the monitoring data generated by POKMASWAS is put to use?
Please explain your answer

11. Can you tell me who uses the monitoring data generated by POKMASWAS?
Please explain your answer

12. In your opinion, what are the strengths of POKMASWAS?
Please explain your answer

13. In your opinion, what are the weaknesses of POKMASWAS?
Please explain your answer

14. Do you have any suggestions as to how to improve the role of POKMASWAS in assisting in the monitoring and surveillance of IUU fishing in Indonesia?
Please explain your answer

Section Three – **This last section seeks some characteristics about you.**

15. By what gender do you identify?

- ◉ Male
- ○ Female
- ○ Other

16. Please tell me your age category:

- ◉ 18 to 24
- ○ 25 to 34
- ○ 35 to 44
- ○ 45 to 54
- ○ 55 to 64
- ○ 65 to 74
- ○ 75 or older

17. Please tell me level of employment:

- ◉ Top/Middle Management
- ○ Middle Management
- ○ Lower Management
- ○ Senior Staff
- ○ Junior Staff

18. How long have you been employed in your current position?

- ◉ Top/Middle Management
- ○ Middle Management
- ○ Lower Management
- ○ Senior Staff
- ○ Junior Staff

19. How long you have been worked in your position?

- ◉ Less than 1 year
- ○ 1-3 years
- ○ 4-6 years
- ○ 7-10 years
- ○ 11-20 years
- ○ over 20 years

20. How often in your job as public servant in one year would you visit the Natuna Sea or surrounding area?

- ◉ once per year
- ○ 2-5 per year
- ○ one per month
- ○ Weekly
- ○ Daily
- ○ Never

21. Is your duty at your office related with POKMASWAS?

- ◉ No
- ○ Yes: Please explain_____

Appendix 1B. Interview Questions for POKMASWAS

Structured Interview Questions

This research is focussing on foreign IUU in Indonesia.

Opening script:

Thank you for agreeing to participate in this study. Please be assured that I do not want you to directly disclose any specific details or specific cases (individuals) that may be under current legal or criminal investigation. I am interested in general concepts and trends.

Section One – Perception as the Nature of the Problem of IUU Fishing

1. Do you agree that IUU fishing is a major problem for Indonesia?

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please give a reason for your choice

2. Do you agree that IUU fishing is a major problem for Natuna Sea?

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

Please give a reason for your choice

3. In terms of the trends of IUU Fishing in Indonesia, please tell me if you think it is improving or getting worse?

Much Worse	Getting Somewhat Worse	About the Same	Getting Somewhat Better	Getting Much Better

Please give a reason for your choice

4. In terms of the trends of IUU Fishing in Natuna Sea, please tell me if you think it is improving or getting worse.

Much Worse	Somewhat Worse	About the Same	Somewhat Better	Much Better

Please give a reason for your choice

5. Do you think IUU fishing has had direct environmental impacts in this area?

No	Yes

If Yes, Please explain the impacts

6. Do you think IUU fishing has had direct economic impacts in this area?

No	Yes

If Yes, Please explain the impacts

7. Do you think IUU fishing has had direct social impacts in this area?

No	Yes

If Yes, Please explain the impacts

Section Two – Monitoring and Surveillance

8. How does POKMASWAS conduct monitoring and surveillance of marine and fisheries resources in your area? (Please describe the process – who is involved in collecting data, what information is collected? How is information collected, stored and compiled; frequency of reporting)?

9. What tools and equipment does POKMASWAS use to conduct surveillance? Who provides the tools and equipment?

10. How satisfied are you with the capacity of POKMASWAS to conduct monitoring and surveillance e.g. are the tools and equipment sufficient?

Very dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied

Please explain your answer

11. To whom does POKMASWAS report the results of its monitoring?

12. How does POKMASWAS report (what is the nature of the reporting process? E.g. what are the steps, what information is sent, how is it sent, when is it sent?)

13. How is the monitoring data of POKMASWAS used?

14. Who uses the monitoring data of POKMASWAS?

15. How does your group cooperate/communicate with other POKMASWAS groups in combating IUU fishing?

Section Three – **This last section seeks some characteristics about you.**

16. By what gender do you identify?

- ◉ Male
- ○ Female
- ○ Other

17. Please tell me your age category:

- ◉ 18 to 24
- ○ 25 to 34
- ○ 35 to 44
- ○ 45 to 54
- ○ 55 to 64
- ○ 65 to 74
- ○ 75 or older

18. How long have you been employed in your current position?

- ◉ Religious Leader
- ○ Local Leader
- ○ Fishermen
- ○ NGOs
- ○ Other:_____

19. How long have you joined in POKMASWAS?

- ◉ Less than 1 year
- ○ 1-3 years
- ○ 4-10 years
- ○ more than 10 years

20. How have you lived in the Natuna Island (discard any periods living elsewhere)?

- I ◉ less than 1 year
- ○ 1-3 years
- ○ 3-5 years
- ○ 5-10 years
- ○ 10-20 years
- ○ Do not reside in council area I work it

Appendix 2. Social and Behavioural Research Ethics Committee (SBREC) Ethic Approval

Dear Didik Agus,

The Chair of the Social and Behavioural Research Ethics Committee (SBREC) at Flinders University considered your response to conditional approval out of session and your project has now been granted final ethics approval. This means that you now have approval to commence your research. Your ethics final approval notice can be found below.

FINAL APPROVAL NOTICE

Project No.:	**7819**
Project Title:	Understanding the role of community-based surveillance in combating illegal fishing in Indonesia
Principal Researcher:	Didik Agus Suwarsono
Email:	suwa0013@flinders.edu.au
Approval Date:	20 December 2017
Ethics Approval Expiry Date:	**30 June 2020**

The above proposed project has been **approved** on the basis of the information contained in the application, its attachments and the information subsequently provided.
