# Blowing it out of the water: How breaking down illegal, unreported, and unregulated (IUU) fishing can contribute to its effective management in Indonesia using an area based approach

By

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**Abstract**

Fisheries are declining on a global scale. While some of this decline has been attributed to mismanagement of fisheries leading to overcapacity and overfishing, illegal, unreported, and unregulated (IUU) fishing is also held accountable for part of this decline. IUU fishing often employs destructive fishing methods and undermines the science behind fisheries management. Such practices are particularly prevalent in developing countries and contribute to the loss of billions of dollars each year. Too often, actions to mitigate IUU fishing address it as a single problematic unit. This project suggests that breaking up IUU fishing into three separate units might allow for more effective management. Using Indonesian tuna fisheries as a case study to evaluate this approach the first part of this study develops a framework upon which to build an "IUU vulnerability index". The second part of this study compiles a suite of NGO-initiated and government-initiated actions that work to combat either illegal, unreported, or unregulated fishing into the "IUU toolbox". Together, these approaches should provide decision makers with an alternative to the traditional blanket method to combat IUU fishing and facilitate a tailored approach to build legal, regulated, and reported (LRR) fisheries.

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*Key terms*: IUU fishing; developing country; Indonesia; decentralisation; vulnerability index; IUU toolbox

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# List of Abbreviations

ACIAR: Australian Centre for International Agricultural Research
CCSBT: Commission for the Conservation of Southern Bluefin Tuna
DKP: Local fisheries government office
EU: European Union
EU-CCS: European Union Catch Certification Scheme
FAO: Food and Agriculture Organization of the United Nations
FIP: Fishery Improvement Project
FT: Fair Trade
GT: Gross tonnage
HPK: Vessel inspection form
IFITT: Improving Fisheries Information and Traceability for Tuna
IOTC: Indian Ocean Tuna Commission
IPOA-IUU: International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing
IUU: Illegal, unreported, and unregulated
KKP: Regional fisheries government office
LRR: Legal, regulated, and reported
MCS: Monitoring, Control, and Surveillance
MDPI: Yayasan Masyarakat dan Perikanan Indonesia
MMAF: Ministry of Marine Affairs and Fisheries
MPA: Marine Protected Area
MSC: Marine Stewardship Council
NGO: Non-Government Organisation
nm: Nautical mile
NPOA-IUU: National Plan of Action to Prevent and to Combat Illegal, Unreported, and Unregulated Fishing
POKMASWAS: Community surveillance groups
PSM: Port State Measures Agreement
PVR: ProActive Vessel Registration
RFMO: Regional Fisheries Management Organisation
SIKPI: Carrier vessel license
SIPI: Catch license
SIUP: Fishery business license
SKA: Form required if fish is intended for export
SLO: Fishing operation permit
SPB: Sailing approval letter
VMS: Vessel Monitoring System
WCPFC: Western Central Pacific Fisheries Commission
WPP: Indonesian fishery management area
WWF-Id: World Wildlife Fund – Indonesia

# 1.0 Introduction

Fisheries are declining on a global scale (Pauly & Zeller, 2016; Pontecorvo & Schrank, 2014; Worm et al., 2009). It has been estimated that as of 2011 approximately 30% of the world's fisheries are being fished at an unsustainable level and are, therefore, overfished (FAO, 2014a). Such declines are cause for concern as capture fisheries provide some 58.3 million people with a source of income and seafood is an essential source of protein for much of global community (FAO, 2014a). While overcapacity, overfishing and poor governance are partly to blame for this problem, illegal, unreported, and unregulated (IUU) fishing practices also play a significant role in such declines worldwide (Agnew et al., 2009). According to the FAO International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing (IPOA-IUU), IUU fishing is defined as follows:

Illegal fishing refers to:

1. *Fishing activities that are conducted by foreign vessels operating within the jurisdiction of another state and breaking the local laws, policies, or regulations;*
2. *Flying the flags of States that are parties to a relevant regional fisheries management organisation (RFMO) but are operating in a manner that does not comply with the conservation and management measures adopted by that RFMO or the State (i.e. fishing in no take zones or employing the use of illegal methods);*
3. *Activities that violate national laws or international obligations including those of cooperating States to a relevant RFMO.*

Unreported fishing refers to:

1. *Catch that has either been misreported on purpose or has not been reported at all to the appropriate authorities, contradicting national laws or regulations;*
2. *Fishing activities undertaken within an RFMO where catch has not been reported or has been misreported according to the guidelines and procedures determined by the RFMO.*

Unregulated fishing refers to:

1. *Fishing activities occurring within an RFMO by vessels without nationality or flying the flag of a State who is not a party to the RFMO;*
2. *Fishing activities in areas or fishing for fish stocks where there are no applicable conservation or management measures and where these activities are conducted in a manner that is inconsistent with State responsibilities for the conservation of living marine resources under international law*.

All three activities can occur at multiple scales: from small to medium to industrial fisheries. IUU fishing can have devastating effects on fisheries for a multitude of reasons. Not only does IUU fishing undermine the science behind fisheries management by providing inaccurate representations of catch and fish biomass, it often employs destructive fishing methods such as blast fishing or cyanide causing irreparable damage to marine ecosystems (Bailey & Sumaila, 2015; Polacheck, 2012; Varkey et al., 2010). More disturbingly, in recent years, IUU fishing has also been associated with the use of slave labour, drug trafficking, and tax evasion (Pramod et al., 2014). This compromises the long-term vitality of the marine ecosystem, and directly affects compliance with the Code of Conduct for Responsible Fisheries, a code promoting the long-term conservation and sustainability of fisheries resources (FAO, 2001; FAO, 1995).

Each year billions of dollars are lost worldwide due to IUU fishing; it has been estimated that the total global value of IUU fishing is between $10 billion USD and $23.5 billion USD, annually (Agnew et al., 2009). This range in values alone should emphasize the doubt underscoring IUU activities, representing a significant uncertainty gap.

On the international stage, many regulations have been established to reduce IUU fishing. The two most relevant and ubiquitously applied are the FAO International Plan of Action to Prevent, Deter, and Eliminate IUU Fishing (IPOA-IUU) and the FAO Port State Measures Agreement (PSMA) (FAO, 2016a; FAO, 2001). Developed from the IPOA-IUU, the European

Union (EU) has also taken bold legislative measures to prevent, deter, and eliminate IUU fishing by adopting a new regulation, Council Regulation No 1005/2008. The Regulation includes actions block IUU-listed vessels from EU ports and markets. Other, more creative, alternatives to curb IUU fishing have also been suggested. One such proposal, is to restrict or eliminate the insurance for IUU listed vessels (Miller et al., 2016).

Significant motivators to engage in IUU fishing are often economic drivers, institutional factors, and social factors (Le Gallic & Cox, 2006; Sumaila et al., 2006). Generally, IUU fishing will proceed if the expected financial return is greater than the best legal alternative (Le Gallic & Cox, 2006). However, despite poor economic conditions and short-term prospects that IUU fishing can provide to individuals, the ultimate result can have devastating environmental and economic consequences. Losses such as these are most heavily experienced in developing countries (Petrossian, 2015). One such example where IUU fishing is occurring over multiple scales and by different methodologies is in Indonesia (FAO, 2014b). It's been estimated that Indonesia alone loses approximately $4 billion USD per year due to IUU fishing (Varkey et al., 2010). FAO identified Indonesia as the sixth most important fishing nation in the world, both for fishing and exports of fish; therefore, the persistence of IUU fishing has serious implications not only on the economy, but also the ecological and sustainable management of its fisheries and the livelihoods of law-abiding fishers.

## 1.1 IUU Fishing in Indonesia

Traditional forms of IUU management are primarily made up of measures to improve the monitoring, control, and surveillance (MCS) of the given region (Bray, 2000). However, due to the seriousness and relevance of IUU fishing, many new initiatives are starting to take seed throughout Indonesia. These initiatives tend to be spearheaded either by non-government

organisations (NGOs) or from government institutions. The Indonesian Government is acutely aware of its IUU fishing problem. To help address its concerns, the Government is implementing a National Action Plan to Prevent and Combat IUU Fishing (NPOA-IUU) (MMAF, 2012a). The Government has also cooperated with the European Union to ensure that all exported fish to Europe are obtained legally (i.e. accompanied by a catch certificate, which will be expanded upon further in this paper) and are working with NGOs to implement more sustainable practices (which will also be expanded upon further in this paper) (FAO, 2014b).

However, despite these initiatives, IUU fishing continues to be an ever-present threat in Indonesia. Part of this risk stems from the potential misconception that the most harmful actions are done by illegal foreign fleets rather than by activities of domestic fishers. In 2014, Her Excellency Susi Pudijastuti (henceforth, Ibu Susi), was elected as the new Minister for Marine Affairs and Fisheries. Since her inauguration, Indonesia has detained and sunk more than 200 vessels that were found to be fishing illegally in their waters (Wadhams & Faires, 2016). While these initiatives certainly send a powerful, and very public, message to foreign countries who have previously exploited Indonesia's productive waters, it is obvious that the current focus is largely fixated on foreign illegal vessels. Although Indonesia has clearly started to address its problems with illegal foreign vessels, the compliance of domestic small-scale fleets have arguably been overlooked.

Due to the regulatory conditions under which small-scale fishermen report catch (i.e. infrequently) overlooking the small-scale fishermen as a contribution to the whole can result in a severe under-reporting of catch and augment problems within the corresponding fisheries management plan (Pauly & Zeller, 2016).

As listed in the Indonesian NPOA-IUU the top problems occurring in Indonesian waters that relate to *illegal fishing* are as follows (MMAF, 2012a):

- *Fishing by foreign vessels in Indonesia's EEZ and archipelagic waters, most often using purse seine and trawl fishing gear*
- *Fishing vessels do not possess a catch license (SIPI)*
- *The fishing carrier vessels do not possess a carrier vessel license (SIKPI)*
- *Fishing activities occurring in areas that are not congruent with the fishing areas specified on the fishing license*
- *The use of harmful or prohibited fishing gear*
- *Forgery of fishing licenses*
- *Manipulating the vessels' documents relating to size, location of manufacture, and vessel ownership information*
- *The name of the vessel, size, brand, or serial number does not match what is listed on the license*
- *The type of fishing gear does not match what is listed in the license*
- *Vessels operating without a Sailing Approval Letter (SPB)*
- *The vessel does not install or activate monitoring equipment such as VMS*
- *Catch is reported to foreign countries, rather than the relevant port*
- *Vessels carrying an Indonesian flag capture or carrying fish in the jurisdiction of other countries without the permission of the country and without approval of the government of Indonesia*

As listed in their NPOA-IUU the top problems occurring in Indonesian waters that relate to *unreported fishing* are as follows (MMAF, 2012a):

- *Catch is transferred in the sea or transshipped without being reported or recorded to the relevant authorities*
- *Offenders do not report their catch an avoid a tax levy on the businesses*
- *Fishing vessels do not report their catch at the port base given the license granted*
- *Fishing vessels directly transport their catch overseas*

As listed in their NPOA-IUU the top problems occurring in Indonesian waters that relate to *unregulated fishing* are as follows (MMAF, 2012a):

- *Sport fishing occurring in local waters*

The above listed priorities concerning illegal, unreported, and unregulated in Indonesia indicate that the MMAF disproportionately singles out and publicises illegal fishing as the main concern over unreported, and unregulated fishing.

## 1.2 Tuna Fisheries in Indonesia

With the world's largest archipelago spanning more than 17,000 islands and 54,000 km of coastline, fishing is a significant contributor to coastal livelihoods, food security, and culture in Indonesia. In 2012, nearly 6.4 million individuals engaged in wild capture fisheries and fish farming, contributing up to about 50% of the animal protein intake for the country (FAO, 2014b). Most of these resources originate from subsistence and small-scale fishing practices which can often fall through the cracks of national regulations and provincial enforcement (FAO, 2014b). Furthermore, Indonesia is a large seafood producer, in that they export a significant portion of the national catch. In 2013, the total value of exported fishery products was ~3.8 billion USD, accounting for 21% of Indonesia's agricultural industry and about 3% of the national GDP (FAO, 2014b). Most notably, Indonesia is the world's second largest exporter of tuna products, such that, in 2013, the total export value was ~ 760 million USD (Duggan & Kochen, 2016). In this paper "tuna" refers to multiple species, with the most important being skipjack (*Katsuwonas pelamis*), yellowfin (*Thunnus albacares*), bigeye (*Thunnus obesus*), and albacore (*Thunnus alalunga*) based on FAO data and Duggan and Kochen (2016). While only a small proportion of the catch volume of tuna species (about 20%) is caught by small-scale fishing gears, approximately 90% of the vessels that target tuna species in the Western and Central Pacific Ocean are small-scale with

vessels of 1-5 GT (Duggan & Kochen, 2016). Additionally, small-scale tuna fisheries,in particular, make an important contribution to the culture and often, livelihood in many remote communities. The prevalence of IUU fishing in small-scale Indonesian tuna fisheries threatens the sustainability of such fisheries and cannot go unheeded.

## 1.3 Indonesia as a decentralized fishing nation – the case for an area based approach

In 1999 the national government of Indonesia changed its governance from a centralized form of control to a decentralized form of control – reallocating control over natural resources, including its fisheries, to provincial governments (Ahmad & Mansoor, 2002). In 2009 Indonesia divided its waters into 11 fisheries management areas (WPPs) (Figure 1) (MMAF, 2012a). Within each WPP fishermen must obtain their license from either the local (DKP), regional (KKP), or national (MMAF) governing fisheries body depending on the criteria of their vessel. Vessels are categorized by size such that a small-scale vessel is 1-5 GT, a medium scale vessel is 5-30 GT, and a large-scale vessel is >30 GT. Fishermen must obtain their licences from the respective government office. Further, owners of vessels that are 1-7 GT must register their boat with the local transportation office, while owners of vessels over 7 GT must be registered with the provincial transportation office (pers. obs., August, 2016). The primary compliance documents include a Fisheries Business License (SIUP), Catch License (SIPI), and a Fish Carrier License (SIKPI). Decentralizing the management of fisheries means that the Director General is authorized to issue the SIUP, SIPI, and SIKPI for vessels >30 GT, the Governor is authorized to issue these documents to vessels between 10 and 30 GT, and the Regent/Mayor is authorized to issue the documents to vessels between 5 and 10 GT (MMAF, 2012a). Currently, vessels under 5 GT are often overlooked with respect to the issuance of compliance documentation. Vessels under 7 GT

are not legally obligated to be registered, however valid registration is necessary to obtain a fishing license (Appendices A and B outline process for obtaining such documents).

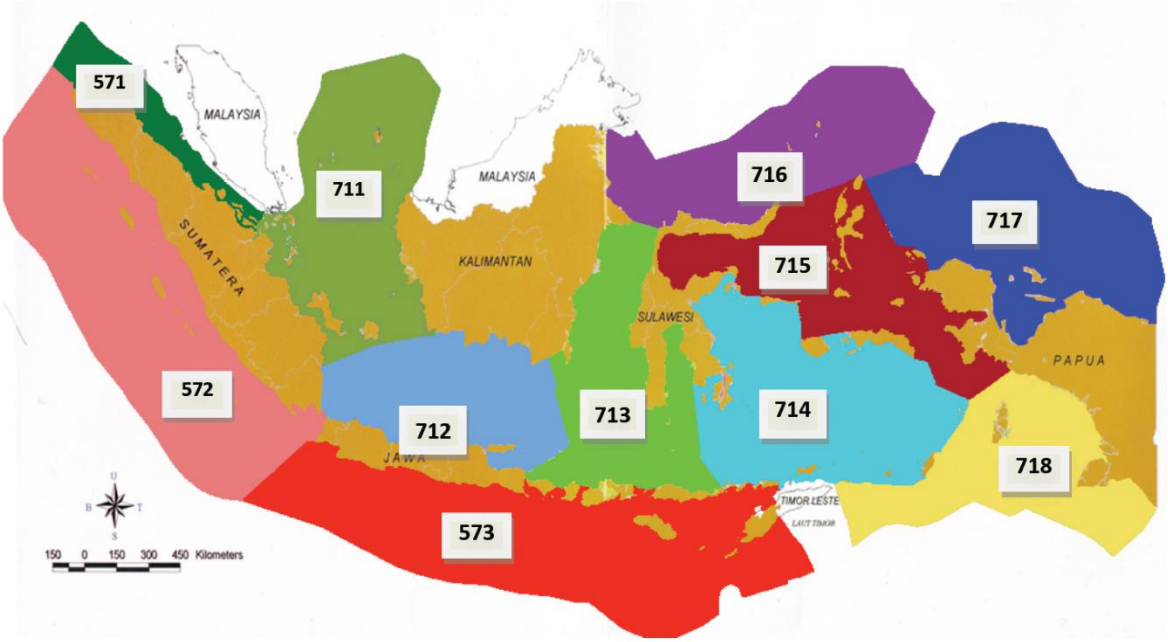


***Figure 1:*** *Indonesia is divided into 11 fisheries management areas (WPPs). Here, WPPs are coloured and labeled with their corresponding numerical code (Adapted from: MMAFa).*

As an island nation with vast archipelagic waters, there are obvious challenges in regulating and monitoring seas under various jurisdictions. Additionally, as a developing nation with a large number of rural, isolated fishing communities who have little to no interaction with the local or regional governments, ensuring compliance among fisherfolk affords additional challenges (Duggan & Kochen, 2016). These are further compounded by the lack of organisation amongst government offices where the fisheries offices and the transportation offices are not necessarily located near one another, nor are they dispersed evenly throughout a WPP. Therefore, certain communities where most of the population are small-scale fishermen, are usually unable to access Government offices due to poor road conditions, long ferry rides, and a general lack of means for transportation to the necessary office. Jurisdictional borders further complicate the lack of cooperation amongst the various levels of government. The regional government controls the seas

up to 12 nautical miles (nm), while the national government controls 12-200 nm. However, in some cases the regional government does not have the means to monitor such waters, and assistance from the national government is unavailable.

While the challenges are numerous and clear, it's important to recognize the opportunities associated with a decentralized government. Because of decentralization, the governing bodies can, in theory, focus on the specific needs of their own region, making the case for an area-based management approach. With respect to IUU fishing, each WPP may have different objectives and targets towards the eradication of IUU fishing. Decentralization allows for a more specific and tailored implementation plan based on the explicit needs of the WPP.

## 1.4 Problem Statement

Too often, strategies to combat IUU fishing are drafted under the pretense that all three aspects of IUU fishing can be addressed with the same methodology, and are treated as a *single problematic unit*. Although they are usually *defined* individually, after the initial definition they are once again grouped together. Illegal, unreported, and unregulated fishing are different activities, and management plans should reflect this notion. When IUU fishing is teased apart and defined individually it is clear that effective preventative methods against each component are likely different and vary depending on which activities or categories pose a greater challenge in a given region. For managers to lump all three components together with a panacea-fix is unrealistic, and such an approach will fail to attack the root causes of IUU fishing. The overarching objective of this paper is to demonstrate how breaking up illegal, unreported, and unregulated fishing into its separate constituents might contribute to more effective management. This analysis is completed through two main conceptual approaches, "The IUU Vulnerability Index" and "The IUU Toolbox". Indonesia was chosen as a country of study because of its social and economic

dependence on the ocean as a resource, its current and historical problems with IUU fishing, and its recent anti-IUU momentum.

As a preliminary step to demonstrate potential discrepancies between illegal, unreported and unregulated fishing activities throughout Indonesian waters, the first part of this study develops a framework upon which to design an IUU vulnerability index to analyse the risk of illegal, unreported, or unregulated fishing in the context of given areas, in this case, WPPs. Ultimately, the index will have the potential to outline possible discrepancies between each WPP with respect to illegal, unreported, and unregulated fishing threats. Due to the variances between WPPs, it is anticipated that different areas are vulnerable to different aspects of IUU fishing, and thus approaches to combat IUU fishing should vary by WPP as well.

The second part of this study evaluates various current initiatives in Indonesia that have been implemented to combat IUU fishing. Together, these initiatives make up "The IUU Toolbox". The actions, or 'tools' that work towards combatting IUU fishing are often initiated by NGOs, the most prevalent being World Wildlife Fund-Indonesia (WWF-Id) and Yayasan Masyarakat dan Perikanan Indonesia (MDPI), or through government legislation.

How can the initiatives that have been undertaken by local NGOs work to combat each aspect of IUU fishing? And conversely, how do government-driven initiatives, such as increased or new regulations fit into the current industry-driven model? Could splitting IUU up into its separate constituents provide the framework for a more effective management plan towards the mitigation of IUU fishing in a decentralized state like Indonesia? The results of this study can provide Indonesia, and other developing country fisheries managers, with an analysis of how different sustainability approaches can effectively combat IUU fishing in tuna fisheries, and

subsequently, how this may lead to the establishment of a legal, regulated, and reported (LRR) industry.

## 1.5 Paper Outline

Based on the problem statement and research questions this project has been structured as follows: Chapter 2 (The IUU Vulnerability Index) discusses the methods and results of the development of framework for The IUU Vulnerability Index. Chapter 3 (The IUU Toolbox) is divided into the two major components of The IUU Toolbox; NGO initiated tools, and Government initiated tools. There are six NGO initiated tools that are discussed in this chapter. The Government initiated tools are further divided into national and international actions. A contextual background for each tool is provided, followed by details of how the tool works to combat illegal, unreported, or unregulated fishing along with a brief analysis on its limitations and strengths. The Discussion chapter (Chapter 4), identifies how The IUU Vulnerability Index and The IUU Toolbox can eventually work together to make more informed management decisions with respect to IUU fishing in Indonesia. This chapter also identifies the limitations of this project and future research directions. The final chapter draws conclusions from the resulting analysis and suggests how this project might be applicable in the global context of IUU fishing.

While the data for this project were collected through a literature review and publicly available data, the author did have the opportunity to travel to Indonesia for the months of May, July, and August, 2016. During this time, the author spent one month travelling to five different fishing villages in the North Maluku region and to Bitung, a large port city in North Sulawesi, as part of an internship hosted by MDPI (Figure 2). Personal comments of a qualitative nature are based on observations made during these months.


***Figure 2:*** *Map of Indonesia with major cities, roads, railways, and seas labelled. The orange arrow indicates where Bitung is located. Here (and on islands in the Molucca Sea) is where the author spent one month conducting field work. (Map retrieved from: http://www.lib.utexas.edu/maps/indonesia.html).*

## 2.0 The IUU Vulnerability Index

Vulnerability indices can act as useful tools to determine the risk of a population to the exposure of a hazard. Ultimately the results can be communicated in the form of a numerical value where higher numbers indicate a higher vulnerability and lower numbers indicate lower vulnerability (Halpern et al., 2012; Halpern et al., 2007). In the case of this project, the hazards would be illegal, unreported, or unregulated fishing and the risk would be the exposure of them throughout Indonesia's WPPs.

To quantify the vulnerability of a specific WPP towards illegal, unreported, or unregulated fishing, the first step was the creation of a framework to measure IUU vulnerability. No prior

framework was found in the literature review upon which to base this analysis. Therefore, the vulnerability index framework in this project was developed based on the criteria of the definition of IUU fishing, and is preliminary in nature. Using these definitions as a guide, a table was developed listing various attributes that might encourage or discourage illegal, unreported, or unregulated fishing, or provide general information that would influence the vulnerability of IUU fishing in Indonesia. Each attribute was then analysed to determined its relevance to IUU fishing in tuna fisheries, any limitations that it posed, and wherever possible, hard evidence to defend its position in the table. These results are compiled in Table 1 and presented below.

Specific values to each WPP are beyond the scope of this project. That is, due to the infancy of this framework, an actual index giving IUU vulnerability values to WPPs is not yet feasible. However, the index has been designed in the hopes that WPPs may eventually subscribe to this type of analysis and use it to assist in decision making with regards to actions combatting illegal, unreported, or unregulated fishing.

The attributes that were used to develop the framework for the vulnerability index are as follows: number of ports, total fishing effort, length of international borders, length of domestic borders, number of fisheries government offices, number of transportation offices, number of RFMOs the WPP must report to, whether it is an area where NGOs are active, amount of reported tuna catch, patrol routes, the presence of a surveillance post or working unit, and the presence of community surveillance groups. Each attribute was assigned a thematic area, that is, IUU + if its presence enabled IUU fishing or IUU- if it discouraged IUU fishing and analysed for its relevance towards illegal, unreported, or unregulated fishing. A formula will ultimately be designed to analyse IUU vulnerability within each WPP. At the time of this analysis, many of the attribute ranges are unknown or unavailable and therefore they cannot be quantified. An important part of

this index is that it can be improved upon and edited as more data becomes available through future work.

***Table 1:*** *Attribute table indicating the attributes used to build the framework to develop an IUU vulnerability index. Each attribute has a designated thematic area indicating its endorsement of IUU fishing (IUU+) or its discouragement of IUU fishing (IUU-). The relevance of each attribute with respect to illegal, unreported, and unregulated fishing is determined, by either strongly or weakly affecting illegal, unreported, or unregulated fishing, any limitations of the attribute and, where possible, evidence is given. The "data upon which to build a numerical scale" indicates the data that will be necessary to build the index and analyse each WPP for IUU vulnerability.*

| **Thematic area** | **Attribute** | **Relevance** | **Limitation** | **Evidence** | **Data upon which to build a numerical scale** |
|---|---|---|---|---|---|
| IUU - | Number of Ports | **Illegal (strong)** vessels operating illegally will not be granted access to the port (unless distress, etc.)<br>**Unreported (strong)** vessels must report all catch<br>**Unregulated (strong)** vessels should be recording exactly where they fished. This should be confirmed with VMS on larger vessels | Port-limited, only effective when there are ports present | Port State Measures | Ports per WPP<br>• More ports would indicate lower vulnerability to IUU fishing |
| IUU + | Fishing Effort | The higher the fishing effort in an area, the harder to manage | | | Amount of effort per WPP<br>• Higher fishing effort indicates higher vulnerability to IUU fishing |
| IUU + | Length of international borders | **Illegal (strong)** longer international borders allows for more area space for foreign vessels to enter national waters<br>**Unreported (weak) –** international borders have less impact on the local reporting of catch. Unreporting by foreign vessels is categorized as *illegal* fishing<br>**Unregulated (weak)** length of international borders has less influence over the unregulated fishing capacity | | Majority of illegal vessels are found near international borders | Length of border per WPP<br>• Longer borders indicate higher vulnerability to IUU fishing |
| IUU + | Length of domestic borders | **Illegal fishing (weak)** Archipelagic WPPs are | | | |

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| | | less likely to support illegal vessels<br>**Unreported (misreported) (strong)** - in areas where there is a high likelihood of fishermen fishing in one WPP and reporting their catch to a port in an adjacent WPP<br>**Unregulated (strong)** fishermen being registered to fish in one WPP and actually fish in an adjacent WPP | | | Length of the domestic borders of each WPP<br>• Longer borders indicate higher vulnerability to IUU fishing |
| IUU - | MMAF offices | **Illegal (strong)** presence of offices allows fishermen to register their vessels and obtain fishing licenses<br>**Unreported (weak)** fishermen/suppliers are supposed to report their shipped product on a monthly basis (region dependent)<br>**Unregulated (weak)** MMAF offices do not ensure that vessels are fishing in the regions they are authorized to do so. Government initiated VMS for large scale vessels. | Local and some regional gov't offices often lack the means of enforcement, must be a reliance that the government is not corrupt | More offices make the registration process easier | Number of MMAF offices per WPP<br>• Fewer MMAF offices indicates higher vulnerability to IUU fishing |
| IUU - | Transportation offices | **Illegal (strong)** presence of offices allows fishermen to register their vessels and obtain fishing licenses<br>**Unreported (weak)** fishermen/suppliers are supposed to report their shipped product on a monthly basis (region dependent)<br>**Unregulated (weak)** number of transportation offices do not ensure vessels are fishing in the regions they are authorized to do so. | Local and some regional gov't offices often lack the means of enforcement, must be a reliance that the government is not corrupt | More offices make the registration process easier | Number of transportation offices per WPP<br>• Fewer transportation offices indicate higher vulnerability to IUU fishing |
| IUU +/- | Number of RFMOs | **Illegal (weak)** amount of RFMOs does not influence the amount of illegal fishing activity | Presently unknown whether the number of RFMOs would | "tied for the highest uncertainty with the Philippines" (Duggan and Kochen, 2016) | Number of RFMOs each WPP should be reporting to |

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| | | **Unreported (weak)** more RFMOs to report to can make for more complications in reporting manner, based on requirements of specific RFMO<br><br>As Indonesia should be reporting to multiple RFMOs potentially higher incentive to report to at least one of them<br>**Unregulated (weak)** number of RFMOs does not ensure fishing activity is where is supposed to be | have a positive or negative influence over combatting IUU fishing | | • Not enough information to determine how the number of RFMOs should influence the vulnerability index |
| IUU - | NGO Presence | **Illegal (strong)** NGO initiatives do not employ illegal activities, ensures that fishermen and vessel have up to date documentation<br>**Unreported (strong)** data collection is a preliminary activity before certification activities take place<br>**Unregulated (weak)** unless VMS is onboard cannot completely guarantee that | Capacity of NGOs to expand to other areas and ability of NGOs to work beyond the small or medium scale sector | | Areas of activity of marine and/or fisheries related NGOs and projects<br><br>• More NGO activity indicates a lower vulnerability to IUU fishing |
| General Info | Catch | Areas with high catch reporting could mean unregulated and unreported is less of an issue, or could mean that's where the majority of the fish are, drawing in more people, perhaps illegal vessels too | Indonesia is traditionally data-poor, hard to quantify the weight that should be placed on this factor | | Reported catch in each WPP<br><br>• Not enough information to determine how the reported catch should influence the vulnerability index |
| IUU - | Patrol routes | **Illegal (strong)** presence of patrol boats scare away people who are not where they're supposed to be<br>**Unreported (weak)** if patrol boat makes note of vessels, may check to see that vessel reports catch when lands<br>**Unregulated (weak)** patrol must consciously check the documents of the captain to ensure | Relies on active patrol crew, no corruption, capacity limited, unrealistic to patrol every nm of Indonesian waters | | Percentage of WPP covered in typical patrol routes<br><br>• Higher percentage of WPP covered in patrol route indicates lower vulnerability to IUU fishing |

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| | | that they are fishing in the area they're licensed to | | | |
| IUU - | Presence of a surveillance post or working unit | **Illegal (strong)** can monitor foreign and local vessels<br>**Unreported (weak)** surveillance mechanisms do not reliably ensure compliance in reporting catch<br>**Unregulated (strong)** ensuring vessels are where they should be | | | Number of surveillance posts per WPP<br>• Higher number of surveillance posts in WPP indicates lower vulnerability to IUU fishing |
| IUU - | Presence of a community-based surveillance group | **Illegal (strong)** helps against destructive fishing and fishing in MPAs<br>**Unreported (weak)** some community groups may encourage catch reporting<br>**Unregulated (weak)** some community groups may encourage regulated fishing | Data deficient attribute where its full effectiveness against IUU fishing has not been evaluated | | Number of groups per WPP<br>• Higher number of groups indicates lower vulnerability to IUU fishing |

## 2.1 Ports

**Definition:** As an island nation where sea transport is the dominant conduit to move goods, Indonesia is home to approximately 1,700 seaports (OECD, 2012). Ports act as harbours where fishing and transportation vessels can dock. Prior to fishing activities in the morning and upon completion of fishing activities the captain of the vessel is supposed to 'check in' with the port authority, otherwise known as the *syahbandar*. There are specific documents that are meant to be completed, largely pertaining to where fishing activities occurred, by whom (including vessel ID), and what species and quantity was caught each trip.

**Rationale:** Given the authoritative nature of ports and the Port States Measures Agreement, this attribute has fallen into the IUU- thematic area and, when present, strongly influences scores for illegal, unreported, and unregulated fishing. Additionally, there is the potential for

the presence of ports to discourage transshipment at sea. The main limitation of this attribute is that it is only effective when designated ports are present.

### 2.2 Fishing Effort

**Definition:** Fishing effort is "the amount of fishing gear of a specific type used on the fishing grounds over a given unit of time" (FAO, 2002).

**Rationale:** While not directly related to illegal, unreported, or unregulated fishing, fishing effort can help to given an indication of the number of people involved in fishing activities and the gear types involved. It falls into the IUU+ thematic area because, in general, the more people involved in fishing, the harder it is to manage.

### 2.3 Length of International Borders

**Definition:** The length of the borders around each WPP that are shared with either another country, or with the high seas, as defined by the United Nations Convention on the Law of the Sea (UN, 1982).

**Rationale:** Within the scope of Indonesia, most of the *illegal* fishing occurs from foreign boats entering local waters. Therefore, a longer international border contributes to an IUU+ thematic area. On the other hand, unreported and unregulated activities in Indonesia, tend to occur more in archipelagic waters.

### 2.9 Length of Domestic Borders

**Definition:** This attribute describes the length of the internal borders within a WPP; meaning WPPs that border onto other Indonesian WPPs.

**Rationale:** Within the scope of Indonesia, the majority of unreported and unregulated fishing activities occurs in local waters (pers. obs., August, 2016). This attribute falls into the IUU+ thematic area. Because the majority of unregulated fishing from small-scale fleets occurs in

internal waters, it was assumed that a longer length of internal borders could contribute more strongly to an increase unregulated fishing and some unreported fishing. This is due to the nature of WPPs where longer domestic borders might display a higher likelihood that fishermen might be registered in one WPP and conduct unregulated fishing activities in another, or alternatively, fish in one WPP and report their catch in another WPP.

## 2.4 MMAF and Transportation Offices

**Definition:** The number of government offices located in each WPP where fishermen and vessel owners can obtain fishing licenses and register their vessels.

**Rationale:** Legally, fishermen and vessel owners should be filing the correct documentation for fleet and vessel specific categories. To do this, they can apply online or apply in person at the relevant office. In rural communities, it is rare to have a reliable internet connection, so most often they must go in person to the relevant local, provincial, or national offices. In general, it was assumed that the more office locations spread throughout the WPPs, the easier it would be to become licensed and registered, resulting in an increase in documentation distribution and a decrease in illegal fishing, and perhaps slight decreases in unreported and unregulated fishing, thereby falling into the IUU- thematic area.

## 2.5 Number of RFMOs

**Definition:** Regional fisheries management areas (RFMOs) are areas of the ocean which primarily exist to regulate the transboundary stocks or highly migratory species, such as tuna stocks in the high seas. RFMOs are internationally legalized cooperative units that are generally responsible for collecting fisheries statistics, assessing abiotic and biotic resources, making management decisions, and monitoring activities (FAO, 2008; UN, 1995). RFMOs consist of member countries that have a common interest in the management of shared fish stocks. These

interests may be a geographical or financial interest (i.e. countries that either fish in RFMO waters, or are located adjacent to RFMO waters). Indonesia is currently a member of three RFMOs, specifically related to tuna. They are the Western and Central Pacific Fisheries Commission (WCPFC), the Indian Ocean Tuna Commission (IOTC), and the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). See Figure 3 for a map of Indonesia and the relevant RFMOs.

**Rationale:** Each RFMO has specific requirements for data collection, reporting, conservation, and management measures. Certain WPPs should be reporting to multiple RFMOs. Reporting to multiple RFMOs with varying forms of data collection may either improve actions against IUU fishing or, alternatively, promote confusion, inducing actions that would contribute towards unreported, or unregulated fishing, at the very least. Overall, underreporting or misreporting to RFMOs influences global catch data and can ultimately play a role in international actions. While the number of RFMOs is an important attribute to consider in area-based management, there is currently not enough information about this attribute to determine whether it falls into IUU+ or IUU- thematic area.

## 2.6 NGO Presence

**Definition:** This attribute describes whether fisheries and/or marine NGOs are actively working in any given WPP, and approximately what percentage of the WPP area the work is conducted in.

**Rationale:** Since part of the IUU toolbox includes the activity of NGOs, it is appropriate to include NGO work as an IUU- contributing factor. Note that the NGO activities that are

discussed in the following chapters refer primarily to MDPI and WWF-Id, who do not conduct work in every WPP.

## 2.7 Catch

**Definition:** This attribute describes the amount of reported tuna catch occurring in any given WPP.

**Rationale:** Although Indonesia is traditionally a data poor country, the amount of catch is an important factor to consider. This attribute falls into the "general info" category because there is not enough information to determine IUU+ or IUU- thematic areas. While the assumption could be made that areas with high catch reported implies there is less unreported and unregulated fishing occurring, it could also imply that these are highly productive areas attracting more fish, drawing in more vessels, and thereby potentially increasing the unregulated and illegal fishing practices. Presently, not enough information is known to determine if data on reported catch positively or negatively contributes to IUU mitigation, but as reporting improves, this attribute may become more accurate.

## 2.8 Patrol Routes

**Definition:** In the last few years, Indonesia has noticeably increased the number of patrol boats on the water and the frequency with which they patrol (MMAF, 2012a). This attribute describes how many patrol routes are conducted through the WPP and how often.

**Rationale:** This attribute falls into the IUU- thematic area. Increasing the patrolling effort on the water, should result in a decrease in observed illegal fishing vessels, at least.

## 2.10 Presence of a Surveillance Post or Working Unit

**Definition:** Because of the NPOA-IUU Indonesia established several new land-based surveillance posts and working units (MMAF, 2012a). These act as a land-based support system

to both send out surveillance boats and to prosecute those found to be partaking in illegal, unreported or unregulated fishing.

**Rationale:** The presence of such offices provides the land based support needed to increase on-the-water enforcement. As such, they work against IUU fishing, placing them in the IUU- thematic area.

### 2.11 Presence of a Community-Based Surveillance Group

**Definition: A** community-based group which assists in the coastal management of resources.

**Rationale:** The presence of community-based surveillance groups typically works against destructive fishing methods such as cyanide or blast fishing, or fishing in illegal areas, such as marine protected areas (MPAs) (Crawford et al., 2004). Therefore, this category was placed in the IUU- thematic area and seemingly works best against illegal fishing, with a potential to work against unreported and unregulated fishing. There is not currently enough evidence to determine its effectiveness against unreported and unregulated fishing practices.

The above framework is to meant be used as the foundation upon which to build an IUU vulnerability index. Future work would entail assigning numerical values to each WPP to determine the range of each attribute. After determining the ranges of each attribute, we propose that a formula could be developed and the values of each WPP can be inputted into the formula to determine its vulnerability towards illegal, unreported, or unregulated fishing. Ultimately this could help managers visualize what types of IUU-related problems they should be focussing on in any given area. The discussion chapter of this project addresses this concept further and outlines how the index can be used in conjunction with the toolbox to make better informed fishery management decisions.

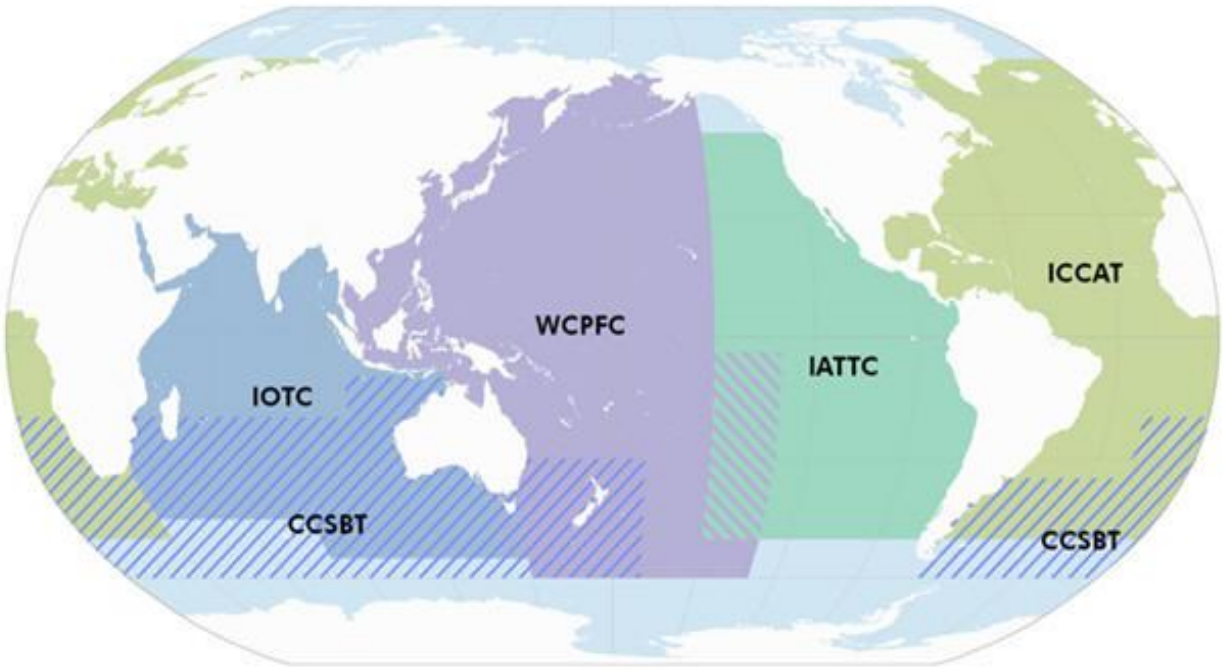



***Figure 3:*** *Global RFMOs responsible for the collective management of tuna stocks. Indonesia is a member of the WCPFC, IOTC, and CCSBT largely due to geographic relevance.*
*(Image retrieved from: http://www.trimarinegroup.com/activities/sustainability.html)*

## 3.0 The IUU Toolbox

The IUU Toolbox is a figurative toolbox, made up of approaches and initiatives (tools) that have been taken in Indonesia that work to combat illegal, unreported, and unregulated fishing. To determine the IUU toolbox, a literature review was conducted seeking out the most prevalent actions that Indonesia has taken towards increasing its sustainability in fisheries, to decrease IUU fishing. Based on preliminary analysis it became clear that these actions could be grouped into two categories, that is, NGO-initiated strategies and Government-initiated strategies. Most of the NGO-initiatives were learned of during the author's time in Indonesia. The government initiatives can be subdivided into National and International actions.

After each initiative was identified it was thoroughly studied and analysed for how it addressed illegal, unreported, and unregulated fishing. Simultaneously, any limitations and strengths of each initiative were identified. The results were then compiled into a table, some of

which were also transcribed into a user-friendly graphic. This graphic allows decision makers to see, at a glance, which initiatives might be most effective given the illegal, unreported or unregulated fishing problems at hand (Figure 4, and Tables 2, 3, and 4).

The following sections give a brief introduction to each tool, discuss its capacity in Indonesia, outline how it works against illegal, unreported, and unregulated fishing, and concludes with points about tool's limitations and strengths. The tools with NGO-initiated origins are Marine Stewardship Council Certification (MSC), Fair Trade USA Capture Fisheries Certification (FT), Traceability, Vessel Registration, Data Enumeration, and Spot Tracers. The primary tool associated with National Government Action is the National Plan of Action to Prevent, Deter, and Eliminate IUU Fishing. The tools associated with International Government Action are Port State Measures Agreement, the Strategic Plan for ACIAR Engagement in Capture Fisheries Research and Capacity Development in Indonesia, the Regional Plan of Action to Promote Responsible Fishing Practices including Combatting Illegal, Unreported, and Unregulated Fishing in Southeast Asia Region, and the EU Catch Certification Scheme.

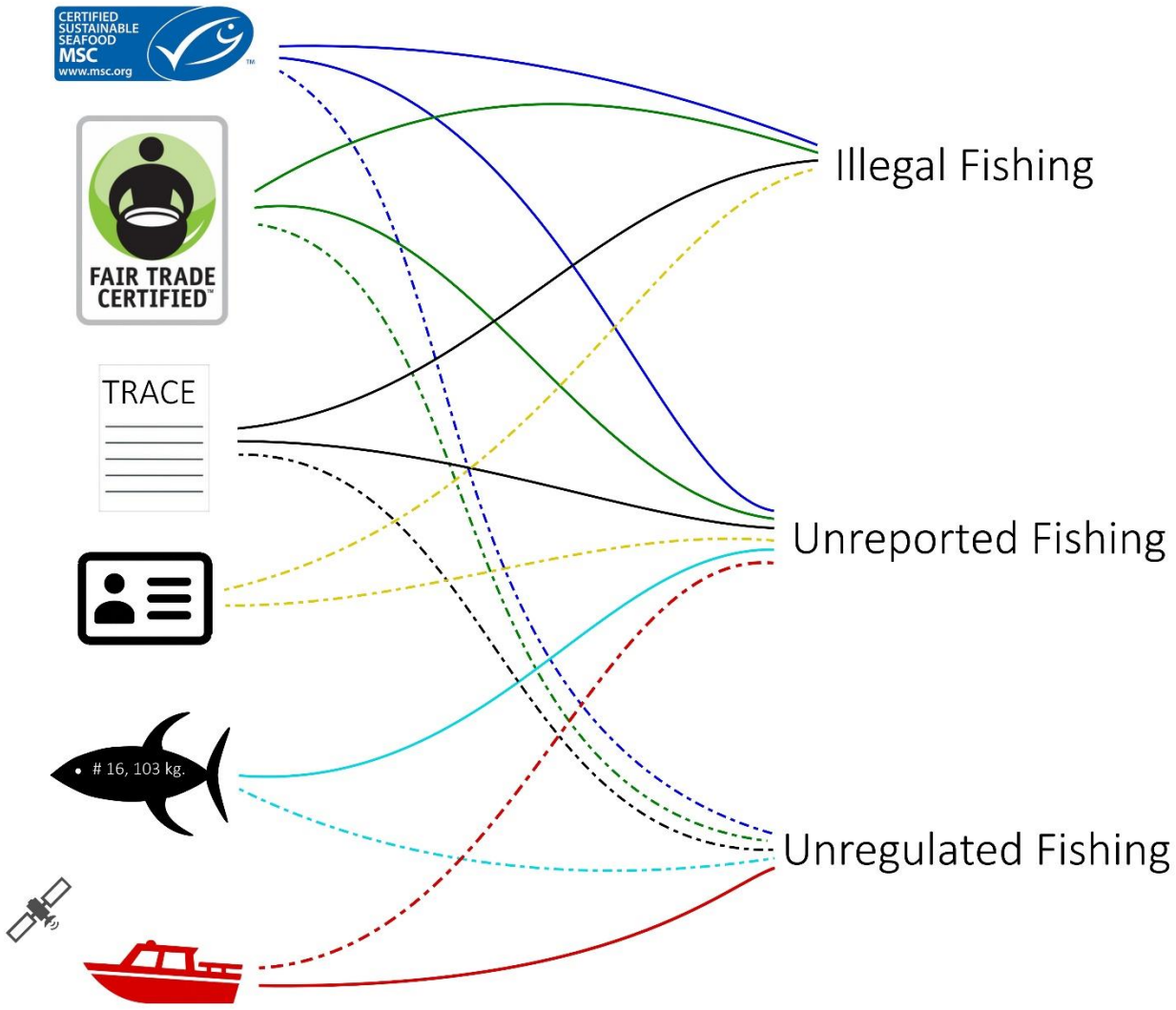



***Figure 4:*** *Icon depicting which NGO-driven initiative either directly or indirectly reduce illegal, unreported, and unregulated fishing. From top to bottom the icons represent MSC certification schemes, Fair Trade certification schemes, traceability, vessel registration, Data Enumeration, and Spot Checkers. The solid lines represent a strong relationship between the initiative and anti I, U, or U actions, while the dotted lines represent a weaker connection. No line indicates the weakest connection and the initiative is not recommended to mitigate the activity to which is has it no connection.*

## 3.1 NGO-Initiated

For a complete overview of all NGO-initiated tools that were analysed, please refer to Table 2.

### 3.1.1 Marine Stewardship Council Certification

In an effort to increase consumer awareness of sustainable practices with respect to marine resources, certification schemes and eco-labels have been flushing the market, most notably in Western markets. The purpose of labels is to inform the consumer that the product they are

purchasing has been sourced in a sustainable manner (Jacquet & Pauly, 2006). The most recognizable and fastest growing seafood certification scheme that of the Marine Stewardship Council (MSC) (Gulbrandsen, 2009; Bush et al., 2013a).

The Marine Stewardship Council is an international non-profit organisation dedicated to safeguarding biological marine resources for future generations. It was established in 1997 to increase consumer awareness of where seafood was coming from and reward fisheries who employ sustainable fishing practices with higher revenues (MSC, n. d.). As of 2015, MSC certified catch encompasses 10% of the total global wild-caught catch (MSC, 2016). To become certified fisheries must comply with the MSC Standard which encompasses three core principles. These are described below (MSC, 2015a):

1. *Sustainable target fish stocks, where a fishery must not be conducted in such a way that would lead to depletion or over-fishing and that if a stock is depleted the fishery is conducted in a manner that leads to its recovery.*
2. *Environmental impact of fishing where fishing operations do not significantly compromise the structure, productivity, function, and diversity of the ecosystem upon which the fishery depends.*
3. *Effective management, where the fishery complies with a management system that respects local, national, and international laws and standards that operate on responsible and sustainable frameworks.*

Within the three principles there are 28 performance indicators upon which a fishery is scored. The fishery may receive a score between 60 and 100, 100 on each indicator, with a score of 100 being demonstrably best practice. If the score is between 60 and 80 that indicator will pass upon specific conditions. To receive full certification, the fishery must have an average total score of 80 or above (MSC, 2016; MSC, 2015a).

Despite strict criteria for certification the MSC has been criticised for a multitude of reasons, one of which is its inaccessibility to developing countries (Bush et al., 2013a; Duggan & Kochen, 2016; Kalfagianni & Pattberg, 2013; Perez-Ramirez et al., 2012). As of 2015 only 8% of the MSC-certified fisheries were from developing countries, none of which were in Indonesia (MSC, 2015b). However, in 2009, the MSC conducted a pre-assessment of Indonesia's tuna fisheries and tuna management system. In 2011, it was determined that Indonesia would not fulfill the requirements to meet a full certification resulting in the development of a National Tuna Fishery Improvement Project. One of the results of the Fishery Improvement Project (FIP) was the development of an Action Plan towards improving the management practices and sustainability of Indonesian tuna fisheries, with the ultimate goal of becoming MSC certified (MMAF and WWF, 2011). Since then, the government has partnered with NGOs with the goal of improving the management process of Indonesian tuna fisheries, specifically through the implementation of more sustainable practices. Using a market-based approach, NGOs such as WWF and MDPI have been facilitating companies to change their practices to better comply with the MSC standard. As one of the world's largest exporter of tuna, notably towards countries where large brand names such as Wal-Mart and Sainsbury's have made obligations towards sustainably sourcing their seafood, Indonesia views MSC certification as one of the best ways to compete in such global markets. But to what extent does MSC help eliminate IUU fishing? The next section will identify exactly how the MSC standard combats illegal, unreported, and unregulated fishing and gives insight into the limitations and strengths of this type of certification. The following analysis has been completed using the MSC Fisheries Standard (2015) as the primary document under consideration.

#### *3.1.1.1 MSC and Illegal Fishing*

The fisheries standard describes the criteria necessary for full MSC certification. Although no Indonesian fisheries have become MSC certified, thus far, the goal of most the work towards implementing sustainable fishing practices is to become MSC certified, therefore, it's important to understand how MSC can also work towards combatting IUU fishing.

MSC certification places several important rules that work towards eliminating illegal fishing. All fishermen, suppliers, processors, and other participating supply chain actors must be registered and licensed to conduct fisheries related business. Additionally, the fishery must operate within the legal framework of the country, where the legal framework of the country also complies with MSC's core principles. If the fishery is a straddling stock, or highly migratory species (i.e. tuna) the fishery must also comply with relevant international standards and RFMO frameworks. Further, the fishery cannot employ blacklisted IUU vessels. Finally, the fishery cannot negatively interact with endangered, threatened, or protected (ETP) species.

#### *3.1.1.2 MSC and Unreported Fishing*

MSC is also an effective means to help mitigate unreported fishing. Part of the requirements of MSC certification include thorough record keeping at every node along the supply chain. This is ensured by a separate component to MSC certification, that is, chain of custody certification. Essentially, all of the catch must be completed by registered fishers and vessels, all catch volumes must be reported and traceable, and records must be kept and maintained by both the upstream and downstream ends of the supply chain (i.e. both fishers and suppliers must keep records of transactions). Built into the chain of custody requirements is the assurance of an effective quality control system ensuring there are methods to recall mis-labeled products, for

example, further emphasizing the extent to which MSC certification can effectively work towards a reported and data-rich fishery.

#### *3.1.1.3 MSC and Unregulated Fishing*

Despite the strict criteria for ensuring that catch is reported, MSC certification does not necessarily guarantee that the catch is from where the fishers state it to be from on the landing document. The fisheries standard does not require that the vessel have a form of Vessel Monitoring System (VMS) on board. However, the standard does require that there is evidence of an effective monitoring, control, and surveillance (MCS) system in place at the national level. MCS and its effectiveness is generally a government driven initiative in most countries (Flewwelling, 1995). Therefore, the unregulated branch of MSC certification is driven based on effective governance of the fishery, rather than a bold requirement of the standard. While MSC certification does bring up the issue of unregulated fishing, the bottom line of unregulated fishing is based on an existing governance framework, rather than a stipulation of the standard.

#### *3.1.1.4 Limitations of MSC*

While the prospect of MSC certification does provide a viable route to take in the anti-IUU movement, it does have some limitations in the context of Indonesian tuna fisheries. The most obvious of these limitations is the fact that no Indonesian tuna fisheries have yet to become certified. Although a pre-assessment has been completed, it was determined that Indonesia had significant hurdles to overcome. Consequently, a national tuna Fishery Improvement Program (FIP) is in various stages of implementation, with the goal of becoming MSC certified. Yet, there is no guarantee that at the culmination of the FIP, tuna fisheries will achieve their goal of becoming MSC certified. It is also important to recognize the time, cost, and energy that will be necessary to maintain the current momentum towards MSC certification. Additionally, because Indonesian tuna

fisheries have been identified as being on the road to MSC certification, by being engaged in a FIP, there is the risk that industry bodies will no longer see the benefits of reaching full MSC certification (Bush et al., 2013a). MSC certification also relies heavily on a strong governmental and legal framework already in place, upon which the fishery can base itself. Prior to the initial pre-assessment for Indonesian tuna fisheries, no national tuna management plan existed (MMAF, 2012b).

#### *3.1.1.5 Strengths of MSC*

Full MSC certification ensures that there is an effective fisheries management plan in writing, and in practice. After the initial certification, MSC requires a reassessment every five years to ensure the fishery is maintaining compliance and is adequately monitored. Further such procedures ensure that MSC certified fish have undergone a thorough verification process minimising the risk posed by catches being categorized as "IUU fish".

### 3.1.2 Fair Trade USA Capture Fisheries Certification

Much like eco-labels in the seafood industry, Fair Trade (FT) labels were established to increase consumer awareness and emphasize social and environmental responsibility, albeit at an earlier time. The concept of Fair Trade had initial beginnings in the late 1940s and largely catered toward the agriculture industry with most fair-trade certifications being part of the coffee, chocolate, tea, nuts, and spices industries (FLO, n. d.). For products to be certified as Fair Trade they must pass environmental, social, and economic standards. Although Fair Trade International is the dominant body setting FT standards for other products, they have chosen, thus far, not to engage in fisheries standards and certifications (Bailey, et al., 2015a). Fair Trade USA (FT-USA), not to be confused with Fair Trade International, was established in 1998, and in 2014 FT-USA developed their Capture Fisheries Program, which was designed to improve the resilience and

livelihoods of coastal communities, while also promoting sustainable fishing practices and environmental stewardship by locals (FT-USA, n.d.).

The FT-USA Capture Fisheries Program operates on a standard consisting of the basis of the main Fair Trade principles, which are as follows (FT-USA, 2014):

1. ***Empowerment****, in that fishermen engaged in the program will develop skills that allow them to negotiate with other actors in the supply chain who play a role in buying, processing, or marketing of their products. This is accomplished through the development of a fisher association, a Fair Trade Committee, establishing a Fair Trade Premium Plan, and collectively making decisions about how to spend the Fair Trade Premium*
2. ***Economic development*** *where the standard seeks to increase the income of the fishers by guaranteeing a transparent and stable trading relationship with buyers. This is accomplished by placing a Fair Trade Premium on every Fair Trade certified product that is sold. The standard also determines wage requirements for those involved in the fishery so that income may be increased*
3. ***Social responsibility*** *where the standard protects the human rights of those involved in the fishery. Work related injuries are diminished through the establishment of health and safety measures, and fishers are encouraged to use the Fair Trade Premium to improve the quality and accessibility of healthcare and education. The Premium is a set percentage of the price of the raw material and is received in addition to the normal product rate.*
4. ***Environmental stewardship*** *in that fishers must adopt sustainable and responsible fishing practices. This includes the management of the fishery where data collection and monitoring are a requirement to improve the quality of the information available on the fish stocks.*

The Program works such that fishers engaged in the program are legally part of a cooperation or partnership with the seafood importer, exporter, processor, or supporting organisation which functions as the certificate holder. It is the responsibility of the certificate holder to ensure compliance of the standard by all stakeholders (FT-USA, 2014). In order to

participate in and receive the benefits from Fair Trade certification, the Capture Fisheries Program operates on the basis that fishers must form a democratically run Fisher's Association and a Fair Trade Committee. The purpose of the committee is to ensure transparency in the decision of the use of the premium fund, liaise with the certificate holders, and to ensure progress on maintaining compliance criteria. The Standard is structured to be fully implemented over a six-year period with audits being carried out at years 0, 1, 3, and 6.

In 2014, a small-scale yellowfin handline fishery in the Molucca region was certified as Fair Trade through the help of MDPI. The next sections explore the how the FT-USA Capture Fisheries Program works towards combatting illegal, unreported, and unregulated fishing by analysing the FT-USA Capture Fisheries Standard (FT-USA, 2014) and associated Compliance Criteria (FT-USA, n.d.).

#### *3.1.2.1 FT and Illegal Fishing*

As a certification scheme, Fair Trade works well to curb illegal fishing through the following measures: (a) All fishers, suppliers, processors, and other actors in the supply chain must be legally registered and licensed, (b) cannot employ destructive or illegal gear to catch the target species, and (c) must be legally permitted to work in the country of the fishery. In addition, no IUU-listed vessels must be used, and all illegal fishing should be monitored. There must also be evidence of a monitoring system in place to report any illegal activities at regular intervals. Another component that is imperative to the FT certification is that under no circumstances should child or slave labour be used.

#### *3.1.2.2 FT and Unreported Fishing*

The Fair Trade Capture Fisheries Standard (2014) makes clear requirements for record-keeping of catch. All catch and interactions with ETP species, including volumes, must be reported

either in logbooks, or more sophisticated forms of data collection, by both the upstream and downstream ends of the supply chain (i.e. fishers, suppliers, processors, etc…). Additionally, all catch must be traceable back to the point of landing. The legal framework underlying FT is further reinforced as part of the record keeping process includes the wages of the workers, ensuring their legal status to work in the country.

#### *3.1.2.3 FT and Unregulated Fishing*

Although FT certification requires that the fishers stay within the scope of the fishery (i.e. a designated area), there are no requirements for spot tracers (small vessel GPS) or any other form of VMS. Thus, like MSC there is no guarantee that fishers are conducting fishing activity in the areas they are registered to. However, the landing sites are purposefully situated geographically close to the fishing areas, therefore there is a high likelihood that the fishers are, in fact, fishing where they are authorized to do so.

#### *3.1.2.4 Limitations*

Although Indonesia does have FT tuna fisheries, this certification is in the small-scale sector of the industry. The form in which the standard is designed, it will likely remain a certification designated to small scale fleets for the foreseeable future. However, certifying large, industrial fleets could have a larger impact in anti-IUU actions, purely based on fishing capacity. Another limitation of the FT certification is the six-year implementation protocol. While this can be a realistic implementation plan, the stipulations in the first few years are not as stringent as those after full implementation. For example, in the first few years' data collections only *needs* to

encompass 50% of the catch, with at least 90% of the catch being recorded by the 6th year. It is also worth noting that there is the potential conflict for FT certification to compete with MSC certification. However, there is not yet enough research to determine to what extent these two certification schemes can either work together or work in conflict.

#### *3.1.2.5 Strengths*

Part of the requirements of the FT certification is assurance that there is a fisheries management plan in place for the certified fishery. Within the fisheries management plan all other requirements (the most notable here pertaining to IUU) can be incorporated. Additionally, while FT has been criticised for its less rigorous environmental requirements when compared to those of MSC, unlike MSC it has already been successfully implemented proving its applicability in a country such as Indonesia. Though it does lend itself to criticism and that there is no evidence that the FT fishery is far closer to being completely legal, reported, and regulated post certification, compared to its pre-certification state, though an analysis could be done. Overall, this type of certification is a good start towards combatting IUU fishing, particularly in the small-scale fisheries sector and has potential to be applied to other countries who might face similar issues and opportunities as Indonesia.

### 3.1.3 Traceability

Traceability is *"the ability to access any or all information relating to that which is under consideration, throughout its entire life cycle, by means of recorded identifications"* (Olsen &

Borit, 2013). In recent years, transparency about food origin has become a growing concern among consumers. Consumers, often from the global North, have started to question the legality of their goods, what the origin is, where various stages of processing occurred, and who was involved. What started as a requirement for food safety to enact recalls, for example, traceability systems have now grown to encompass other attributes such as sustainability (including social responsibility), origin, legality of the product, and may help to combat seafood slavery (Bailey and Egels-Zandén, 2016; Bailey et al., 2015b; Duggan & Kochen, 2016). The value of full chain traceability is further emphasized by being a component of eco-labelling certification schemes, such as MSC and FT, included through a "chain of custody" mechanism. Traceability schemes have also influenced policy and governance through the development of legal requirements on the importation of seafood (specifically, tuna), notably in the US and EU. Tuna imported into the US must be accompanied by a series of documents verifying the legal and safety status of the fish, through catch-certificates, form 370, and health certificates (NOAA, 2016). In Europe, seafood must be accompanied by a catch certificate which is a comprehensive document enclosing information on the details of transport, processing, Flag State, compliance with conservation measures, among other criteria (EU, 2008).

Mounting momentum has been gained in traceability for the seafood sector through the development of technologies to help facilitate full chain traceability and projects such as the Improving Fisheries Information and Traceability for Tuna (IFITT) project, which was an initiative by Wageningen University and implemented by MDPI, Fishing & Living, ThisFish, and the University of Bogor (Bush et al., 2013b; Duggan & Kochen, 2016). As a country known for being 'fish rich and data poor', Indonesia provided the ideal setting to test the IFITT model (Bush et al., 2013b; Duggan & Kochen, 2016). One objective of the IFITT project is the development of a

consumer facing model where consumers can trace the journey of their tuna, from hook to store, while also acting as a mechanism for the foundation of a data collection system that Indonesia's tuna fisheries are currently lacking (IFITT, n. d). With the assistance of NGOs, small-scale tuna fisheries have been able to implement a trust worthy traceability system under the IFITT model.

Another aspect of traceability systems is the role it can play in combatting IUU fishing and preventing IUU fish from entering the supply chain. The next section explores how traceability systems can work to mitigate illegal, unreported, and unregulated fishing, with respect to Indonesia's tuna fisheries.

#### *3.1.3.1 Traceability and Illegal Fishing*

Traceability systems can act as a good tool towards combatting illegal fishing. In full chain traceability, the fish must be able to be traced back to a legal source. Here, 'legal source' ensures that the fishers, suppliers, processors, and others involved in the supply chain possess all the correct documentation, especially in regards to vessel registration, fisheries licenses, and catch certificates. To advertise a fully traceable product, there should be legal documentation accompanying the fish along every node of the supply chain.

#### *3.1.3.2 Traceability and Unreported Fishing*

The very definition of traceability gives itself to the assumption that when full chain traceability is guaranteed there is virtually no catch that goes unreported. To ensure full chain traceability, all catch must be reported and records must be kept and maintained. Additionally, as product transfers from any given actor in the supply chain to another, a paper trail is mirrored. Catch must be held accountable at every stage of transfer, through, for example, a mass-balance approach. It is also preferable that records are kept at by both upstream and downstream ends of the supply chain which can be used to cross check all movements of product.

#### *3.1.3.3 Traceability and Unregulated Fishing*

Although traceability necessitates that fishers say approximately where the fish was caught, there are no hard requirements that fishers be equipped with any form of VMS. Occasionally, there can be a discrepancy between where fishermen believe they are fishing and where they physically fish (Neitzel, S. M., 2015). Although in larger WPPs this there may be fewer regulatory issues, if landing sites are near any kind of jurisdictional border, there may be cases of mis or unregulated fishing. Consequently, traceability is a weaker tool when unregulated fishing is the priority issue.

#### *3.1.3.4 Limitations*

Traceability has largely been critiqued on its means of implementation (pers. obs, July, 2016). Indonesia often relies on a paper-based system, with only a small number of areas moving towards more sophisticated means of record keeping. Paper based systems can sometimes lead to errors along the supply chain, not guarantying full traceability. Additionally, they can be cumbersome to go back through should an error be discovered. Upgrading the technology, or ensuring traceable product, can also incur a cost that may not have immediate, observable benefits to the company implementing the changes. Without completely understanding the benefits companies may be less enthusiastic about complying with international traceability requirements. Only having a traceable product, without any recognizable associated ecolabel, may not provide the company or the fisher with the same market benefit as FT, for example. Additionally, with respect to IUU fishing, while successful traceability systems can help greatly with illegal and unreported fishing, they are not as strong at mitigating unregulated fishing. Therefore, in areas where unregulated fishing is the primary concern, perhaps other tools are better applied.

#### *3.1.3.5 Strengths*

Despite the obvious weaknesses in traceability, there are many strengths in implementing a traceability system. Although full chain traceability may not have the immediate market benefits

that MSC or FT certifications do, traceability is an important component to both certification schemes, and many more. Therefore, ensuring traceability can act as a valuable stepping stone towards other types of certifications. Additionally, if the major problems in the fishery are related to illegal and unreported catch, traceability offers an effective way of mitigating issues such as these. Another strength of traceability is that it has already been successfully implemented in multiple fisheries of varying sizes.

### 3.1.4 Vessel Registration

According to Indonesian law, vessels must be legally registered with the government (Ministry of Transport, 2012). To acquire a fishing licence, one must first register their vessel. Due to the decentralized nature of the Government with different institutions responsible for licensing at each level, different sized vessels must be registered with individual offices in different ministries. This can be a challenging task when government offices are far away and the vessel owners lack the means to undergo the online registration process, due to a limited capacity in internet access and electricity (Duggan & Kochen, 2016). This is particularly evident in artisanal fishing communities where the number of people engaged in fishing activities is often disproportionate to the availability of government offices.

The difficulty is further compounded when different regions have different requirements for the fishers or vessels owners, the relevant government office is corrupt, or it is common knowledge that the local government in the area lacks the means for enforcement of applicable laws. Despite legislation, there are often multiple factors to disincentivize vessel registration and fishing licensing at the local level. Further, legislation for vessel registration only stipulates that registered vessels must be at *least* 7 GT (Ministry of Transport, 2012). Hence, a vast number of

vessels *under* 7 GT, which make up a significant portion of the handline tuna fishery might not fall under the gamut of existing laws and regulations.

The ISSF is an organisation committed to improving the health of global tuna stocks by implementing information rich, verifiable, and scientific practices that result in MSC-certified tuna fisheries (ISSF Report, 2015). To help lower the uncertainty as to the number of unregistered and unlicensed tuna fishery vessels across the globe, the ISSF established the ProActive Vessel Registration (PVR) project.

Prior to 2015, most of the vessels on the PVR database were large purse seine vessels. While registration was global, and between 2012 and 2015 registration of vessels increased exponentially, there are multiple gear types, from unregistered vessels, which contribute to the global tuna catch (ISSF Report, 2015). However, in 2016, ISSF partnered with MDPI, IPNLP, and AP2HI to help enable small scale fishermen to register their vessels on the PVR database. Currently, there are 225 vessels listen on the PVR database (ISSF, 2016). While this initiative is smaller in scale, there is potential for it to effectively contribute towards eliminating aspects of IUU fishing. Additionally, MDPI works independently of other organisations to facilitate vessel registration and fish licensing. The following sections describe to what extent PVR (and vessel registration/fishing licenses in general) works to combat illegal, unreported, or unregulated fishing and the limitations and strengths underlying this initiative.

#### *3.1.4.1 PVR and Illegal Fishing*

Although PVR encourages fishermen to obtain legal licences and register their vessels, as per the local law, it does not necessarily guarantee that they will fish legally. For example, although the paperwork is in order, they may use destructive methods or catch illegal species. However, if fishermen remain within the area specified by their license, and catch legal species using the

appropriate gear, the presence of personal paperwork allows their catch to legally enter the global market.

#### *3.1.4.2 PVR and Unreported Fishing*

PVR is only somewhat good at ensuring catch is reported. When fishers or their supplier obtain licenses, they are also supposed to submit catch summaries to the local fisheries office every month. These should outline how much product was caught and what was distributed. However, sometimes governments lack the means to enforce this protocol and suppliers or fishers do not always comply. Additionally, despite licensing, when fish enter the local market, their status is not always reported on.

#### *3.1.4.3 PVR and Unregulated Fishing*

PVR is a poor choice of tool if the priority issue is unregulated fishing. Although the documentation states what area the vessel is authorized to fish in, there are not measures in place that guarantee the vessel stays within those boundaries. Larger vessels occasionally have observer coverage on board, but it is not a requirement to do so by PVR itself. This is especially evident in the small-scale vessels that have started to become involved with the PVR program.

#### *3.1.4.4 Limitations*

Even under the influence of an organising facilitator, there is a cost to obtain and renew licenses. This cost varies by region and may be an obstacle for vessel owners who lack the means to pay for it. This tool also relies on the government not being corrupt. Anecdotes from local, small scale fishermen and suppliers spoke often of a distrust in their government either through nepotism or other means such as setting the cost of a license over what is normally expected, or accepting the necessary paperwork and fees, and never registering the applicant (pers. obs., 2016). In the small-scale sector, vessel registration is purely an industry driven initiative. Vessel owners are

almost exclusively becoming registered and licensed because their supplier or processors have requested it, not because of legislation.

#### *3.1.4.5 Strengths*

The PVR program helps to make the entire process of registration easier, especially for those who have difficulty accessing government offices. Once registered, PVR is also a good tool for helping to minimize the number of unregistered, unlicensed, or otherwise, illegal, fishers on the water. Because Indonesian law also only states that vessels of a minimum of 7 GT must have registration, PVR has the potential to account for vessels under 7 GT, particularly as the owners of vessels to be used for fishing, must be licensed if their vessel is at least 5 GT. Although it can be described purely as an administrative measure, it is still a tool that has applicability towards combatting certain aspects of IUU fishing that should be known to fisheries managers. The weaknesses of the discrepancies between the department of transportation and the MMAF will be addressed in the discussion chapter of this project.

### 3.1.5 Data Enumeration

Indonesia is widely known as a traditionally 'data-poor' country particularly with respect to its tuna fisheries (WCPFC, 2012; Pramod et al., 2008). It is not surprising, given the extensive archipelago, the number of people who live in isolated communities yet still rely on the ocean for their primary source of protein, and the lack of ports that require catch data.

In an effort to alleviate this large source of uncertainty, NGOs such as MDPI, have been establishing data enumeration sites, most notably in the small-scale tuna sector. MDPI staff are contracted to report the catch of the fishermen, who might not otherwise report their catch, through a detailed catch enumeration system. This information is ultimately uploaded onto a database under the name I-Fish, which stands for Indonesian Fisheries Information System and was initially

a tool developed under the USAID IMACS program (Mous, 2012). The data primarily consists of the catch composition and operational details of the fishing trip. Data are usually kept track of using paper forms, however, some pilot projects have been experimenting with digital formats (for example, the app “Dock”, developed by the software start-up Point97). Seemingly small in scale, this type of data collection can help sequester information that, to date, has often eluded fisheries officials.

The next sections describe how data enumeration helps to combat illegal, unreported, and unregulated fishing.

#### *3.1.5.1 Data Enumeration and Illegal Fishing*

With respect to illegal fishing, data enumeration does a relatively moderate job of helping to curb illegal fishing. Fishers participating in data collection should be registered and legally licensed to fish, as the enumerator must report as to who was responsible for the catch. Fishers are also supposed to report on any interactions with ETP species. If there are negative interactions, the enumerator may make suggestions not to continue such actions as it is technically against the law.

#### *3.1.5.2 Data Enumeration and Unreported Fishing*

Data enumeration is an ideal method for mitigating unreported fishing and improve stock assessments. Not only do enumerators initiate records of previously unreported catches, the material can contribute to a growing database of information which can assist in future decision making. Additionally, the enumerators are typically not associated specifically with the fishery, so there is little incentive for the fishers to be biased about their catch or other interactions.

#### *3.1.5.3 Data Enumeration and Unregulated Fishing*

Data enumeration is not an effective tool to mitigate unregulated fishing. Although the process involves interviews with the fishers and the catch location is recorded, this is not verifiable

by any other means. It is recommended that data enumeration be used in consort with the spot tracers or some type of VMS system.

#### *3.1.5.4 Limitations*

Data enumeration is collected on the assumption that the fishers are truthful about their activities on the water. For example, if there are unreported discards or interactions with ETP species, this information might not be reported in the enumeration process. Additionally, data enumeration typically is contingent on the capacity of the NGO to provide staff to be available at the landing sites. Further, enumerators do not have any enforcing power so if there are IUU activities occurring within a fishery there are few remedial actions that can be taken.

#### *3.1.5.5 Strengths*

Data enumerators can be a strong tool that can be used to collect information about an area which was previously unknown. While there are obvious limitations behind simple data collection, data enumeration can certainly be used as a mechanism to garner more information about a place, which can be used as evidence to generate more sustainability driven activities in the same area (i.e. furthering towards full chain traceability or recommending VMS systems). This is especially true of the enumeration program follows scientifically robust sampling criteria. It is also important to appreciate the way different tools can work together. For example, for some sites in Indonesia, data from I-fish is linked with traceability data in the IFITT program.

### 3.1.6 Spot Tracers

Legally, registered fishing vessels (Recall: only vessels ≥ 7 GT must be registered) are required to be equipped with some form of vessel monitoring systems (VMS) so that they might be monitored to ensure that they are conducting fishing activities in the legal areas (i.e. staying within the WPP they are registered to or not fishing in protected areas). While large industrial

fishing fleets are often equipped with an official VMS, small scale vessels typically are not afforded such technology. Although some fishermen will report their catch and make claims as to the location of where they fished, such an evaluation is not always correct. While perhaps not purposeful the behavioural dynamics of fishermen suggest that management and regulatory agendas do not always align with a fisher's specific personal goals, despite geographic boundaries (Salas & Gaertner, 2004) (i.e. fishers may fish in one jurisdictional area and report their catch in another jurisdictional area, unintentionally). Misreportings such as this, can have long term effects for fisheries management efforts, where reported data is not representative of on-the-water actions, ultimately resulting in decisions based on misunderstood information.

Sophisticated VMS systems can be costly to install and maintain. In an effort to help put small scale vessels on the literal map, NGOs have been helping install cost-efficient ways of ensuring vessels are staying within their respective fishing areas, in the form of 'spot tracers'. Spot tracers are a battery powered device which allows the location of equipped vessels to be viewed online. Locations can be set to every 2.5, 5, 10, 30, 60 minutes or 12 hours, depending on the needs of the data acquisition (Baroqi, 2016) Spot tracers have also been used in consort with the data enumerations teams, as a means of verification to the information the fishers provide. In fact, the I-Fish system has the capacity to combine the two types of data (enumeration and tracking) (Baroqi, 2016). To date, spot tracers have been deployed in three sites, however MDPI is currently in the process of installing more in other areas. Initiatives such as this offer an important step towards improving the certainty and compliance of tuna fishing vessels, particularly in the small scale sector. The next sections discuss how spot tracers work against illegal, unreported, and unregulated fishing.

#### *3.1.6.1 Spot tracers and Illegal Fishing*

To be eligible to receive a spot tracer vessels must be legally registered and fishers must possess a license. While spot tracers alone cannot effectively combat illegal fishing, some legal actions must be taken (i.e. registration and licensing). Because spot tracers are relatively small and easy to operate they are most appropriate for the small scale fisheries sector. Large, two way VMS systems, on the other hand, might be more appropriate for larger vessels, which is not typically a priority for NGOs.

#### *3.1.6.2 Spot tracers and Unreported Fishing*

Although spot tracers can ensure *where* fishers are going, in and of themselves they do not ensure *what* the fishers are catching. That is, they may help with estimates of fishing effort, in terms of where it takes place, but they are not able to provide data related to the resultant catch.

#### *3.1.6.3 Spot tracers and Unregulated Fishing*

Spot tracers are most appropriately used to monitor vessels to ensure they are conducting activity in the areas in which they are regulated to so. Although there is no enforcement component to installing a spot tracer, they are helpful in establishing a baseline of information as to where major fishing activity occurs.

#### *3.1.6.4 Limitations*

Although spot tracers are considered as a cost-effective alternative to a large-scale VMS they still do incur a cost. If there is a large fleet of vessels that may need spot tracers, the cost might not be favourable. Additionally, a personnel team would be required on land to monitor the signals and be prepared to act if vessels were found to be in areas where they should not be.

### *3.1.6.5 Strengths*

Although VMS is required by law to be equipped onto larger vessels, there are no legal stipulations for the small-scale sector with regards to VMS. Spot tracers offer a good alternative to fishers who need to prove that they are catching fish where they claim to be (for example if verified landings area was required for a specific certification). In terms of technology spot tracers have also proven useful in ensuring the proper regulatory stipulations are being followed. Unrelated to IUU fishing, spot tracers may also prove to be effective at improving the safety of small scale fishers (i.e. if a vessel were to go missing, spot tracers can be used as a tool to find the last place the vessel was seen).

*Table 2: Primary NGO initiatives occurring within Indonesia and how they address illegal, unreported, and unregulated fishing. Green, yellow, and red boxes indicate strong, medium, and weak evidence to support effectiveness in diminishing illegal, unreported, or unregulated fishing.*

| | **Illegal** | **Unreported** | **Unregulated** |
|---|---|---|---|
| **NGO Initiatives** | | | |
| **MSC** | • registered fishers/vessels,<br>• no illegal/threatened species<br>• no IUU vessels,<br>• Fishery must operate within the legal framework of the country such that the legal framework of the country complies with Principles 1 and 2 of the std,<br>• straddling stocks or HMS also need to comply with the international framework | • all catch must be reported,<br>• all catch must be traceable,<br>• volumes recorded/reported,<br>• records must be kept by everyone in the supply chain | • there is evidence of MSC systems in place, sanctions for irregularities are in place and evidence of consistent enforcement is demonstrated |
| **Fair Trade** | • legally registered fishers/vessels,<br>• no illegal/threatened species,<br>• no IUU vessels, no slavery,<br>• no child labour,<br>• must legally be allowed to work in the country to maintain records<br>• no illegal gear (cyanide or blast fishing) i.e. destructive methods are not employed<br>• Illegal fishing is monitored and a system is | • all catch must be reported (in logbooks, or more sophisticated form of data collection),<br>• all catch must be traceable (back to the point of landing),<br>• volumes recorded/reported,<br>• records must be kept by everyone in the supply chain (documentation of all movement of FT products), incl. wages, (therefore must legally be allowed to work in the country),<br>• table/document that must be completed including interactions with all species | • must stay within the scope of the fishery but can lack this enforcement<br>• landing sites geographically close to fishing areas |

| | | | |
|---|---|---|---|
| | in place to report (and enforce)<br>• illegal fishing (could be part of the fisheries management plan) | • people in place who collect data and procedures are written out to ensure consistency and accuracy | |
| **Tracebility** - in preparation for MSC CoC | • cannot fish ETP species<br>• vessels must be registered<br>• fishers/suppliers should have the appropriate documentation to be able to obtain a catch certificate | • catch must be reported in some fashion, and records should be kept and maintained,<br>• catch but be held accountable and verified at every node of the supply chain | • cannot guarantee where vessels are fishing without VMS |
| **Vessel Registration** | • Fishermen and suppliers operate under legal lisences, allows fish to enter global market | • registered fishers/suppliers are supposed to send a catch report at the end of each month of product to the government | • despite being registered within a certain area does not guarantee they will stick to it, certain vessels have observer coverage, but not a necessity |
| **Spot Tracer** | • can help ensure that fishers stay within waters that they should be | • can be used in consort with data enumeration to help ensure catch is coming from where fishers say | • Allows vessel locations to be monitored and ensure activity is occurring in the right area |
| **Data Enumeration** | • Helps eliminate catching illegal species through interviews with fishers | • establishes a baseline of data, previously unreported catches are now being reported, generally by a third party so incentive to misreport is lower | • location of fishing should be recorded, though no guarantee of accuracy |

## 3.2 Government Initiatives

This section describes the major actions that have been taken by the Indonesian government to combat illegal, unreported, and unregulated fishing. The following actions were determined through a literature review and categorized into national and international actions. National/international actions were deemed as such based on the geographical extent of the action and whether it involved coordination or agreements with other countries. National actions are those that are only relevant within Indonesian waters while international actions are those that require collaboration with other countries or are drafted on the international scale. Due to the type of action that often resulted (i.e. regulation, law, or otherwise paper-based), the same type of analysis that was used for the NGO initiatives was not feasible. In this case the tables were designed as follows:

- *The action → the regulation, law, agreement, etc.*

- *Context → the main details of the action*
- *Relevance to IUU fishing → how does it contribute to LRR fisheries? To what extent does the action work against either illegal, unregulated, or unreported fishing?*
- *Limitation → what are the limitations in the context of the action?*

It should be noted that all of the following actions are built off of some pre-existing international instruments that will not be analysed directly. These main instruments are United Nations Convention on the Law of the Sea (UNCLOS, 1982) which defines the rights and responsibilities of all Signatory Nations with resect to the use of the world's oceans and the management of marine resources, the FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (1993), The United Nations Fish Stocks Agreement (1995), The FAO Code of Conduct for Responsible Fisheries (1995), and the International Plan of Action to Prevent, Deter, and Eliminate IUU Fishing (IPOAA-IUU, 2001). They are mentioned to provide some background on the international dialogue that has happened in the last three decades with respect to managing our world's oceans.

### 3.2.1 National Action

In 2012, Indonesia published and started to implement its National Plan of Action to Prevent and to Combat IUU Fishing. The recommendations given and details of this plan are mainly derived from the IPOA-IUU (FAO, 2001). Many of these initiatives are supported by existing and recent legislative action. The main law underpinning much of the recent anti-IUU activity that has been making headlines is the Act Number 31 of 2004 fisheries as amended with act No. 45 of 2009. By the hand of this act MCS activities are able to be carried out (Fig. 5), justice can be served to those engaging in IUU activities, VMS should be implemented on large fishing vessels, ports should employ active inspections and pre and post fishing trip paperwork, not to mention other actions. Other major legislative initiatives are summarized in Table 3.

This relatively new plan involves immense coordination among several branches of the government; that is, MMAF, Ministry of Transportation, Indonesian Navy, Indonesian Police, Indonesian Maritime Security Coordinating Board, and law bodies such as the Indonesian Supreme Court and the Indonesian Office of Attorney General in cases where there is non-compliance. An integrated approach, such as this, is a good strategy to utilize limited resources. However, the major limitation with Indonesia's national plan is that it lacks capacity to carry out all necessary actions simultaneously. There is currently an insufficient amount of manpower to complete all the necessary activities such as patrolling, VMS surveillance, port inspections, etc. (MMAF, 2012a).

#### *3.2.1.1 NPOA-IUU and Illegal Fishing*

The NPOA-IUU explicitly states its intention of targeting illegal fishing. This is supported by implementing and enforcing national legislation, of which the major laws are summarized in Table 3. As part of the legislation Indonesia is attempting to regulate their use of flag states by ensuring that only Indonesian vessels fly Indonesian flags and that the flying of more than one flag by any given vessel is prohibited.

#### *3.2.1.2 NPOA-IUU and Unreported Fishing*

Indonesia is in the process of improving their fisheries management systems. Part of this is improved data collection, which is only possible with better and increased reporting of catch. Act No. 31 involving the publication of fishing vessel books addresses this. Before and after their fishing trips, fishermen are supposed to check in with the port authority where information like their vessel name, catch, gear used, where it was caught, among other information is recorded. This kind of surveillance activity can be cross-checked with information from VMS transmission signals, for example. At each of these stages different documentation is authorized. Before leaving for a trip a Fishing Operation Permit (SLO) is issued and Minutes of Vessel Inspection Results

(HPK). On the water surveillance is conducted through VMS and patrol vessels. When the vessels come back into port verification of activities is conducted through confirming the licensing documents, catch, size, species, equipment used, and compliance of catch lane and fishing ground. A Fishing Base Report Book is used and an HPK-Arrival is granted. To ensure the fishermen are conducting the business they should be, actions can be cross-checked with what is specified on their SIPI or SIKPI. If the catch is intended for export another form (SKA) should be authorized, indicating the origin of the catch.

#### *3.2.1.3 NPOA-IUU and Unregulated Fishing*

As part of the NPOA-IUU, Indonesia has improved its regulations concerning the used of fishing vessel monitoring systems. VMS is now used as a data record keeper to support handling in fisheries violation. Records include data transmitter activation status, vessel position, and fishing vessel movement. Although the law for VMS was implemented in 2003 to track fishing activities, by 2011 MMAF installed approximately 420 online VMS units with average activation up to 2122 units (i.e. not all vessels are activating their units, in violation of the law) (MMAF, 2012a) Indonesia has also started to undertake activities that monitor the movements of vessels that conduct business in RFMOs or other jurisdictional States by increasing surveillance and communicating with such vessels.

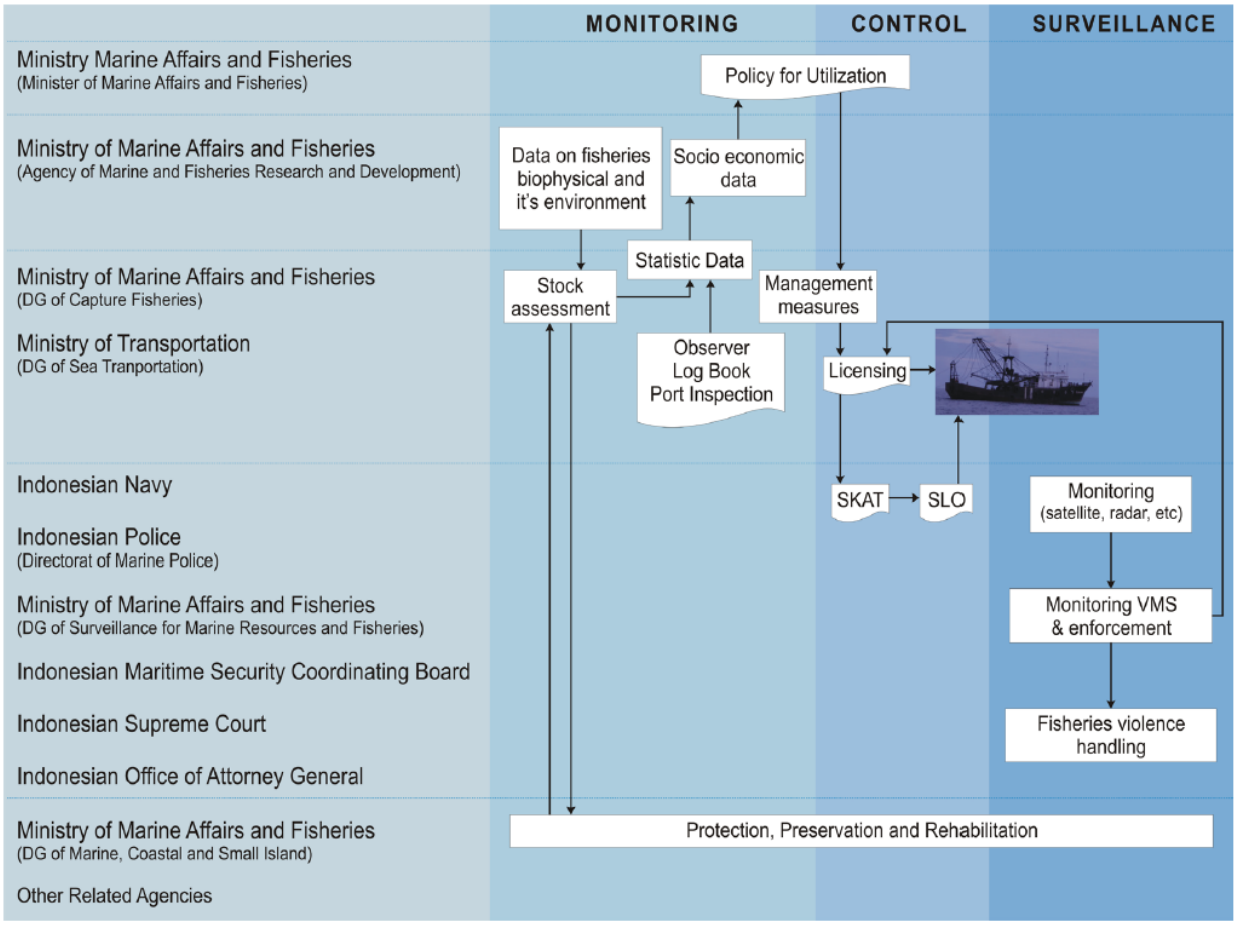
#### *3.2.1.4 NPOA-IUU Limitations*

The major constraint of these regulations is that they focus on large and medium sized vessels (>30GT and 10-30 GT). They are also reliant on an active and honest government presence throughout WPPs. Additionally, written into the plan itself is that the current situation in Indonesia is such that there are insufficient resources to accomplish the extent of surveillance and monitoring that should occur. Although on paper, Indonesia meets many of its obligations, it is clear that its

on-the-water action may not be sufficient. Finally, the plan that was analysed only extends to 2016. Accordingly, a revised and updated plan should come to fruition within the next year as the analysed should be updated every four years.

#### *3.2.1.5 NPOA-IUU Strengths*

The NPOA-IUU provides Indonesia with a comprehensive legal framework upon which to base anti-IUU actions. Additionally, the NPOA-IUU works towards against all three branches of IUU fishing. Since composing this initial plan, Indonesia has also established 5 Technical Implementation Units, which consist of 2 bases and 3 stations where there are 58 working units, and 138 surveillance posts spread throughout the country; in short, though perhaps not enough yet, actual action has occurred because of the plan. The NPOA-IUU also recognizes the contribution that community groups can make through the use of Community Based Surveillance Groups (POKMASWAS). There are currently 1,878 community based surveillance groups that are spread throughout 33 provinces. In the plan, it is stipulated that Indonesia should communicate, coordinate, and exchange data with other countries in the region. Sharing information is an effective way to work together to combat such a widespread problem.




*DG: Directorate General *SLO: Surat Laik Operasi (Fishing Operation Permit)
*SKAT: Surat Keterangan Aktivasi Transmiter (Transmitter Activation Letter)

***Figure 5:*** *Schematic of how MCS activities can be effectively carried out to help mitigate IUU fishing in Indonesia. (Image retrieved from MMAF, 2012a).*

***Table 3:*** *Major legislative actions that have been taken in Indonesia to "improve the effectiveness of fisheries resources management and conservation, implement the sustainable fisheries development, and accommodate the strategic environment development, both regionally and globally" (NPOA, 2012-2016).*

| **Law** | **Context** | **Relevance to I, U or U fishing** | **Limitation** |
|---|---|---|---|
| Within WPPs:<br>*MMAF Regulation number PER.14/MEN/2011 amended by MMAF Regulation Number PER.49/MEN/2011*<br><br>Within the High Seas:<br>*Regulation Number PER.12/MEN/2012 High Seas Fishing Business* | • Regulation in place for improving licensing and registration of fishers and fishing vessel owners.<br>• Fisheries Business License (SIUP), Catch License (SIPI) and Fish Carrier Vessel License (SIKPI) | • Legal framework in place that helps to work against I, U and U fishing in local waters<br>• Legal framework that helps to work against I, U and U fishing in the high seas | • Not a requirement for vessels <5 GT |
| MCS Fisheries System activities described and supporting legal basis: | • Surveillance subsystem<br>• Act which enables the relevant branches of the | • Legal framework to carry out Monitoring, Control, and Surveillance work, | • Capacity of the government to staff such operations |

| | | | |
|---|---|---|---|
| *Act Number 31 of 2004 fisheries as amended with act No. 45 of 2009* | government carry out monitoring, control, and surveillance practices (i.e. stock assessments, observer logbook inspections, VMS and enforcement, fisheries violence handling, law enforcement, etc…) | which are best applied to combat illegal fishing, and some unreported and unregulated fishing activities | • Requires coordination of different branches of the government |
| *MMAF Regulation number: PER.13/MEN/2005 on Fisheries Law Enforcement Coordination Forum (Forum Koordinasi Tindak Pidana Perikanan) as ammended with MMAF Reg. No.: PER.18/MEN/2011* | • Regulation to improve coordination among agencies involved in fisheries law enforcement | • Supports legal action against I, U, or U activities | |
| *MMAF Number. PER.04/MEN/2006 on Organization and Administration of Technical Implementation Unit (TIU) in surveillance for marine and fisheries resources (SMFR)* | • TIU has been implemented under the Directorate General of Surveillance for Marine and Fisheries Resources<br>• Work units established to enforce legal, regulated, and reported fishing activities<br>• Includes: patrol vessels, communication devices, VMS, patrol aircrafts, coastal radar, Community Based Surveillance System (SISWASMAS), fisheries inspector personnel, among other | • Enables the infrastructure necessary to enforce LRR fisheries | • Current institutional TUI-SMFR is insufficient and unable to support the demand for a higher workload (NPOA-IUU)<br>• Indonesian waters pose surveillance problems due to vast areas for coverage needed |
| *MMAF Decree No. KEP.58/MEN/2001* | • Procedures in implementing a community based surveillance system<br>• Local government is obligated to facilitate empowerment of fisher groups as surveillance | • Legal framework for self community-based anti-IUU actions | • Interest from community to act as whistle-blowers |
| *MMAF Reg. No. PER.19/MEN/2006 on appointment of port officer of the fishing ports* | • Presence of a port officer in fishing ports, ensures there is someone available to issue departure/arrival documents and record catch | • Legal framework enforcing the need for a port officer<br>• Port officers can help ensure catch is legal and reported, sometimes regulated | • Number of established ports where checking in and out and recording catch is mandatory |
| *MMAF Reg. No. PER.05/MEN/2007 on Fishing Vessel Monitoring System* | • VMS on board large vessels to assist in regulating fishing activities and cross check information | • Legal framework enforcing the use of VMS on large vessels | • Mostly concerned with large vessels<br>• Can be costly to implement and harder to enforce |
| *MMAF Reg. No. PER. 27/MEN/2009 on Registration and marking of fishing vessel* | • Increase in registration of vessels contributes to an enabling environment for promotion of LRR fisheries | • Legal framework for registration of fishing vessel | • Actual registration must be done with Transportation<br>• Could increase confusion or difficulty |

| | | | |
|---|---|---|---|
| *MMAF Reg. No. PER. 18/MEN/2010 on fishing log book* | • Increases the amount of record keeping in regards to fishing activities at ports | • Legal framework to support fishing activity log books | • Enforced in ports<br>• Limited by number of ports |

### 3.2.2 International Actions

The government-initiated international actions that are discussed in the following sections did not always lend themselves to allow for a robust analysis isolating illegal, unreported, and unregulated fishing. This largely due to the nature of the actions, which are either preliminary in nature or an administrative/documentation measure (i.e. PSM). However, a summary of international actions and how they work to combat illegal, unreported, and unregulated fishing can be found in Table 4.

#### *3.2.2.1 Port State Measures Agreement*

The Port State Measures Agreement (PSM) was initially composed in 2009 as a means towards combatting IUU fishing. It is a legally binding agreement by signatories stipulating the requirements of designated active fishing ports to act against IUU activities. Indonesia fully ratified the PSM June 23, 2016. These measures are meant to act in accordance with already existing forms of anti-IUU actions. These measures also state that the State in question must perform an inspection of a given number of vessels each year to ensure no IUU fishing is occurring, and must take legal action if IUU fishing is found to occur. If countries do not carry out the necessary actions they must report to the International Court of Justice or the International Tribunal for the Law of the Sea. Figure 5 outlines an overview of the operational plan of PSM.

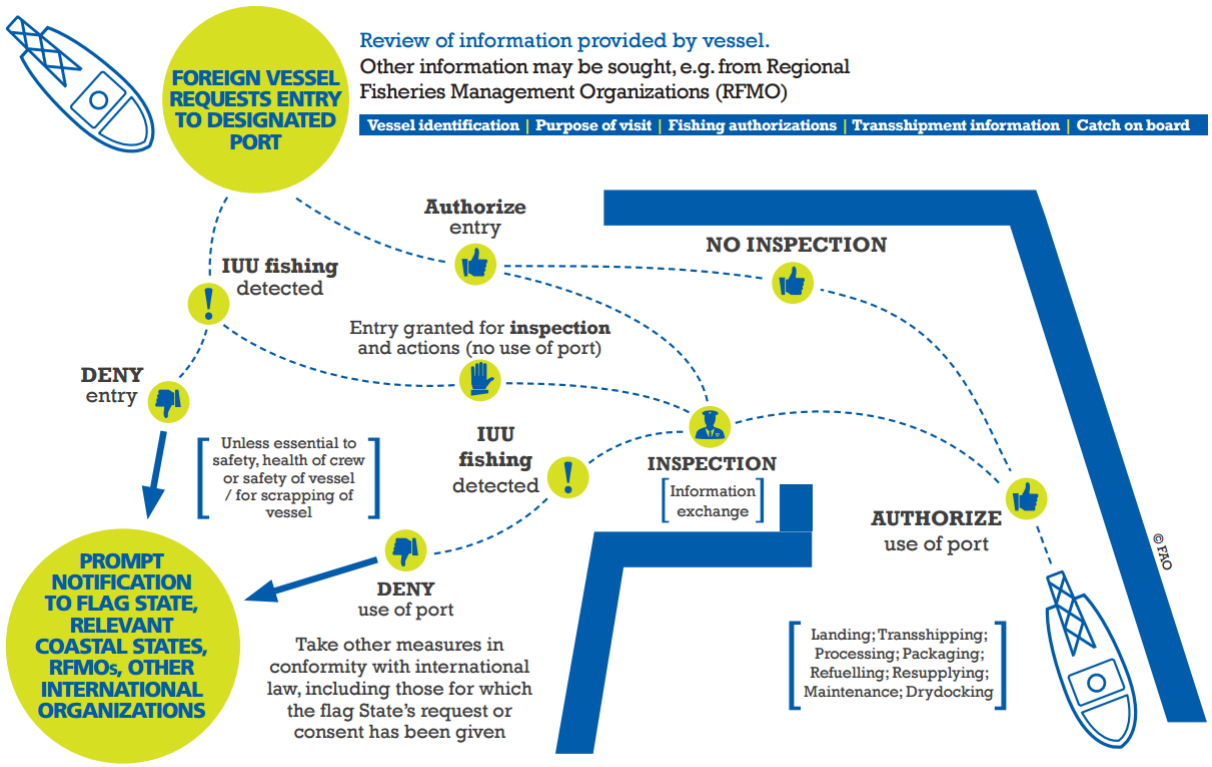



***Figure 6:*** *Overview infographic of how PSM work against illegal, unreported, or unregulated fishing. Image retrieved from: FAO, 2016b.*

#### 3.2.2.1.1 PSM and Illegal, Unreported, and Unregulated Fishing

The PSMA address all three aspects of IUU fishing equally. Through port inspections, all actions relating to illegal, unreported, and unregulated fishing are addressed. Please refer to Appendix D for the annexes described in the PSMA. The documents that must be filled out upon inspections by the relevant port authority outline the information needed. In providing this information the vessel owner is complying with international legislation and contributing to an information-rich, LRR, fishery.

#### 3.2.2.1.2 PSM Limitations

Although the PSMA provides a clear mechanism towards ensuring vessels are complying with anti-IUU laws, the largest limitation is that they can only be enforced in designated ports.

While this may prove effective for regulating the actions of large vessels that need to use large ports, it falls short with respect to small-scale fisheries. Often, small-scale fishermen do not land their catch in large ports, so the strict information gathering does not occur for them. That being said, this is an exceedingly new implementation and anti-IUU strategy for Indonesia, so its effectiveness has yet to be completely evaluated.

##### 3.2.2.1.3 PSM Strengths

When enforced, the PSMA is very thorough in the information that is required to be collected. PSMA is also a legally binding mechanism. This, theoretically, should ensure that countries that have ratified carry out what is required of them. This marks itself as one of the few international legally binding documents towards anti-IUU actions (many previous documents are plans or recommendations without any legal basis).

#### *3.2.2.2 Strategic Plan for ACIAR Engagement in Capture Fisheries Research and Capacity Development in Indonesia, 2015-25*

The Australian Centre for International Agricultural Research (ACIAR) and the Government of Indonesia have partnered together in recognition of their mutual interest in tuna stocks. The strategic plan analysed in this paper is built upon an already existing partnership between Indonesia and Australia. In this plan, explicit references towards combatting IUU fishing practices do not extend further then mentioning how Australia will help facilitate the implementation of Indonesia's NPOA-IUU. However, it is recognized that this is only feasible through robust capacity building. Capacity building includes direct research training featuring workshops, data management and database development, facilitating study trips of Indonesian student to Australian labs and training facilities, design and implementation of enumerator and

observer programs and training, post graduate research undertaken by Indonesian scientists, establishing research institutes, and further policy development.

In this strategic plan, the number one priority is "productive and sustainable tuna fisheries". This objective will largely be accomplished through active engagement and cooperation with neighbouring countries and RFMOs, improving the knowledge and understanding (through data collection and research) of tuna to make evidence based decisions towards management, and analyse the importance of small and large-scale tuna fisheries for communities. Although this plan is *not* advertised as an anti-IUU strategy, by carrying out all the actions stipulated in the plan, legal, reported, and regulated fisheries act as a natural by-product (ACIAR, 2015).

#### 3.2.2.2.1 Limitations

Although this plan is composed with good intentions, there are some foreseeable limitations. While collaboration among countries is encouraged, the success of Indonesia's tuna management heavily relies on engagement with Australia. Between Australia and Indonesia there is a significant power imbalance and should Australia decide that it can no longer invest in a capacity building strategy, Indonesia may lack the ability to pursue the remainder of the plan. Additionally, much of the plan is drafted under the medium to long term timelines. While it's important to have overarching goals, it is also important to have short term tangible benchmarks for success and assurance that implementation is on schedule.

#### 3.2.2.2.2 Strengths

By focussing on capacity building techniques such as training locals to manage fisheries or understand life history characteristics, there becomes an ownership of knowledge. Capacity building programs provide the locals with the tools necessary to manage their own resources

without the input of other countries. Although the scope of the plan is limited to the next 10 years, should full implementation occur, there is the potential for a good foundation where Indonesia has the ability become fully independent, rather than rely on developed countries for support in such situations.

#### *3.2.2.3 Regional Plan of Action to Promote Responsible Fishing Practices including Combatting Illegal, Unreported, and Unregulated Fishing in Southeast Asia Region (RPOA-IUU, 2007)*

The RPOA-IUU is an agreement between 10 engaged Southeast Asian states and one observer State (Brunei, Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam with Papua New Guinea observing) with the overall objective of promoting responsible fishing practices and combatting IUU fishing practices. The RPOA-IUU is composed under the recommendations of the IPOA-IUU and the overall objective is to enhance and strengthen overall fisheries management, most notably, in the South China Sea, Sulu-Sulawesi Seas (Celebes Seas) and Arafura-Timor Seas. Although not legally binding, this plan has been endorsed by the fisheries ministers from all 11 countries and recently, Indonesia has become the secretariat (RPOA, 2007)

##### 3.2.2.3.1 RPOA-IUU and Illegal, Unreported, and Unregulated Fishing

Like the other government initiatives this plan simultaneously addresses illegal, unreported, and unregulated fishing practices. There are 11 action components of the plan, and, when combined, the major problems around illegal, unreported or unregulated fishing are addressed. The 11 action components are (RPOA, 2007): (1) improving the current resource and management situation in the area, (2) implementing international and regional instruments such as UNCLOS, UNFSA, RFMOs, (3) understanding the role of regional and multi-lateral organisations where countries work together to build capacity, data share, and implement conservation measures, (4) understand coastal state responsibilities, (5) understand flag state responsibilities, (6) sign on

to and ratify port state measures, (7) understand regional market measure where countries should collaborate to implement regional market measures to ID and track fish and where international trade laws can be implemented and regular and timely reports are submitted and trade discrepancies can be checked between fish export and product and mistakes can be reported to the relevant flag states, (8) support regional capacity building where there is MCS research and development, implement traceability systems, and ensure flag states are cooperative, (9) strengthen and implement MCS systems, (10) better regulate transshipment at sea, and (11) focus on implementing all of the above through coordination of all ASEAN countries and communicate on the international stage, when appropriate. This document is essentially a call to action for participating ASEAN countries. It addresses the need for the region to mobilize its resources by working together and taking ownership through effective management and control.

#### 3.2.2.3.2 Limitations

The major limitation of the RPOA-IUU is that it is not legally binding. Therefore, while there are recommendations there are no consequences for countries who do not comply or follow the recommendations in a timely manner. Additionally, there is a general lack of timelines in the document. There are also few actionable items; while it states what *should* be done, it lacks in substance as to *how* and *when*.

#### 3.2.2.3.3 Strengths

This is one of the few documents that emphasize the need for collaboration and cooperation among several neighbouring countries. Despite not being legally binding, it is important to recognize that this document shows strides in the SE Asia region towards working together to combat this global issue. Additionally, the components of the plan call into action against all three

aspects of IUU fishing and outline some of the 'best practices' based on international instruments of change.

#### *3.2.2.4 EU Catch Certification Scheme*

The EU Catch certification scheme is a legally binding document for the European Community that is meant to help eliminate IUU fishing within the Community. It describes a new regime regarding the import of fishery product into the EU to ensure they were not caught by any action that would be categorized as illegal, unreported, or unregulated fishing. Part of this scheme is the allocation of a "catch certificate" ensuring the legal, regulated, and reported status of the catch (see Appendix D for example forms). The EU must check all catch certificates and refuse product that does not possess the correct documentation, or that does not match the certificate. The information that must be contained within the certificate are: the vessel ID, name of designated port of destination and purpose of call, landing, transshipment, fishing authorisation, dates of fishing trip, quantities of each species to remain on board or be landed, zone or zones where catch was made and verified by VMS when possible. Together this information would contribute to reinforcing an LRR fishery.

##### 3.2.2.4.1 Limitations

While the benefits of such measures are easily witnessed, the EU catch certification scheme (EU-CCS) is not without its limitations. Much like the PSMA, the EU-CCS can only be implemented and authorised in certain ports. In Indonesia there are currently only 29 ports which can make such authorisations. This is not conducive to small scale fishermen (or their suppliers) who desire to export their catch to the EU (Marwoto, 2011). Additionally, although all aspects of IUU fishing is addressed through this scheme, it is only relevant towards product that is being

exported to the EU Community. A significant portion of the national catch remains in Indonesia and the EU-CCS  has no bearing on that product.

#### 3.2.2.4.2 Strengths

This is a well enforced scheme which addressed all aspects of IUU fishing. Using import regulations is a good start towards eliminating IUU fish on the global scale. If there is no market for IUU fish, fewer people will engage in IUU fishing. In the larger ports, which have the authority to sign off on EU bound fish, fishermen and vessel owners are forced to comply with the scheme if they want to compete in the European market.

***Table 4**: International coordination initiatives between Indonesia and other countries towards combatting illegal, unreported, and unregulated fishing.*

| Action | Context | Relevance to I, U, or U Fishing | Limitation |
|---|---|---|---|
| *Ratification of FAO's Port State Measures (PSM), 2016* | • Regulation as to the activities that should occur in designated ports<br>• Legally binding | • PSM are enforced by port authorities and when inspections relate to illegal, unreported, and unregulated fishing activities | • Port-limited, PSM can only be enforced in actual ports<br>• There are specific designated ports |
| *Strategic plan for ACIAR engagement in capture fisheries research and capacity development in Indonesia, 2015-25* | • Plan 2015-2025, built on existing relationship between Indonesia and Australia<br>• Assist in NPOA-IUU implementation and upholding Code of Conduct for Responsible Fisheries (FAO, 2007) of which both countries are signatories<br>• Research and capacity building<br>• Productive and sustainable tuna fisheries is a top priority | • goal to improve port reporting and increase capacity of the country, establish ability to report to relevant RFMOs<br>• Reduction of I, U and U fishing is a by-product of research and capacity building towards productive and sustainable tuna fisheries | • Strategic plan is build on the medium to long term<br>• Relies on the continued cooperation between Australia and Indonesia |
| *Regional Plan of Action to Promote Responsible Fishing Practices including Combatting Illegal, Unreported and Unregulated Fishing in the Southeast Asia Region (RPOA-IUU, 2007)* | • Agreement between the 11 southeast Asian countries (ASEAN)<br>• Work together to promote sustainable fishing and combat IUU fishing | • Endorses capacity building to solve management issues<br>• Implement sustainable practices based on international instruments<br>• Emphasizes the responsibility of all countries to improve systems and enforce action<br>• Resultant is reduction in I, U and U fishing | • Voluntary<br>• No timelines<br>• Lacks in actionable substance, largely paper-based |
| Adoption of:<br>*Catch Certification Scheme for EU 1005/2008*<br>where<br>*task force for implementation ministerial through decree no. KEP. 46/MEN/2009* | • Recognition that the European Union has strict seafood import requirements<br>• Catch certificate scheme, with documentation, needed to accompany product | • Catch certification scheme in place where associated documentation is extensive and specifies information related to I, U and U | • Only 22 ports qualified to authorize on catch certification<br>• Some requirements are not congruent with small-scale fishermen methods<br>• Only applicable on Europe-bound product |

# 4.0 Discussion

Globally, IUU fishing remains to be a significant contributor to the international decline of fish stocks, the destruction of sensitive ecosystems, and economic loss (Beddington et al., 2007;

Pitcher et al., 2009; Pramod, et al., 2008; Varkey et al., 2010). This is particularly evident in developing countries which are often associated with weaker governance over their fisheries resources and the persistence of IUU fishing can severely hamper the sustainable development of such fisheries (Petrossian, 2015; Worm & Branch, 2012). Measures to combat IUU fishing predominantly speak to all forms (that is, addressing illegal, unreported, and unregulated fishing, simultaneously), but the extent to which such approaches are effective for combatting the underlying forces of IUU fishing is questionable. Although often presented as a single problematic unit, when defined individually, illegal, unreported, and unregulated fishing activities are three related, but inherently different, problematic units. How can breaking up IUU fishing into its separate constituents facilitate more effective management plans to mitigate IUU activities? In this project, Indonesia provided the setting through which to explore this theme. Indonesia was selected as a case study for several reasons the two most relevant being (1) the intense attention that IUU fishing in Indonesia is currently receiving on the national and international stage and (2) the social and economic dependence that Indonesia has on its ocean resources.

In this study, the framework for an IUU vulnerability index using an area based approach was developed to provide the foundation on which to ultimately construct an index through which geographical areas can be analysed for their vulnerability towards illegal, unreported, or unregulated fishing. The development of the framework, though preliminary in nature, can help to discern what the underlying causes might be to engage in illegal, unregulated, or unreported fishing. For example, if a certain WPP indicates a high vulnerability towards unreported fishing, it could be attributed to a lack of ports and relevant authorities to record catches and fishing trips. The fluidity of the framework allows it to adapt as more information about the activities and processes in and on Indonesian waters becomes available, providing sequentially more refined

analyses and contexts for the risk of IUU fishing. The framework marks the first step in a process to eventually quantify the vulnerability of IUU fishing in a specific area. Although an analysis has yet to be completed to determine its viability, this approach has the potential to be applied in other countries, especially those with a decentralized government or even globally, where area-based approaches are appropriate.

The second part of this study brought together a suite of major tools that are being deployed in Indonesia to combat IUU fishing, in the form of an IUU toolbox. Each tool was described based on its relevance and applicability towards combatting illegal, unreported, or unregulated fishing. The IUU toolbox provides managers with a good overview of some of the dominant tools that are available to them to help combat IUU fishing. Depending on the scope of the problem which managers face, certain tools may be more favourable than others. In the Indonesian context, NGO-initiated tools are, very generally, best applied to the small-scale sector of tuna fisheries. Evidence to support this suggests that the successful management of artisanal fisheries requires alternative forms of management which are often dissociated from classic governmental structures (Worm & Branch, 2012). NGOs are able to provide the support that is needed in areas dominated by small-scale fishermen to facilitate such alternative forms of management through FIP implementation, for example (Deighan & Jenkins, 2015). However, it should be noted that although on paper FT and MSC certifications appear to cover similar parameters with respect to IUU fishing, in practice, MSC is one NGO-initiated tool that is arguably more appropriate for large-scale fleets largely due to its cost to achieve and maintain and stringent organization and licensing requirements (Duggan & Kochen, 2016; Jacquet & Pauly, 2008).

Conversely, this project found that all government initiated actions (national and international) are seemingly more paper-based plans where enforcement and compliance is more

applicable to large-scale fleets. Due to the infrastructure typically necessary to house larger vessels, large-scale vessels are more frequently observed at legitimate ports where there is a higher likelihood of competent authoritative bodies to regulate the activities of fishermen and ensure compliance with the national legislation stipulated in the NPOA-IUU. Additionally, the ability of Indonesia to effectively implement all aspects of its NPOA-IUU is questionable. The capacity of the Government to ensure compliance is limited, suggesting that on paper Indonesia measures up to the best practices of anti-IUU actions, but in practice it falls short (Bailey et al., 2012; MMAF, 2012a; FAO, 2001).

The international actions taken by the Indonesian government indicate a collective desire to collaborate and work with neighbouring countries towards safeguarding mutual resources. As Bailey et al. discuss (2010) *cooperation* over the management of shared resources (such as tuna, and in this case, IUU fishing) often favour a more desirable outcome for all parties over a non-cooperative approach. However, because all international plans and initiatives discussed are in their infancy in deployment throughout Indonesia an analysis on their effectiveness in practice is absent for most actions. However, in 2010 the Pew Environmental Group analysed port state performance. PSMA were highly critiqued for their insufficiency to identify and track IUU-listed vessels, inadequacy of ports to comply with PSMA, and (then) regional focus allowing IUU-listed vessels to seek sanctuary in other regions (Kistowski et al., 2010). Despite being written in 2009, June 5, 2016 marked the date when the PSMA legally entered force, after the ratification by a minimum of 25 countries (FAO, 2016c). Therefore, some of the criticisms presented by the Pew Environmental Group may no longer be valid and future analysis is warranted. In Indonesia, it is too early to conclude how the Port State Measures Agreement will influence compliance and

mitigate IUU fishing; its legal criteria and comprehensiveness suggest that it is an important tool in the global context for building sustainable fisheries.

Arguably much of the recent momentum for targeting IUU fishing can be attributed to Ibu Susi and her IUU fishing agenda. Though it is valuable to have a national figure spearheading anti-IUU driven initiatives, it is clear that Indonesia's NPOA-IUU is disproportionately focussed on the large-scale fishing sector. This is evidenced in that under "threats to unregulated fishing" the major threat listed is sport fishing (MMAF, 2012a). Additionally, "threats to unreported fishing" are mostly concerned with catch being accurately reported in ports (MMAF, 2012a). Most often small-scale fishermen do not use authoritative ports and therefore, do not reliably report their catch. This risk is lacking in the NPOA-IUU and should be factored into the threat of unreported fishing (WCPFC, 2012; Pauly & Zeller, 2016). This is an example where fisheries managers can turn to the IUU toolbox to assist in decision making to effectively build an LRR fishery in areas populated with small-scale fishers. Where governments lack the capacity to enforce in rural areas, NGOs can help establish valuable partnerships between fishers, suppliers, local governments (where applicable), and industry. In some instances local leaders can have a positive influence on fisheries management if they utilize community networks to participate in the enforcement of fishery policies (Pomeroy et al., 2016).

In this project, the two approaches that were used to understand IUU fishing in Indonesia (i.e. the index and the toolbox) are designed to be used in conjunction with one another. When the index reaches fruition, it can function as a mechanism to broadly describe the illegal fishing, unreported fishing, or unregulated fishing situation in the national context, providing a first step in analysis. Once the major issues have been identified decision makers can turn to the toolbox to evaluate which tools might best be applied in any given area. Like the index, the toolbox lends

itself to further refinement as more anti-IUU tools are developed and dispersed throughout Indonesia.

## 4.1 Limitations

There are some obvious limitations to this study with respect to the feasibility of how the toolbox can successfully be applied to highly vulnerable areas. One such limitation is that no cost-benefit analysis was conducted. Therefore, when decision makers use the vulnerability index to understand the basic problems in any given WPP, and select various seemingly appropriate solutions, a cost-benefit analysis would need to be conducted to ensure that whichever tool they choose is the best one based on the area.

Due to the preliminary nature of the vulnerability index and absence of an analysis of a WPP estimating its vulnerability to IUU fishing the usefulness and accuracy of the index cannot be verified. Nevertheless, it is still important to recognize the opportunity that the framework provides towards future work.

A personal limitation of this project is that most the Indonesian laws and government documents are written in Indonesian, as is the MMAF website, and these sources had to be translated for the author. It is possible that certain information pertaining to anti-IUU actions were lost in translation or have yet to be made available in English and were not found during the research process. Although documentation was verified by the local Indonesian staff at MDPI this is an notable limitation to consider.

Finally, given that IUU fishing is currently a prominent topic in the national and international conversation, actions to mitigate IUU-fishing and enforcement activities change or are added to frequently. There is a risk that since the composition of this project further tools can

be added to the toolbox based new initiatives, for example, or that the Indonesian Government has signed onto additional agreements.

### 4.2 Future Directions

The most important next step to take from this project is to refine the details of the vulnerability index. Such details include the range of values for each attribute and the development of a formula to apply to an area based analysis. The proposed methodology is to build this tool in ArcGIS online and configure it so that it is available to the public. Ultimately it should be an elastic map where users can change certain attributes to observe how the vulnerability to illegal, unreported, or unregulated fishing is affected (for example, if WPP X acquired 5 more ports, how would that change its vulnerability to unreported fishing?).

Hopefully future research stemming from this preliminary work can help decision makers come to appropriate and cost-effective solutions to combat different aspects of IUU fishing. Finally, the methodology taken in this project should be leveraged to the global picture. The actions of NGOs in Indonesia or themes of government initiated activities have the potential to be applied in other countries (or already are, i.e. MSC certification) and future directions of this project should reflect the global IUU problem.

## 5.0 Conclusion

Given the complex nature of IUU fishing it is clear that the best approach towards combatting IUU fishing is through a variety of approaches. While there is merit to the hands-on work that NGOs perform, government legislation must also in place to support the actions of the NGOs. And conversely, while it is important for there to be applicable legislation, there also needs to be on the ground support to ensure laws are being carried out in the best manner.

This project provided some useful insight into the available tools for fisheries managers in addition to a framework that could be used to assess IUU vulnerability. This is particularly important for developing countries where funds and resources might be limited and tailored efforts can provide a more efficient way of managing both IUU fishing and fisheries, in general.

As an extensive archipelagic nation with known IUU fishing problems, it is important for Indonesia to problem solve and work with others to develop long term sustainable solutions. Lessons learned from this project have the potential to be applied to the global scope of IUU fishing. Teasing apart IUU fishing and understanding the potential root causes is a unique approach that can reasonably be applied to any given country where IUU fishing is a significant threat. Arguably, IUU fishing can never be completely eliminated due to its evasiveness and ability to manifest itself in several different ways, but we can try and evolve as IUU evolves, and attempt to remain ahead. Inventive approaches towards effectively combatting IUU fishing is an international responsibility upon which we build legal, regulated, and reported fisheries to safeguard our global ocean resources.

## Acknowledgements

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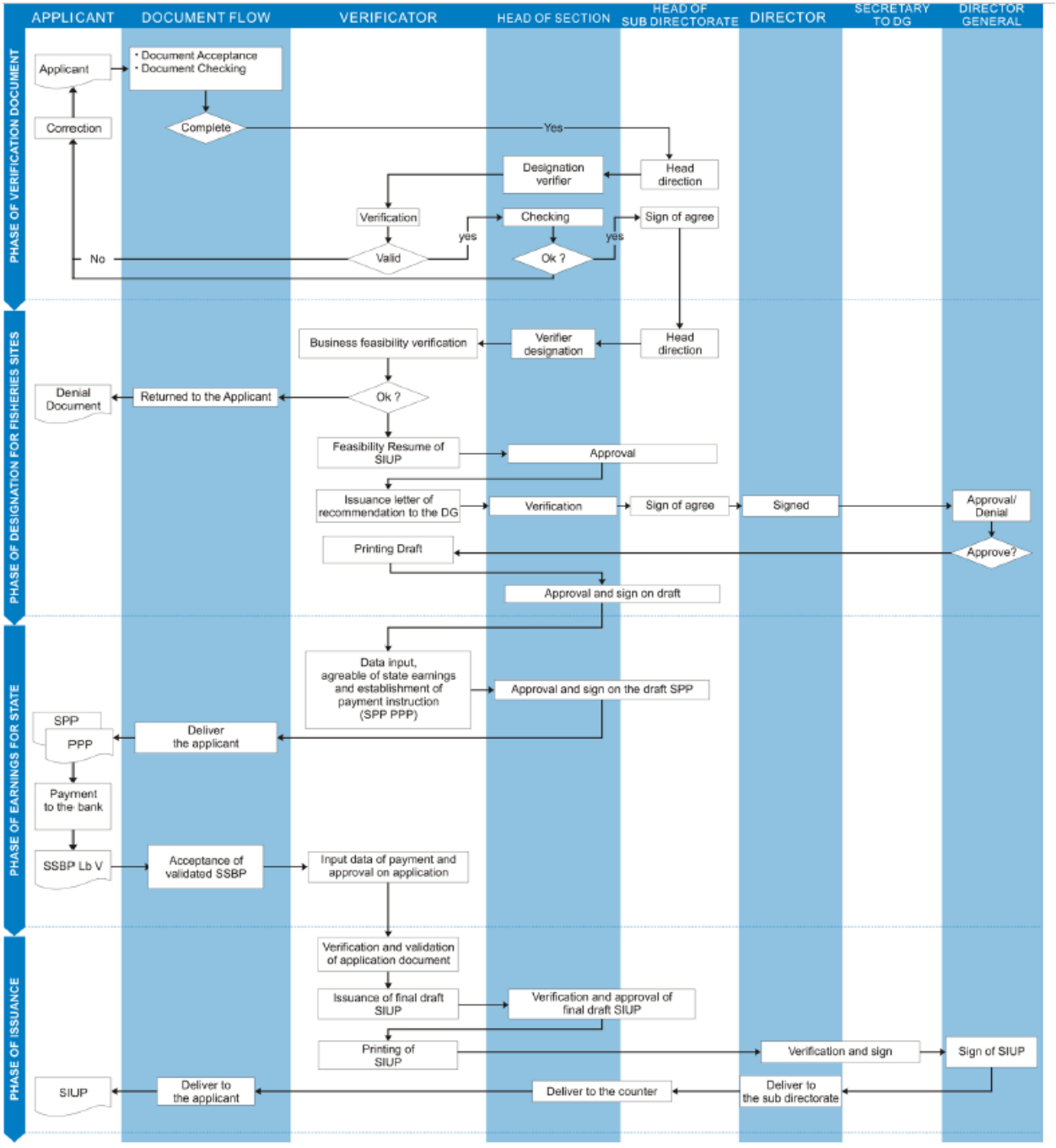
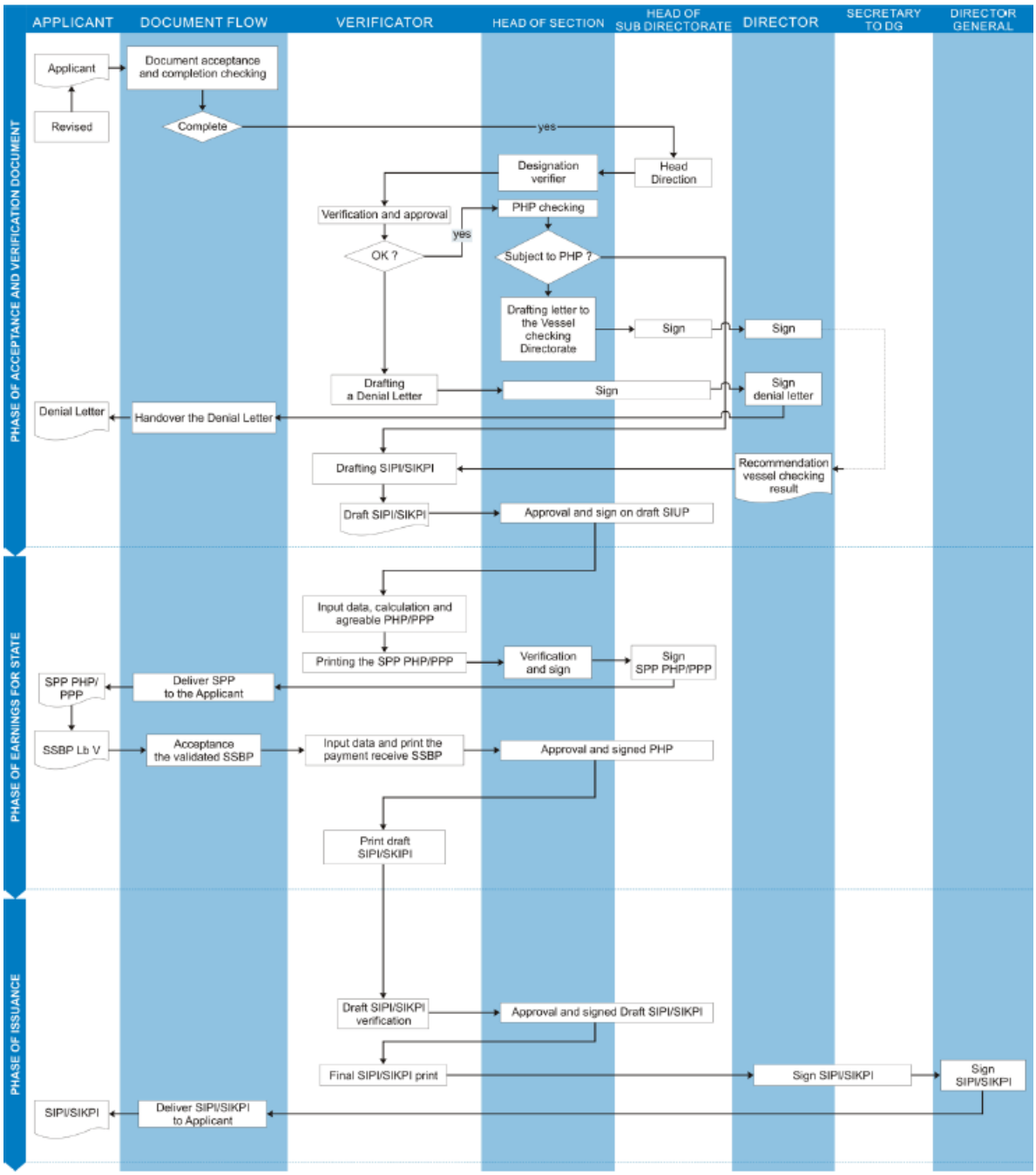
# Appendices

***Appendix A:*** *Flowchart adapted from MMAF 2012a depicting the process for acquiring a SIUP form.*



***Appendix B:*** *Flowchart adapted from MMAFa depicting the process for acquiring a SIPI or a SIKPI form.*



***Appendix C:*** *To comply with PSM the following forms must be completed by the relevant port authority. Failure to accurately report data will result in legal action and denial of port entry.*

**Information to be provided in advance by vessels requesting port entry**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1. Intended port of call** | | | | | | | | |
| **2. Port State** | | | | | | | | |
| **3. Estimated date and time of arrival** | | | | | | | | |
| **4. Purpose(s)** | | | | | | | | |
| **5. Port and date of last port call** | | | | | | | | |
| **6. Name of the vessel** | | | | | | | | |
| **7. Flag State** | | | | | | | | |
| **8. Type of vessel** | | | | | | | | |
| **9. International Radio Call Sign** | | | | | | | | |
| **10. Vessel contact information** | | | | | | | | |
| **11. Vessel owner(s)** | | | | | | | | |
| **12. Certificate of registry ID** | | | | | | | | |
| **13. IMO ship ID, if available** | | | | | | | | |
| **14. External ID, if available** | | | | | | | | |
| **15. RFMO ID, if applicable** | | | | | | | | |
| **16. VMS** | No | Yes: National | Yes: RFMO(s) | Type: | | | | |
| **17. Vessel dimensions** | Length | | Beam | | Draft | | | |
| **18. Vessel master name and nationality** | | | | | | | | |
| **19. Relevant fishing authorization(s)** | | | | | | | | |
| *Identifier* | *Issued by* | *Validity* | *Fishing area(s)* | *Species* | *Gear* | | | |
| | | | | | | | | |
| | | | | | | | | |
| **20. Relevant transshipment authorization(s)** | | | | | | | | |
| *Identifier* | | *Issued by* | | *Validity* | | | | |
| *Identifier* | | *Issued by* | | *Validity* | | | | |
| **21. Transshipment information concerning donor vessels** | | | | | | | | |
| *Date* | *Location* | *Name* | *Flag State* | *ID number* | *Species* | *Product form* | *Catch area* | *Quantity* |
| | | | | | | | | |
| | | | | | | | | |
| **22. Total catch onboard** | | | | **23. Catch to be offloaded** | | | | |
| *Species* | *Product form* | *Catch area* | *Quantity* | *Quantity* | | | | |
| | | | | | | | | |
| | | | | | | | | |

## Report of the results of the inspection

| | | | | | |
|---|---|---|---|---|---|
| **1. Inspection report no** | | **2. Port State** | | | |
| **3. Inspecting authority** | | | | | |
| **4. Name of principal inspector** | | **ID** | | | |
| **5. Port of inspection** | | | | | |
| **6. Commencement of inspection** | *YYYY* | *MM* | *DD* | *HH* | |
| **7. Completion of inspection** | *YYYY* | *MM* | *DD* | *HH* | |
| **8. Advanced notification received** | *Yes* | | *No* | | |
| **9. Purpose(s)** | *LAN* | *TRX* | *PRO* | *OTH (specify)* | |
| **10. Port and State and date of last port call** | | | *YYYY* | *MM* | *DD* |
| **11. Vessel name** | | | | | |
| **12. Flag State** | | | | | |
| **13. Type of vessel** | | | | | |
| **14. International Radio Call Sign** | | | | | |
| **15. Certificate of registry ID** | | | | | |
| **16. IMO ship ID, if available** | | | | | |
| **17. External ID , if available** | | | | | |
| **18. Port of registry** | | | | | |
| **19. Vessel owner(s)** | | | | | |
| **20. Vessel beneficial owner(s), if known and different from vessel owner** | | | | | |
| **21. Vessel operator(s), if different from vessel owner** | | | | | |
| **22. Vessel master name and nationality** | | | | | |
| **23. Fishing master name and nationality** | | | | | |
| **24. Vessel agent** | | | | | |
| **25. VMS** | *No* | *Yes: National* | *Yes: RFMOs* | Type: | |

**26. Status in RFMO areas where fishing or fishing related activities have been undertaken, including any IUU vessel listing**

| *Vessel identifier* | *RFMO* | *Flag State status* | *Vessel on authorized vessel list* | *Vessel on IUU vessel list* |
|---|---|---|---|---|
| | | | | |
| | | | | |

**27. Relevant fishing authorization(s)**

| *Identifier* | *Issued by* | *Validity* | *Fishing area(s)* | *Species* | *Gear* |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

**28. Relevant transshipment authorization(s)**

| | | | | | |
|---|---|---|---|---|---|
| *Identifier* | | *Issued by* | | *Validity* | |
| *Identifier* | | *Issued by* | | *Validity* | |

| **29. Transshipment information concerning donor vessels** | | | | | | |
|---|---|---|---|---|---|---|
| *Name* | *Flag State* | *ID no.* | *Species* | *Product form* | *Catch area(s)* | *Quantity* |
| | | | | | | |
| | | | | | | |

| **30. Evaluation of offloaded catch (quantity)** | | | | | |
|---|---|---|---|---|---|
| *Species* | *Product form* | *Catch area(s)* | *Quantity declared* | *Quantity offloaded* | *Difference between quantity declared and quantity determined, if any* |
| | | | | | |
| | | | | | |

| **31. Catch retained onboard (quantity)** | | | | | |
|---|---|---|---|---|---|
| *Species* | *Product form* | *Catch area(s)* | *Quantity declared* | *Quantity retained* | *Difference between quantity declared and quantity determined, if any* |
| | | | | | |
| | | | | | |

| | | | |
|---|---|---|---|
| **32. Examination of logbook(s) and other documentation** | *Yes* | *No* | *Comments* |
| **33. Compliance with applicable catch documentation scheme(s)** | *Yes* | *No* | *Comments* |
| **34. Compliance with applicable trade information scheme(s)** | *Yes* | *No* | *Comments* |
| **35. Type of gear used** | | | |
| **36. Gear examined in accordance with paragraph e) of Annex B** | *Yes* | *No* | *Comments* |

| |
|---|
| **37. Findings by inspector(s)** |
| |
| **38. Apparent infringement(s) noted including reference to relevant legal instrument(s)** |
| |
| **39. Comments by the master** |
| |
| **40. Action taken** |
| |
| **41. Master's signature** |
| |
| **42. Inspector's signature** |
| |

***Appendix D:*** *The following documents are forms that must be completed to be in compliance with the EU Catch Certificate (EC, 2008).*

| EUROPEAN COMMUNITY CATCH CERTIFICATE | | | | | | | |
|---|---|---|---|---|---|---|---|
| Document number | | | Validating authority | | | | |
| 1. Name | Address | | | Tel.<br>Fax | | | |
| 2. Fishing vessel name | Flag – Home port and registration number | | Call sign | IMO/Lloyd's number (if issued) | | | |
| Fishing licence No – Valid to | Inmarsat No, Fax No, Telephone No, E-mail address (if issued) | | | | | | |
| 3. Description of product | Type of processing authorised on board | | 4. References of applicable conservation and management measures | | | | |
| Species | Product code | Catch area(s) and dates | Estimated live weight (kg) | Estimated weight to be landed (kg) | Verified weight landed (kg) where appropriate | | |
| | | | | | | | |
| 5. Name of master of fishing vessel – Signature – Seal: | | | | | | | |
| 6. Declaration of transhipment at sea<br>Name of master of fishing vessel | Signature and date | Transhipment date/ area/position | Estimated weight (kg) | | | | |
| Master of receiving vessel | Signature | Vessel name | Call sign | IMO/Lloyds number (if issued) | | | |
| 7. Transhipment authorisation within a port area | | | | | | | |
| Name | Authority | Signature | Address | Tel. | Port of landing | Date of landing | Seal (stamp) |
| 8. Name and address of exporter | Signature | Date | Seal | | | | |
| 9. Flag State authority validation: | | | | | | | |
| Name/title | Signature | Date | Seal (stamp) | | | | |

| 10. Transport details *(see Appendix)* | | | | | |
|---|---|---|---|---|---|
| 11. Importer declaration | | | | | |
| Name and address of importer | Signature | Date | | Seal | Product CN code |
| Documents under Articles 14(1), (2) of Regulation (EC) No .../2008 | References | | | | |
| 12. Import control — authority | Place | Importation authorised (*) | Importation suspended (*) | Verification requested – date | |
| Customs declaration (if issued) | Number | | Date | Place | |
| (*) Tick as appropriate. | | | | | |

| EUROPEAN COMMUNITY RE-EXPORT CERTIFICATE | | | |
|---|---|---|---|
| Certificate number | Date | Member State | |
| 1. Description of re-exported product | Weight (kg) | | |
| Species | Product code | Balance from total quantity declared in the catch certificate | |
| 2. Name of re-exporter | Address | Signature | Date |
| 3. Authority | | | |
| Name/title | Signature | Date | Seal/stamp |
| 4. Re-export control | | | |
| Place | Re-export authorised (*) | Verification requested (*) | Re-export declaration number and date |
| (*) Tick as appropriate. | | | |

| EUROPEAN COMMUNITY RE-EXPORT CERTIFICATE | | | |
|---|---|---|---|
| Certificate number | Date | | Member State |
| 1. Description of re-exported product | | Weight (kg) | |
| Species | Product code | | Balance from total quantity declared in the catch certificate |
| 2. Name of re-exporter | Address | Signature | Date |
| 3. Authority | | | |
| Name/title | Signature | Date | Seal/stamp |
| 4. Re-export control | | | |
| Place | Re-export authorised (*) | Verification requested (*) | Re-export declaration number and date |
| (*) Tick as appropriate. | | | |

| 1. Country of exportation<br>Port/airport/other place of departure | 2. Exporter signature | | | |
|---|---|---|---|---|
| Vessel name and flag<br>Flight number/airway bill number<br>Truck nationality and registration number<br>Railway bill number<br>Other transport document | Container number(s)<br>list attached | Name | Address | Signature |

*ANNEX IV*

**Statement under Article 14(2) of Council Regulation (EC) No .../2008 of 29 September 2008 establishing a Community system to prevent, deter and eliminate illegal, unreported and unregulated fishing**

I confirm that the processed fishery products: ... (product description and Combined Nomenclature code) have been obtained from catches imported under the following catch certificate(s):

| Catch certificate number | Vessel name(s) and flag(s) | Validation date(s) | Catch description | Total landed weight (kg) | Catch processed (kg) | Processed fishery product (kg) |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

Name and address of the processing plant:

.....

.....

.....

Name and address of the exporter (if different from the processing plant):

.....

.....

.....

Approval number of the processing plant:

.....

Health certificate number and date:

.....

| Responsible person of the processing plant: | Signature: | Date: | Place: |
|---|---|---|---|
| | | | |

Endorsement by the competent authority:

..... ... ..... ... ..... ... .....

| Official: | Signature and seal: | Date: | Place: |
|---|---|---|---|
| | | | |

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