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**World Maritime University**

**Malmö, Sweden**

**CHALLENGES CAUSED BY IUU FISHING IN THE OFFSHORE; LESSONS  
FOR LIBERIA'S FISHERIES BASED ON A GLOBAL REVIEW AND  
ANALYSIS**

**By**

**EMMA C. METIEH GLASSCO**

**Liberia**

A dissertation submitted to the World Maritime University in partial Fulfillment of the  
requirement for the award of the degree of

**MASTER OF SCIENCE**

**In**

**MARITIME AFFAIRS**

**(OCEAN SUSTAINABILITY GOVERNANCE AND MANAGEMENT)**

2017

**Declaration**

I certify that all the material in the dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The content of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): .....

(Date): .....

Supervisor: Professor Mary Wisz

World Maritime University

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Assessor: Professor Neil Bellefontaine

Institution/ Organization: World Maritime University

### **Acknowledgement**

*“Giving thanks always for all things unto God and the Father in the name of our Lord  
Jesus Christ” (Ephesians 5:20)*

First of all, I thank the Almighty God for His continuous grace, mercy and unconditional love towards me.

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I dedicate this dissertation to my dearest mother Professor Mary E. Metieh for her continuous and endless support to have seen me come thus far. In this respect, I appreciate the immense contributions of Emma C. Coleman Gaye who has also been a mother to me, my supportive husband Eric W. Glassco and my Swedish host Viveca Andersson-Plyming including all my family members who have also contributed in diverse ways.

Finally, a heartfelt appreciation goes out to my employer, the Ministry of Agriculture of the Republic of Liberia for their confidence in me to attend the WMU MSc. program.

## **Abstract**

Title of the Dissertation: **Challenges caused by IUU Fishing in the offshore; Lessons for Liberia's Fisheries based on a Global Review and Analysis**

Degree: **MSc**

In Liberia, Illegal Unreported and Unregulated fishing activities are undermining national growth resulting in socio-economic crisis. The country sustains an economic loss of \$75 million annually caused by IUU fishing activities. As a result, 49% of the population is faced with food insecurity and thousands of local fishermen are displaced from a way of life that has existed for years.

This dissertation discusses the underlying reasons for the prevalence of IUU fishing in Liberia's EEZ, including the government management response and also examines best approaches used around the globe to combat IUU fishing activities.

The findings from the analysis depict that the prevalence of IUU fishing in Liberia could be attributed to lack of domestic fishing vessels, dominance of distant water operating fleets (controlled by Asian vessel operators from countries such as China and Korea), lack of domestic fishing vessels and illegal transshipment in the EEZ. However, best practice to improve Liberia's fisheries management must incorporate the implementation of enhanced Monitoring Control and Surveillance (which Liberia began implementing since 2010) and all the components, including adoption/guidance of international fisheries instruments such as UNCLOS, UNFSA, IPOAA-IUU, PSMA, and the 1993 FAO-Compliance Agreement. Liberia must also, adopt stronger deterrent measures (such as fines, sanctions and confiscations), and better utilize Regional Cooperation, Community-Based Approaches, and Good Fisheries Governance and Genetics that have been used and proven effective and measurable in combatting IUU fishing globally, particularly through many RFMOs.

The recommendations from this dissertation will serve as an informative tool for Liberia's fisheries sector on how to improve its management response in order to sustainably manage its fisheries and also assist in achieving the UN SDG 14 target 14.5 which is tailored towards eliminating IUU fishing activities.

**KEY WORDS:** EEZ (Exclusive Economic Zone), offshore, fisheries management and IUU fishing, overfishing, PSMA, best Practices in MCS.

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## **List of Abbreviations**

ABNJ	Areas Beyond National Jurisdiction
ALTFACO	Ministerial Conference on Cooperation of African States Bordering the Atlantic Ocean
AIS	Automatic Identification System
BNF	Bureau of National Fisheries
CDS	Catch Documentation Scheme
CCAMLR	Convention for the Conservation of Antarctic Marine Living Resource
DNA	Deoxyribonucleic Acid
EU-	European Union
EEZ-	Exclusive Economic Zone
FAO	Food and Agriculture Organization
FCWC	Fisheries Committee for the West Central Gulf of Guinea
FMC	Fisheries Monitoring Center
GDP	Gross Domestic Product
GRT	Gross Tonnage
HF	High Frequency
ICG	Icelandic Coast Guard
IPOA-IUU	International Plan of Action to prevent, deter and eliminate Illegal Unregulated, Unreported Fishing Activities
ITQ	Individual Transferable Quotas

IUU Fishing	Illegal Unreported Unregulated
IEZ	Inshore Exclusion Zone
ICCAT	International Commission for the Conservation of Atlantic Tuna
LCG	Liberia Coast Guard
MPA	Marine Protected Area
MRAG	Marine Resources Assessment Group
MCS	Monitoring Control and Surveillance
MCSCC	Monitoring Control and Surveillance Coordination Committee
NOAA	National Oceanic and Atmospheric Administration
NOP	National Observer Program
NEPAD	New Partnership for Africa's Development
NAFO	Northwest Atlantic Fisheries Organization
NEAFC	North East Atlantic Fisheries Commission
PSMA	Port State Measures Agreement
RFMO	Regional Fisheries Management Organization
SAR	Search and Rescue
SDG	Sustainable Development Goal
SWOT	Strength Weakness Opportunity Threaten
SOP	Standard Operating Procedure
SRFC	Sub regional Fisheries Commission

UN	United Nations
UNCLOS	United Nations Convention Law of the Sea
UNFSA	United Nation Fish Stocks Agreement
UNCED	United Nations Conference on Environment and Development
UNHCR	United Nations High Commissioner for Refugees
UNMIL	United Nations Mission in Liberia
USAID	United States Agency for International Development
VMS	Vessel Monitoring Systems
VHF	Very High Frequency
WCFC	Western and Central Pacific Fisheries Commission
WARFP	West African Regional Fisheries Project
WWF	World Wildlife Fund
WTO	World Trade Organization

## **CHAPTER ONE: GENERAL OVERVIEW OF IUU FISHING**

### **1.1 Introduction**

Illegal Unreported Unregulated (IUU) Fishing activities have a global impact on human society, marine ecosystem and conservation as well as food security. IUU fishing undermines global, regional and national laws governing sustainable management and conservation of fisheries (Johns, 2013). It accounts for an economic loss of approximately \$23 billion which is equivalent to 26 million metric tons of fish stocks annually worldwide (Johns, 2013), representing an, estimated 15 to 30% of global annual fish catch. It also threatens 4.3 billion people who depend on fisheries for protein (FAO, 2016).

Fisheries stocks are declining rapidly due to overfishing and ecosystem degradation caused by destructive fishing methods and practices. As a result, global food security, including 30% of the world's animal protein, has been affected (Quaas et al, 2016).

IUU fishing activities have contributed to socio-economic and ecological crisis in economies around the globe. Although several laws and voluntary fisheries legal instruments have been developed by relevant stakeholders, and governmental and non-governmental bodies, there is still a pressing need for more collaborative effort.

This dissertation is a comprehensive study of IUU fishing challenges as well as best management approaches and responses employed by nations to tackle the challenge on a global scale. It further discusses Liberia's IUU fishing challenges and lessons learned that will serve as a useful tool for decision makers in the Liberian fisheries sector and other relevant stakeholders.

## **1.2 What is IUU?**

Illegal Unreported Unregulated (IUU) Fishing is a term coined to describe all fishing activities that violate fisheries law or go beyond the fisheries regulations; It also includes prohibited fishing gear (wrong fishing gear), overfishing (fishing over quota), fishing without license, fishing in closed areas, or fishing prohibited species (FAO, 2016). The FAO (2016) broadly defines IUU as:

**Illegal Fishing:** Fishing activities by a foreign vessel in the national jurisdiction of a coastal state within the 200 nautical miles' unit of the Exclusive Economic Zone (EEZ) or the high seas which is not under the regime of a Regional Fisheries Management Body (RFMO) without permission or without license.

Illegal fishing can also be described as fishing within restricted zones. For example, fishing in a Marine Protected Area (MPA) or in the Inclusive Exclusion Zone (IEZ) of a coastal state within 4 nautical miles from the shoreline by an industrial trawler. The IEZs are spawning grounds for fish and habitat for juvenile fish. Fishing in the IEZ is prohibited by industrial trawlers but permissible for small domestic fishing boats by artisanal or local fishermen.

**Unreported Fishing:** Fishing activities by vessels that are intentionally under-reported or fish catch that is misreported to relevant national fisheries authorities or RFMOs.

**Unregulated Fishing:** Fishing in areas out of the bounds of the national jurisdiction of a coastal state or RFMO, wherein there are no management or conservation measures or fishing activities of a vessel without a flag or by a flag vessel which is not party to the RFMOs.

## **1.3 How has it affected the Fisheries Globally?**

Based on global analysis, over the last twenty years, the trend of illegal fishing has accounted for \$11 to \$ 23.5 billion loss of fish stocks which represents 11 and 22 million

metric tonnes annually of global seafood catch (Agnew et al., 2009). Developing countries have been most affected; for example, over 40% of the fish stocks harvested are unreported catches in West Africa (Agnew et al., 2009). As a result, it threatens the food insecurity of 2.6 billion people from developing countries that depend on fish protein (USAID, 2016). It also has an ecological impact on critical marine environments (Marine Resources Assessment Group, 2005). For example, destructive fishing practices like bottom trawl fishing and the use of unselective fishing gear like small mesh gill nets are used to capture juvenile fish stocks (Namisi, 2005), disrupting natural growth of marine species in reefs, seamounts and other vulnerable marine ecosystems (MRAG, 2005).

Illegal Unreported Unregulated fishing reduces the sustainable management of marine ecosystems and fish stocks (unregulated catch reports and stock estimate), affects the livelihood of local fishermen, increases the black market for illegal fish product and negatively affects the fish industry market such as the wholesale or local distribution of fish product (Leal et al, 2015). The negative impact of illegal fishing is enormous and has raised the concerns of governmental and non-governmental bodies, regional fisheries management organizations and all relevant stakeholders.

- **Coastal Livelihood of Local Fishers:** Most coastal communities depend on fisheries for jobs and food security, however IUU fishing activities by industrial fishing fleets displace these local fishers out of jobs. It also disrupts their fishing activities by competing for ocean space. For example, in 2013 a domestic industrial trawler with a Korean flag was caught fishing in the IEZ of Sierra Leone waters; It reduced the catch of the local fishers, destroyed their nets and it has, at times led to conflict, death or injury (Roush et al., 2014).
- **Marine Stocks:** IUU fisheries harvests are unregulated or unreported; This hampers the ability to sustainably manage the fish stocks and, as a result, the stocks are underestimated. This has led to a drastic decline of the world's fish stocks and threatened global food security (United Nations, 2010). According to expert



reports, 30% of the world fisheries is overexploited and 57% is fully exploited (Bondaroff et al., 2015), also an estimated 20% of world's fisheries were either underexploited or moderately exploited (United Nations, 2010). For example, 60% of the world's shark species are assumed to be overexploited or depleted (United Nations, 2010).

- **Economic Impact:** Expected revenue and taxes due to the government or appropriate authorities generated by fisheries are diverted or reduced because of illegal fishing activities. They also reduce price or market value of fish significantly (Le Gallic & Cox, 2006). IUU fishing contributes to a global economic loss of \$USD 10 to 23 billion annually (Agnew et al., 2009). It is more convenient for IUU fishers to fish illegally because they operate at a lower cost than the legal fishers. Therefore, in countries where illegal fishing is prevalent the government suffers substantial economic loss.
- **Ecological Impact:** There are several environmental impacts caused by IUU such as overfishing which lead to a decline in fish stocks and high amount of bycatch or non-targeted species by commercial fishing vessels; Destructive fishing practices such as benthic trawlers destroy critical marine habitats and disrupt the food web as well as hamper the conservation of vulnerable species (Borges et al., 2001). For example, an average of 17.9 to 39.5 million tonnes of bycatch are discarded annually by commercial fisheries in Portugal (Borges et al., 2001).
- **Socio- Cultural:** Overfishing has led to depletion and collapse of marine fish stocks such as the California sardine fishery in the 1950s, Alantos-Scandian herring fishery in the 1960s, North Cod fishery of Canada in 1992 and the North Sea cod fishery (Hauge, Cleeland, & Wilson, 2009). Commercial exploitation of global fisheries and increase in the world consumption of seafood has resulted in unequal distribution of marine resources, food scarcity and loss of employment for 2.6 billion people that live within coastal communities of poor developing countries and depend on fish as a primary source of protein and livelihood (Jones,

n.d.). For instance, thousands of local fishers have abandoned their fishing careers in search of other jobs because of inadequate catch (Pollack et al., 2008).

#### **1.4 Types of Illegal Unreported and Unregulated Fishing**

There are several types of illegal fishing practices within the exclusive economic zone of a coastal state or on the high seas beyond national jurisdiction. They include bycatch, destructive fishing gear, overfishing, benthic trawlers, illegal transshipment (discussed in chapter 4 with respect to Liberia) and unregulated fishing. Each of these fishing practices is particular to certain regions.

##### **1.4.1 Bycatch**

Bycatch are species incidentally caught or non-targeted species (Davies et.al, 2009); however, they are very vulnerable to overexploitation. Vulnerable marine species such as whales, dolphins, sharks, sea turtles, and seabirds live in pelagic habitats of both tropical and non-tropical regions (Lewison et al, 2004). These non-targeted species are incidentally entrapped, entangled or hooked by fishing gears intended for targeted species. (Borges et al., 2001).

Commercial Fishing is characterized by a high portion of incidental capture species or bycatch wherein there is no directed effort (Borges et al., 2001). However, bycatches are unavoidable because the majority of the fishing gear used is multispecies and non-selective fishing gear such as trawls; As a result, the bycatch and discards are significantly high (Borges et al., 2001). An estimate of 7.3 million metric tons of bycatch is discarded annually in the world's commercial fisheries from 78.4 million metric tons of landed catch (Kelleher, 2005).

##### **1.4.2 Destructive Fishing Gears and Practices**

Fishing gear refer to the tools used by fishers to catch fish and the use of such gear is called fishing method (Both, 2011). Fishing gear includes hooks, lines, nets, and traps.

However, according to FAO (2008), destructive fishing gear or non-selective gear is fishing equipment used in a manner that destroys or damages the marine ecosystem. Some destructive fishing practices include dynamite fishing, cyanide fishing, ghost fishing and trawling activities by commercial fishing vessels.

### **1.4.3 Nets**

There are different types of nets used to capture fish from the simple nets used by artisanal fishers to the most sophisticated nets used by commercial fishing vessels. The most destructive fishing nets are the benthic trawlers and dredgers (blade-like metal which digs into the bottom sea and scrape all the organism into an armor-plated or steel net) which drag across the seabed and scour the benthic habitat, capturing a large amount of bycatch as the trawl beam un-selectively disturbs the sea floor in its path (Watson et al, 2006)

Gill nets are made up of walls of meshes (mesh size is the spaces within the net which determines the size of fish to be captured, Wolf et al., 2015) of thread which could be about 5 by 30 inches as standard size (Bjordal,2001). Another destructive fishing method is the use of small meshed gill nets or mosquito nets commonly used by artisanal fishers, scooping all the juvenile fish into the net ((Namisi, 2005). For example, in Lake Victoria of Uganda, local fishers predominantly use mosquito nets and small mesh gill nets of 3.5 4. or 4.5 inches, which has led to depletion in fish stocks as well as social- economic loss (Namisi, 2005).

### **1.4.4 Cyanide Fishing**

This is a destructive fishing method used predominantly in the Indo-pacific to catch live reef fish; The cyanide poison is put into the water by divers in targeted areas where schools of reef fish are seen or in supposed areas in the corals where the reef fish could be hiding; As a result, the cyanide temporarily stuns the fish, which are easily collected. In the process and then it is easily collected in the process, many non-targeted species such as invertebrate are destroyed (Calado et al., 2014).

#### **1.4.5 Dynamite Fishing**

Fishing with explosives or bomb blast that kills fish stocks within close proximity, is prevalent in developing countries and practiced mainly by locals or artisanal fishers (Wells, 2009). Dynamite fishing is widespread in South Asia, particularly in Indonesia and the Philippines (Shrivastav, 2012). Dynamite, grenades or empty bottles filled with potassium nitrates or artificial fertilizer with pebbles and a fuse are used as bombs in fishing. The explosive or bomb is dispensed into the water and detonated, immediately killing large schools of fish. The bombs burst the swim bladders of the fish and the shock waves from the explosion break the coral's calcium carbonate skeleton into small pieces, which disrupts the symbiotic relationship between the coral and the algae, and gradually the coral loses its nutrients and dies off (Shrivastav, 2012). Dynamite fishing is a convenient and cheap way for fishers to hunt large schools of fish (Shrivastav, 2012).

#### **1.4.6 Ghost Fishing**

These are abandoned, lost or discarded fishing gears in the seas such as gillnets, hooks, longlines, and trawl nets, which kill or capture marine species and contribute to 10% of annual marine debris from a total global estimate of 6.5 million tons (Gilman, 2015).

### **1.5 Why West Africa and Liberia**

The West Africa region especially Liberia is endowed with an abundant fishery resource which provides coastal livelihood, animal protein, and job opportunities for over 3 million people and generates revenue to governments (Fisheries Committee for the West Central Gulf of Guinea et al,2015). In 2011, the total catch production from marine waters in West and Central Africa was estimated to be two million tonnes which is approximately 3.5 % of the world's annual fish production (FCWC et al,2015).

However, West Africa particularly Liberia needs immediate attention because the fishery resources are seriously threatened due to weak trade policy and regulations, poor

governance, weak implementation and enforcement schemes, dominance of distant water fishing trawlers, lack of regional cooperation and overfishing, which have led to a rapid decline of fish stocks (Atta-Mills et al, 2004). In West Africa an estimated 40% of the fish stocks harvested are not reported catches (Agnew et al, 2009). Chinese fishing fleets (industrial trawlers) have dominated the West African waters contributing immensely to most of the IUU fishing activities in the Exclusive Economic Zone (EEZ); Approximately 166,000 metric tonnes of illegal fish catch is associated with Chinese Distant Waters Fishing Operation (Mallory, 2013). Overfishing has led to food insecurity and has affected the coastal communities, which depend solely on fishing for livelihood.

Liberia is an example of a West African country that is faced with enormous challenges of IUU fishing, which has led to economic and social crises; IUU fishing contributes to an economic loss of \$ USD 75 million annually (displacing thousands of local fishers out of jobs and a way of life that has existed for years), as well as food insecurity. As a result, 49% of the country's population is faced with food insecurity because of an inadequate food consumption pattern that is, consisting of a, large intake of cereal and low amount of protein (USAID, 2013). Fisheries contribute 10% to national GDP and provide 15% of animal dietary protein to the population (USAID, 2016).

## **1.6 Rationale of Study**

This dissertation is a literature review of Global Illegal Unreported and Unregulated Fishing, with emphasis on successful approaches and management response. The author reviewed 128 published articles, including national reports, FAO reports, books and journal articles. It also discusses common IUU fishing challenges around the globe. Furthermore, it provides an overview of Liberia's IUU fishing situation and challenges in comparison with current challenges and approaches on a global scale. The dissertation is composed of six parts; Part one (1) gives a general overview of global IUU fishing activities; part two (2) discusses the methodology of the literature review; part three (3) explains the overview of approaches used to combat IUU fishing around the globe; part

four (4) overviews Liberia's IUU fishing situation and current practices ,while part five (5) provides a SWOT analysis of strengths, weakness, opportunities and threats for combatting IUU fishing in Liberia and compares Liberian and global approaches used against IUU fishing and part six (6) makes recommendations for Liberia based on useful lessons learned from the review.

**Recommendations from the dissertation will** serve as an informative tool for various stakeholders, including inter-collaborating agents of Liberia's fishery sector, such as the Ministry of Agriculture, Ministry of Defense (Coast Guard), Maritime Commission, Ministry of Immigration, Ministry of Finance and the Ministry of Justice about the importance of effective collaboration and management response to tackle IUU fishing. This dissertation will also serve as an informative tool for other Regional Fisheries Management Organizations (RFMO), Sub-regional Fisheries Commission (SRFC) and the Fisheries Committee for West Central Gulf of Guinea (FCWC) on how to improve and implement effective measures in preventing IUU fishing.

## **CHAPTER TWO: METHODOLOGY**

### **2.1 Selections of Article**

An intensive, systematic search of peer reviewed literature was conducted on journal articles, articles, including national reports on Liberia and textbooks using keywords, such as EEZ, IUU fishing, Overfishing, offshore, PSMA, best practices in MCS, fisheries management and illegal fishing, in search engines, which included EBSCO discovery science, google scholar and Scopus. Secondly, the reference sections of relevant articles were used to obtain other related articles useful for this research. Finally, the author conducted a bibliographic search of relevant review journal articles identified in the search engines to ensure all relevant articles were identified.

### **2.2 Articles Screening**

The articles screening section comprises of both inclusion and exclusion criteria. In the inclusion criteria, articles were selected using date restriction methods (only articles published from 2000 onwards), and language (English only). Articles with titles and abstracts on Fisheries Management, Illegal Unreported, Unregulated Fishing, Exclusive Economic Zone (EEZ) or Offshore fishing were assessed by full text. The first 36 related article results from EBSCO discovery science were screened by reading through the abstracts only. During the screening process articles were assessed by the article title and abstract, followed by the full content. For the exclusion criteria, articles with titles and abstracts that were indirectly related to the literature review subject matter were not assessed by full text. For example, topics on coastal erosion, pollution, marine sewage, and artisanal fisheries were excluded from the search results. This process was conducted to remove articles that did not contain relevant information.

### **2.3 Data Gathering and Analysis**

Information extracted from the articles included full references and percentage of global impact of IUU fishing activities in particular regions. These were hierarchally assessed and categorized in terms of regions, tropical and non-tropical regions on the basis of best practices/ solutions peculiar to the geographical location. Some of the issues mentioned include bycatch sizes (species that are prohibited from harvesting), benthic trawlers (destructive fishing practices), illegal fishing, wrong fishing gear and illegal transshipment at sea. Best practices or compliance strategies observed by states as they relate to the deterrence of illegal fishing activities were fines, monitoring control and surveillance activities, regional cooperation, sharing of information, genetics (fish traceability) and governance.

The next step was, the SWOT analysis by plotting a chart which shows strengths, weaknesses, opportunities and threats of Liberia's fisheries management approach, and a comparative analysis with other countries and RFMOs with advanced fisheries management regimes. Based on this comparison, useful examples for Liberia to consider in improving its fisheries management were highlighted.

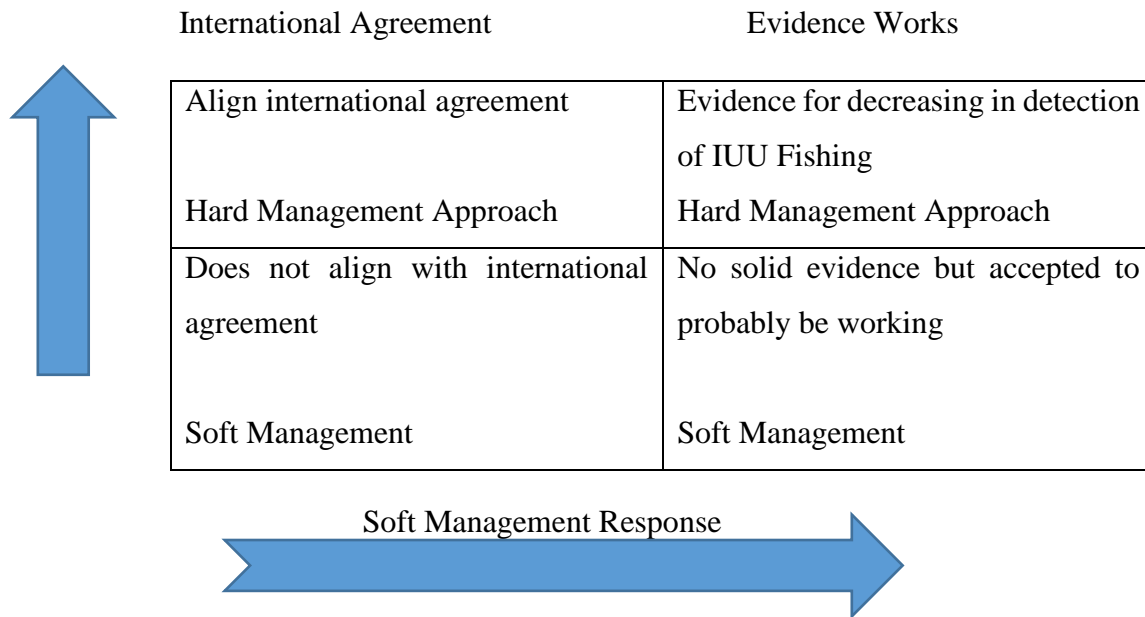
### **2.4 Best Practice**

There is no universally defined, or best agreed upon, goal standard method for defining IUU fishing. Different methods are being applied in different places, using standard guidelines set by global and international organizations such as the FAO, UNCLOS and UNSFA. In this light, for the purpose of this dissertation as defined by the author; best practice can be defined based on two criteria. The first criteria, are based on fisheries management measures that are consistent with international fisheries agreements and are supportable by scientific evidence. These measures are shown to have worked effectively and have measurable results in detection of IUU fishing activities for the same amount of surveillance or management approach efforts as Hard Management Response. The second



criteria are without scientific evidence or not in line with an international fisheries agreements and are considered Soft Management Response. These are visually described in Figure 1 below.

### 2.5 Criteria



*Figure 1 Criteria for Measuring Best Fisheries Practices*

## **CHAPTER THREE: OVERVIEW OF GLOBAL IUU FISHING APPROACHES**

### **3.1 Introduction**

Due to the global decline in fish stocks and degradation of critical ecological ecosystems as well as socio-economic problems caused by IUU fishing activities to economies, various relevant stakeholders such as regional fisheries management bodies, conservationists, fisheries managers, governmental and non-governmental organizations have seen the need to develop new strategies including more effective legal fisheries instruments to combat IUU fishing activities (Lodge et al., 2007).

Since 1995, the UN Fish Stocks Agreement has been the major international treaty that deals directly with fisheries (United Nations, 2010). It was later followed by an international Agreement on Port State Measures (PSMA) to prevent and eliminate IUU fishing as the first legally binding global response against IUU fishing (Schmidt, 2005). This global effort has motivated regional and sub-regional fisheries management organizations to develop laws, regulations and policies both on national and international levels as it relates to the sustainable management and conservation of fisheries.

The most recent international fisheries agreement is the Sustainable Development Goal 14 of the United Nations with particular emphasis on target 14.5 to eliminate IUU fishing by 2020 in commitment to the UN 2030 Agenda (United Nations, 2015). This seems to be a global challenge due to non-compliance, poor governance, lack of political will, weak enforcement and implementation schemes, and several other challenges.

This Chapter is a literature review which highlights global management response and approaches as well as best practices around the world.

### **3.2 Management Approach**

In developing new strategies to combat IUU fishing it is important to identify the main drivers which could be attributed to economic and social factors such as excessive fishing for maximum benefits by IUU fishers, the market value (price) of fish, the efficiency of the Monitoring Control and Surveillance (MCS) programs, level of deterrence against IUU (such as fines and sanctions), flag State obligations, local governance and management regimes, poor socio-economic conditions in developing countries and enforcement of international legal framework (Schmidt, 2005). Hence, cooperation at international and regional levels is the most effective tool to reduce IUU fishing activities to a minimum level. Other types of management approaches include regional cooperation, genetics and community based approaches.

### **3.3 Monitoring Control and Surveillance**

Monitoring Control and Surveillance (MCS) is a legal international fisheries instrument developed by the FAO in 1981 in response to Article 73 of the (LOSC) 1982 which gives sovereign rights to Coastal States over their Exclusive Economic Zone (200 nautical miles from shoreline beyond the territorial seas) to explore, exploit, manage and conserve its natural resources including fisheries (Everett, 2002). It was further defined by FAO in the fisheries context as, “Monitoring is the continuous requirement to measure fishing effort and resource yield, Control is the regulatory condition under which the exploitation of the resource may be conducted and Surveillance is the degree and types of observation required to maintain compliance with regulatory controls imposed on fishing activities” (Everett, 2002).

The Regional Fisheries Management Organizations (intergovernmental fisheries organizations with legal competence under international law to govern, manage and conserves fisheries resources including part of the high seas; (Asmundson, 2016) obligates member states to employ the MCS program as an effective international fisheries

instrument for the purpose of monitoring and controlling the activities of commercial fishing vessels, especially in the domain of the Exclusive Economic Zone of the Coastal State (Sodik, 2009). MCS is an integrated system which entails collaborative efforts from related institutions and organizations at the national level to fight against IUU fishing. Although it has been proven to be an effective fisheries tool, there are still pressing challenges of coordination in MCS operations (Geirsson, 2011). This integrated MCS program is categorized into several components which include Catch Documentation Scheme (log record), Vessel Monitoring System (VMS) and Automated Identification System (AIS) of which the latter two are software satellite programs installed on vessels. MCS also encompasses, fisheries patrols and the Observer and Inspector Programs, which include certified fisheries personnel or officers who record fishing effort or stock estimates and inspect activities of fishing fleets (Wold et al, 2000).

### **3.3.1 Catch Documentation Scheme**

Catch Documentation Scheme is a voluntary fisheries instrument developed by RFMOs as a component of MCS to combat IUU fishing (Clarke, 2010). The system tracks the fish from the point of capture throughout the entire supply chain or trade route and ensures that fish were caught in a manner that is consistent with applicable conservation and regulatory fisheries measures (Clarke, 2010). The scheme includes all legally caught fish (quantity, size, weight, species), excludes illegally caught fish and ensures the legitimacy of the vessel (Clarke, 2010). The CDS certifies the stock at the point of landing, thereby verifying its origin, and requires fishing or trading nations to ensure that copies of all validated documentations, such as the DSD or *Dissostichus* catch documents, under the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) CDS and the BCD or Bluefin catch document under the International Commission for the Conservation Atlantic Tuna (ICCAT) CDS, are issued or received from the fishing vessel, including copies of export or re-export documents (World Wildlife Fund-South Pacific, 2013). The CDS aims to prohibit the entry of illegally caught and uncertified fish into the

world market through the certification process, thereby, ensuring that the trade cycle of fish landed in accordance with the certification process. Violators will be dealt with nationally, sub-regionally and regionally in accordance with set fisheries rules and policies for IUU catches (Lodge et al., 2007). In many countries catch verification is conducted through a Dockside Monitoring Scheme that actively monitors catches at wharveside. In many developed countries the cost of dockside monitoring (weigh out) is borne by the fishers (Rodríguez et al., 2015).

The CCAMLR uses this scheme to trace Patagonian toothfish and exclude those IUU caught fish in major Patagonian toothfish markets within or out of the convention area such as the United States of America (U.S.A), Canada, Japan, Australia and EU (Agnew, 2000). Other regional fisheries management bodies such as Commission for the Conservation of Southern Bluefin Tuna (CCSBT) and the ICCAT have most recently, in 2010 and 2008 respectively, started implementing the scheme amongst all the other RFMOs worldwide; However, only these three RFMOs have adopted the CDS (WWF-South Pacific, 2013). In a number of developed countries there are also dockside monitoring schemes established to increase the reliability of the reported catch at the landing site (Rodríguez et al., 2015).

### **3.3.2 VMS**

Vessel Monitoring Systems are software satellite equipment with high resolution installed on commercial fishing vessels that continuously transmit the vessel's location regionally at specific time intervals between 30mins and 120min (Lee et al, 2010). The VMS is a standard requirement as a voluntary fisheries instrument for all fishing fleets, used to transmit information automatically for computer analysts at fisheries monitoring centers to interpret (Wold et al, 2000). The VMS is composed of three components: the tracking unit on board the vessel, transmission medium and the base station (Deng et al., 2005). The tracking unit has its own integrated Global Positioning System (GPS) programme

which sends positioning data through the transmission medium, a communication satellite to the base station, while VMS reports are automatically transmitted from a predetermined location at a specific time (Deng et al., 2005).

This makes the VMS data reliable and useful in determining a vessel's speed, and fishing location, tracking of fishing and non- fishing activities, removing duplicated VMS records, providing time and distance of vessel near or in the port, providing records of fishing trips (time vessel leaves to when it returns), calculating and estimating fishing effort, affirming the validity of the log book data and determining habitats with high fishing pressure (Watson & Haynie, 2016). The information on affirmation of logbooks is obtained by reading tracks of the vessel's speed provided by the VMS; Both the logbook data and VMS data could be linked by combining details such as vessel name and dates which are common to both data (VMS and Logbook), thus affirming the catches in the logbook with the VMS creating a means to determine depletion analysis (Deng et al., 2005).

In 2001, the European Commission (EU) adopted a regulation that requires VMS installation on all fishing vessels greater than 24 m in length, later extended to vessels over 15m, and finally, in 2012, it was reduced to vessels over 12m, as an enforcement and surveillance tool to monitor the spatial distribution of fishing effort (Lee et al, 2010). VMS is widely used as a mandatory fisheries regulatory and enforcement tool in nations such Australia, Canada, New Zealand and United States of America (FAO, 2006).

### **3.3.3 Fisheries Patrols**

Fisheries patrols include air, sea and land patrols (lakes, rivers and coastal areas) and are the primary MCS surveillance tools used to detect violations and illegal fishing activities. They could become cost effective with the integration of surveillance resources (Flewwelling et al, 2003). Patrols should be pre-planned and key participants briefed on the expected activity within the patrol areas, such as the incursion of offshore vessels in

areas with high fishing concentration and closed spawning areas. These areas may contain many un-licensed vessels mixed with licensed fishing vessels. The debriefing will identify potential illegal fishing activities before the operation, including the preparation and review of relevant documents for the patrol and any follow up action as required after the surveillance operation (Flewwelling, et al 2003). The military coast guard officers conducts sea patrol operations (Renton & McIvor, 2015) and the air patrols are coordinated by a military aircraft on a multitasked mission or by a civilian aircraft hired for specific maritime surveillance operations (Meltzer & Fuller, 2009) and could also include other fisheries enforcement officers on maritime surveillance. Through the fisheries patrols, photographic and observational evidence is obtained, which can later be used for prosecution of fisheries violations (Meltzer & Fuller, 2009).

For example, the Canadian government assigns aircraft in a joint inspection and surveillance operation which provides air surveillance for the NAFO zone and the Canadian EEZ (Meltzer & Fuller, 2009). The Canadian fisheries is one of the most monitored and regulated fisheries in the world because of the aerial and sea patrols component of its enforcement program, which is employed on both the Pacific and Atlantic coasts (Millar & Russell, 2012). It has been used to monitor the rebuilding of the codfish resource which collapsed in the early 1990s and has maximized the deterrence of illegal fishing activities (Millar & Russell, 2012).

### **3.3.4 Inspector Program**

The Fisheries Inspector Program comprises certified and trained fisheries officers with vested powers to participate in or conduct investigations, prepare reports of serious fisheries crimes or provide evidence in court and participate in special fisheries operations organized to detect crime, but with limited power to enforce fisheries laws and regulations on infringements or minor violations (Bergh & Davies, 2002). Such programs may entail forensic audits of catch and sale records that are compared to actual inspection reports,

particularly in high value fisheries such as tuna and other billfish (Secretariat of the Fisheries Transparency Initiative, 2016).

Regional fisheries management bodies (RFMOs), such as the Northwest Atlantic Fisheries Organization (NAFO), CCAMLR and ICCAT, mandate member States to ensure that fisheries inspectors inspect the fishing vessels of non-member States that harvest fish within any part of the convention area and those that enter the port of a member state. Prior to inspection, the vessel shall not land or transship its catch and, furthermore, a non-member State that harvest within the convention area must comply with all relevant fisheries laws and regulations (Wold et al., 2000).

The fisheries inspector is authorized to inspect all fishing vessels within its jurisdiction as it relates to the type of fishing gear, fish catches and log records to ensure that the vessel is in compliance with relevant fisheries regulations (Wold et al., 2000).

### **3.3.5 Observer Program**

The Observer Program is a major component of MSC, wherein trained fisheries personnel or fisheries observers with scientific knowledge are deployed on-board fishing vessels to collect accurate scientific data as well as to ensure compliance with relevant fisheries laws and policies during fishing activities for the purpose of conserving and managing fisheries (Wold et al., 2000). The information collected by the fisheries observer will support the determination of total allowable catch and bycatch fish stocks assessment and assessment of total fish population, with the purpose of sustainable management and conservation of fish stocks (Porter, 2010).

Since the establishment of the U. S National Observer Program (NOP), 1000 observers have been deployed and have spent 83,000 days at sea. They, additionally, render support to 6 other regional programs which that observe 47 fisheries around the world (National Oceanic Atmospheric Administration, 2013), and support national coordination for regional observer programs (Wold et al., 2000).



Presently, forty-two (42) fisheries have adopted regulations that mandate fisheries observers as a requirement on commercial fishing vessels (Porter, 2010). For example, the North Pacific fisheries regulation requires 100% observer coverage on commercial fishing vessels of 125 m and 30% observer coverage on 60m long vessels. During 2000 to 2002, these observers reported 590 violations which serves as a serious deterrent to fisheries violators (Porter, 2010).

### **3.3.6 MCS as Best Practice**

The region of the North Atlantic Ocean particularly Iceland has gained significant success in the fight against IUU fishing activities through an MCS integrated system (Geirsson, 2011). Iceland has improved its software technology for VMS such that it is mandatory for all licensed vessels fishing in its EEZ. The VMS programme is operated strictly by the Icelandic Coast Guard (ICG) for Search and Rescue (SAR) operations, fisheries control, border control, immigration, Icelandic civil defense, customs, communication and air transport as well as monitoring of vessels within or outside of Iceland national jurisdiction (Suhender, 2012).

The approach includes all available data such as vessel's identification, its movement, IUU list, notification, reports, fishing license, permit and port state control reports (Geirsson, 2011). Iceland has improved the biomass of fish stock, and minimized IUU fishing activities to the point that no IUU fishing activities were detected in Iceland waters or North Atlantic Ocean, including Norway and Greenland from 2010 to 2015 (Dignan et al., 2015). The measures undertaken by Iceland have included mandatory VMS regulations, and consist of sea and air patrols conducted by the Icelandic coast guard over its EEZ. The country has implemented other fisheries management and conservation measures such as Individual Transferable Quotas (ITQ) system, discard ban, area closure to protect spawning and juvenile fish species, and improvement in mesh size regulations (Dignan et al., 2015).

### **3.4 Enforcement**

The most effective fisheries management tools are compliance monitoring and enforcement; Nevertheless, the expected economic gain of an illegal activity and expected penalty are factors that influence the decision of an illegal fisher before committing a violation (King et al, 2009). Fisheries enforcement is a process that ensures maximum compliance with fisheries agreements or rules regarding fisheries (Arnason, 2013).

According to Bose, et al (2017), a successful enforcement program ensures the ability to detect a violation when it occurs, the ability to apprehend, and the ability to determine the category and degree of penalty that could serve as a deterrent. Furthermore, the effectiveness of an enforcement program depends on key elements such as rules, detection, arrest, seizure and confiscation given detection, prosecution given arrest, conviction given prosecution and penalty given conviction (Bose et al.,2017). There are several types of fisheries rules or regulations that govern fisheries national, international and regional levels.

#### **3.4.1 National Fisheries laws and policy enforcement**

National fisheries laws or policies are developed by the legislation of a country to ensure that fisheries resources are managed in a sustainable way and in compliance with relevant regional and international fisheries agreements (Skonhofs & Gobena, 2009). For example, the New Zealand Fisheries Act (1996) consists of two concepts, which are the utilization concept (the human right approach) and the sustainability concept (long term conservation for sustainable yield) (Skonhofs & Gobena, 2009).

#### **3.4.2 Regional Fisheries regulations or agreements**

Regional fisheries regulations are a legally binding set of rules and agreements adopted by intergovernmental organizations that are made up of several countries within a particular region (RFMOs). They include parts of the high seas such as Areas Beyond

National Jurisdiction (ABNJ), given the authority under international law for conservation and management fisheries measures (Asmundson, 2016). Examples of RFMOs, are CCAMLR, ICCAT, NAFO amongst others. There is a total of 38 regional fisheries bodies worldwide; Twenty of these are advisory bodies and 18 are RFMOs (Lodge et al., 2007). Most often, the regulatory measures target specific species regarding issues such as area based measures which is the restriction or banning of bottom fishing gear to protect vulnerable benthic habitats, adverse environmental impacts caused by destructive fishing practices, data collection used to assess, describe and identify the impact of fishing activities and status of the marine stocks, and total allowable catch monitoring as well as MCS programs (FAO,2009).

An independent panel made proposals to the High Seas Task Force on best practices for RFMOs as reported by Michael Lodge (Lodge et al., 2007), which are considered as standard global best practices employed in combating IUU activities in regional areas monitoring. The best practice is accomplished through effective regional cooperation and compliance of conservation and fisheries management measures which entails, sharing VMS information and IUU vessel list, coordinating port and trade measures and the harmonization of international fisheries instrument into national legislation (The Royal Institute of International Affairs, 2007). For example, the Northeast Atlantic Fisheries Commission (NEAFC), West Central Fisheries Commission (WCFC) and the earlier mentioned CCAMLR, ICCAT, and NAFO have established an IUU vessel list of fishing vessels caught illegally fishing in their convention areas to be published on their websites and shared among member states as a means of deterring IUU fishing (Lugten, 2014). In particular, Liberia needs to focus on the regional fisheries body ICCAT (see Figure 2 below), given the importance of the large pelagic tuna species to the potential fisheries economy of Liberia. Further information concerning other RFMOs is provided in Annex 1.

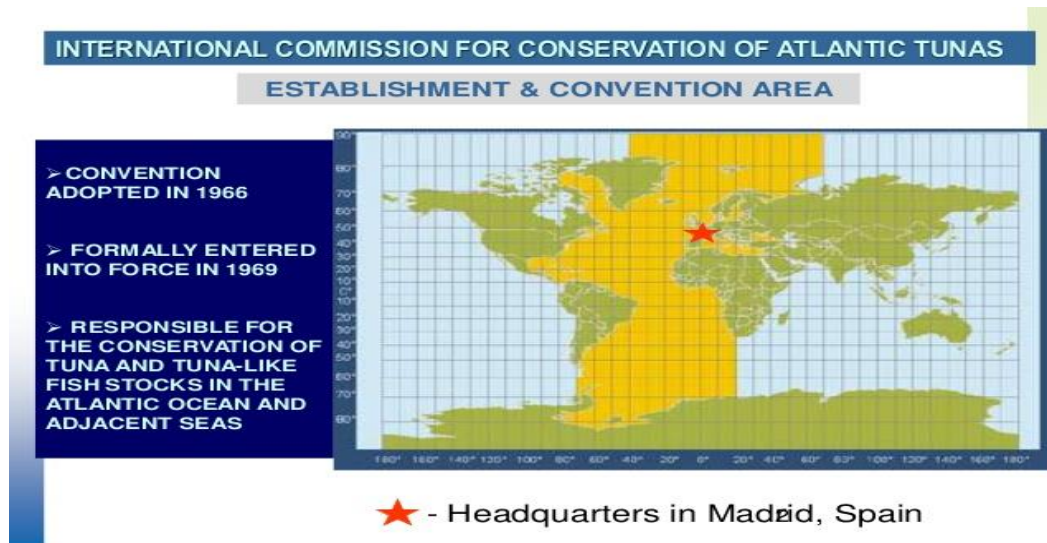


Figure 2 ICCAT Convention Area

Source: <https://www.google.se>

### 3.4.3 International Fisheries laws

International fisheries laws are sets of rules, principles and standards that legally binds States, both members and non-members and establish a framework to regulate and sustainably manage their fisheries resources in the oceans and high seas (Cochrane & Garcia, 2009). There have been several regional and international voluntary and non-voluntary fisheries agreements between member states for effective implementation and enforcement of relevant fisheries laws and regulations to combat and eliminate IUU fishing activities for sustainable management and conservation of fisheries since the early twenty-first century prior to the alarming rate of IUU fishing activities.

UNCLOS 1982; provides coastal states rights to manage and utilize the fisheries resources in the national jurisdiction of their (EEZs). The 1993 FAO Compliance Agreement of the United Nations also plays an important role in the fight against IUU fishing activities; Its main focus is on high sea fishing as it relates to reflagging of vessels by nationals in order to avoid compliance with management and conservation rules for high sea fishing. Hence,

the Agreement assigns FAO, instead of the RFMOs, the role of international coordination as a means to prevent, deter and eliminate illegal fishing (Swan, 2005).

In 2001, the FAO of the United Nations developed a voluntary fisheries instrument, referred to as the International Plan of Action to prevent, deter and eliminate Illegal Unregulated, Unreported Fishing Activities (IPOA-IUU) in the framework of the Code of Conduct for Responsible Fisheries as a regulatory tool to be used by all member states in the fight against IUU. For example, the IPOA-IUU calls upon States and RFMOs to promote the use and implementation of MCS components and cooperate through MCS by sharing of information on IUU activities including Port State control measures (Swan, 2005).

#### **3.4.4 Enforcement as a best practice**

The United States has an effective and rigid enforcement program which has gained maximum compliance since it strengthened its enforcement measures by recruiting more competent field officers and increased the penalty charges against fisheries violators in 2001 (King et al, 2009). Within the first five years, there was a serious reduction in fisheries violations. For instance, from 2001 to 2006, violations declined from 20-30% to 10-20% (King et al., 2009).

#### **3.5 Deterrence Effect**

Non-compliance behavior such as misreporting or underreporting catch, exceeding the catch limits and other illegal activities are common amongst fishers; Therefore, to ensure maximum compliance, there is a need to impose more rigid measures (Nielsen & Mathiesen, 2003). Some effective compliance measures are fines (monetary value), confiscations and sanctions or bans of fishing vessels, equipment and products.

### **3.5.1 Fines**

Fisheries laws and regulations are not self-enforced but most often correspond to an enforcement cost (Nostbakken,2008). Fines are a form of monetary penalty imposed on violators to deter illegal fishing activities (Cacaud et al, 2003). This has proven to be an effective deterrent measure. For example, the third key component of the European Union (EU) fisheries regulation; mandates all member states to penalize any EU individual or EU related entity caught in illegal fishing activities; The penalty requires member states to impose five (5) times the monetary value of the fishery product, and if caught again within the next five years, the member State shall levy a fine which should be eight times the value of the fishery product (Schmid et al, 2016).

Most recently, in 2015, the EU levied a record breaking fine of € 18 million against four Spanish vessels caught fishing Patagonian toothfish in Antarctic waters. It served as deterrence to other illegal fishing vessels and, the Spanish national fisheries amended the fisheries law just to incorporate the EU regulation (Schmid et al, 2016).

### **3.5.2 Confiscation**

Confiscation of vessels, fishing gear and catch is a form of penalty against fisheries violations which is State practice that basically requires court proceedings to become effectives; Notwithstanding, an FAO survey of States fisheries legislation denotes that Australia, Canada and New Zealand are the only States that practice the automatic forfeiture regime wherein the fishing vessel, fishing gear, catch and all other fisheries equipment are seized upon arrest; This approach is used as a means to deter the influx of illegal IUU fishing vessels within their national jurisdictions (Baird, 2008). For example, from 2004 to 2006, the Australian government apprehended 607 vessels in its EEZ, fishing for target species Patagonian toothfish. The number decreased considerably in 2007, after the enforcement of the forfeiture regime in Australia (Baird, 2008).

### **3.5.3 Sanctions**

Fisheries sanctions could be warnings, suspension or revocation of a fishing license, the loss of fishing quota, seizure of gear, equipment, vessel or catches, temporary ineligibility of authorization, monetary penalty, banning or prohibiting of fishing activities in a certain area, that could be applied against vessels that infringe fisheries regulations by an authorized fisheries management authority or body (Cacaud et al., 2003).

According to Tyler (2006), sanctions are the best mechanism to enforce compliance especially in multilateral agreements that help to promote flag state compliance, which is a major problem faced by RFMOs. Tyler (2006), argued that RFMOs should enforce trade sanctions by delegating power to the flag State (third- party State) and compelling them to exert maximum control over their flagged vessels and ensure their flagged vessels fully comply with and do not contravene RFMOs regulations. For example, the most significant achievement of the World Trade Organization (WTO) for fisheries was the settlement on the Shrimp-Turtle dispute between the United States and other nations (India, Thailand, Malaysia and Pakistan) regarding a ban on shrimp fishers for fishing sea turtles as bycatch and a trade ban or sanction on nations (shrimp importers and exporters) that did not adopt programs with conservative and regulatory measures for shrimp fishing. Such measures could lead to a minimal reduction in the number of sea turtles harvested as bycatch (Tyler, 2006). Through this ban other nations including the WTO adopted laws that encourages nations to employ such best practices in order to trade with other nations that have similar programs (Tyler, 2006).

### **3.6 Genetics**

Traceability of seafood or fisheries product through genetics (DNA-based marker to identify an organism from its origin or species history) in a supply chain is critical in enforcing fisheries regulations, food safety of fisheries product and combatting

unregulated fishery trade or fraud through mislabeling of product species and origin (Leal et al, 2015).

Most often species are shipped and marketed in nations or continents far away from their origin; Therefore, there is increasing need for global fish identification tools to be used to assess the fish stocks market (32,500 species of finfish worldwide) in order to provide necessary information to fishery inspectors, custom officers and consumers on a local and regional scale (Fischer, 2013).

As the fish identification tool plays a major role in the fight against IUU activities and due to the misidentification of catch statistics, the FAO has developed a Fishfinder programme with more than 200 species identification guides as well as taxonomy descriptors for more than 8,000 species and an archive with more than 40,000 scientific illustrations to help in the identification of species worldwide (Fischer, 2013).

Many nations are adopting the fish identification scheme as a best practice for sustainable management of fisheries. Most recently, the EU fisheries has been playing a leading role in the application of genetic markers to achieve scientific results in identifying fish species such as hake, herring and sole (Fischer, 2013).

### **3.7 Community-Based Approach**

The community-based fisheries co-management approach or cooperation is a system whereby responsibility or authority for fisheries management is shared between the government agencies, local fishers, non-governmental organizations and stakeholders for sustainable fisheries management (Needham et al., 2013). This fisheries cooperative management is a consensus driven approach wherein the government and the community dwellers aim to achieve common interests (Bulayi, 2001).

This fisheries community-based and co-management approach (FAO Regional Fisheries Livelihood Program) has contributed immensely to improving fisheries capacity in six South and Southeast Asian developing States, including Vietnam, Sri Lanka and Timor



Leste (Needham et al., 2013). The first major approach was by enhancing the relationship between the government and the local communities, wherein the locals were encouraged to participate in a fishery data collection survey which afforded them the opportunity to gain the trust of the local fishers. Secondly, the government improved upon pre-existing traditional laws practiced by the locals and also provided them with fishing gear and relevant fisheries training (Needham et al., 2013).

Through this approach, the governments gained community-based IUU fishing reports (a pilot community based IUU reporting initiative wherein local fishers are trained and provided with relevant equipment such as GPS), enforced compliance in artisanal fisheries (local fishers conducting mobile licensing and registering of vessels), monitored catch (community fishers officers that weigh and identify the fish at each landing sites) as well as disseminated information through trained local fishers to create awareness of fisheries regulations and upcoming mobile licensing (Needham et al., 2013).

The community based approach is a more efficient means of managing fisheries because the locals or the indigenous population have a more practical understanding of particular fish stocks within their community and are directly affected by adverse impacts to the environment. According to Bulayi (2001), the cooperative fisheries-based management approach is more cost effective because the fishing communities also assist in implementation of surveillance, management and enforcement.

### **3.8 Governance**

Governance is the interaction between public and private sectors to solve societal problems and create opportunities by establishing guidelines and principles to guide those interactions (Kooiman et al., 2005). Good Fisheries Governance entails a system that promotes, recognizes and enhances national economies and food security, wherein fishers, fish workers and other stakeholders are empowered to participate in decision making; prohibits marginalization but increases capability and human capacity; and; prevents food

insecurity and poverty. It is also a system where social, economic, and ecological systems are managed in a sustainable and integrated way so as to reduce conflicts (Charles, 2010).

According to Kooiman et al (2005), fisheries governance is dependent on two main features; The first indicates the time trend towards greater diversity, complexity and dynamics and the second is the scale which is defined by the time and space dimension of various governing systems and those systems that are to be governed. Kooiman et al (2005); further state that globalization, which includes trade, production and regulations, has attributed to fisheries complexity worldwide through chains of interaction. Furthermore, complexity is characterized by ecosystems, wide-ranging social, cultural, political environments and regulatory regime.

South Asia and Southern Africa are classic examples in the implementation of good governance through a co-management approach. This approach is utilized to resolve issues arising from globalization and increasing population, which have imposed pressure on fisheries, leading to overexploitation of resources as well as conflicts regarding access to resources, space and markets within their coastal environment (Nielsen et al., 2004).

Globalization involves integration of local market into global market, which often results in exclusion by denying community dwellers adequate control or access over their natural resources because other users enjoy more control. Secondly, international agreements and conventions, which are another aspect of globalization, focuses more on the long term interest of fishing communities than giving attention to the immediate needs of food and income for local fishermen. Both globalization and competing users, such as industrial and infrastructure development, have threatened many fisheries communities in South Asia and Southern Africa (Nielsen et al., 2004).

However, the co-management approach as practiced by many South Asian and Southern African nations has proven to be effective through empowering the local fishing communities to participate and become actively involved in decision making by providing them with opportunities to influence their own future in order to cope with impacts from

globalization, competing freshwater and coastal environment users and other related fisheries matters (Nielsen et al., 2004).

The co-management approach involves the participation of all parties dealing with complex issues and enhances government capacity to manage resilience; open communication and deliberation in co-management builds trust and understanding among diverse stakeholders needed to organize resources or people; Furthermore, the flexibility of polycentric and multilayered systems of governance in co-management regarding the utilization, monitoring and control of natural resources creates opportunities for learning and decision making in a socio-ecological context that allows societies to respond in an adaptive manner at appropriate levels. Finally, an accountable authority that focuses on equal distribution of benefits and social justice improves the capacity of vulnerable groups and the society (Lebel et al., 2006).

### **3.9 Regional Cooperation**

The United Nations Convention on the Law of the Sea (UNCLOS) requires all States to engage in active cooperation at global, regional and sub- regional levels for conservation and management of fish stocks. Other relevant fisheries instruments include the UN Conference on Straddling and Highly Migratory Fish Stocks, which has adopted an agreement that elaborates on the provisions of UNCLOS, providing that straddling and highly migratory fish stocks that travel through the high seas under national jurisdiction shall be managed sustainably through regional and sub-regional organizations (Meltzer, 2009).

The Food and Agriculture Organization of the United Nations has also developed several fisheries instruments that require international cooperation among regions and nations with regard to high seas and international waters to ensure responsible fisheries. The concept includes the FAO Code of Conduct for responsible fisheries and IPOA -1UU (Cochrane & Garcia, 2009).

Regional cooperation can be established through bilateral or multilateral agreements between nations with shared interests or common fish stocks for sustainable management and conservation measures (Lodge et al., 2007). The Regional Fisheries Management Bodies are the primary mechanism and play a key role in achieving cooperation between and among fishing nations for effective management and conservation of fisheries (Lodge et al., 2007). For instance, most recently, in an effort to support the implementation of United Nations Sustainable Goal 14, the EU made a voluntary commitment at the UN Ocean Conference, June 5-9, 2017, to improve regional governance in West Africa by donating 15 million Euro with an aim to develop regional policy, establish regional coordination against IUU and improve fish stock management at a regional level (United Nations, 2017).

Effective and efficient regional cooperation entails harmonizing, consolidating and sharing of vessel register and information from vessel monitoring systems and also gathering information and assessment of scientific data on a global scale (Lodge et al., 2007).

Regional cooperation is important in achieving long term fisheries sustainability due to the migratory nature of fish stocks (Quetin et al, 2010) and the transboundary and common shared stocks (Caminas et al, 2008). The Stock Agreement, through regional cooperation, will assist in addressing problems identified in Agenda 21 of the United Nations Conference on Environment and Development (UNCED). Problems include “unregulated fishing, over-capitalization, excessive fleet size, combating issues of overfishing, reflagging of vessels to escape controls, insufficiently selective gear and unreliable database” (United Nations, 2010).

According to Caminas et al (2008), the two key levels of cooperation among states sharing fishery resources are: cooperation in scientific research to provide a broader understanding on linkage between the varying biophysical conditions, stocks dynamics and distributions of specific species and cooperation in active coordination of management programs.

Caminas et al (2008) emphasized that; fisheries management resources among or between nations with shared targeted species should be managed on an ecosystem basis instead of a single fish stock basis.

The FAO project on scientific research on fisheries in the Mediterranean was used to strengthen the collaboration between 60 marine fisheries nations in the Western and Central Mediterranean. It also broadened their scientific knowledge on spatial distribution and the state of shared marine stocks, created standardized methods for gathering bio-economic data and monitoring programs for small pelagic and demersal fisheries, encouraged the exchange of fisheries related information and widened regional cooperation for sustainable management of Mediterranean fisheries (Caminas et al, 2008).

The CCAMLR has also gained major progress through the implementation of an ecosystem based approach, catch documentation scheme, monitoring programs and other relevant programs by member states through effective regional cooperation which has reduced the amount of illegally fished Patagonian toothfish (Fabra & Gascon, 2008).

In conclusion, Liberia can gain considerable knowledge and experience from the lessons learned globally in addressing IUU offshore fishing in its EEZ as highlighted in this chapter.

Below is a chart that analyses the global approaches of best fisheries practices as defined in Chapter 2, using two main criteria. The first criteria are Hard Measure, based on approaches that were consistent with international law and supported by scientific evidence, while the second are Soft Measures, approaches that are either not consistent with international agreement or unsupported by scientific evidence but have worked as effective fisheries management responses.

**Table 1:** shows the analysis of best fisheries practices using Hard Management Approaches and Soft Management Approaches in their respective locations as defined by the author.

**Table 1 Analysis for Best Global Practices**

	Evidence		International Agreement		Where
	Hard	Soft	Hard	Soft	
<b>Practices</b>					
Catch Documentation	✓		✓		3 RFMOs such as CCAMLR, CCSBT and ICCAT
VMS	✓		✓		Common Practice
Inspector Program	✓		✓		Common Practice
Observer Program	✓		✓		Common Practice
Fisheries Patrol	✓		✓		Common Practice
Detection Effect	✓		✓		Common Practices Canada, Australia, New Zealand
<ul style="list-style-type: none"> <li>• Fines</li> <li>• Confiscation</li> <li>• Sanction</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>✓</li> <li>✓</li> </ul>		<ul style="list-style-type: none"> <li>✓</li> <li></li> <li>✓</li> </ul>	<ul style="list-style-type: none"> <li></li> <li>✓</li> <li></li> </ul>	
Enforcement	✓		✓		Common Practices
<ul style="list-style-type: none"> <li>• MCS</li> <li>• Legal Fisheries Instrument</li> </ul>	<ul style="list-style-type: none"> <li>✓</li> <li>✓</li> </ul>		<ul style="list-style-type: none"> <li>✓</li> <li>✓</li> </ul>		

<ul style="list-style-type: none"> <li>Enforcement Officers</li> </ul>					
Genetics	✓		✓		Developed Countries
Community Based Approach	✓		✓		Some developing countries and developed countries
Governance <ul style="list-style-type: none"> <li>Co-management approach</li> <li>Ecosystem based Management.</li> <li>Fisheries Management based only on National, Regional and International rules and agreement without</li> </ul>	✓			✓	Dominant in South Asian and Southern African Countries and may include few developing and developed countries especially in small scale fisheries  Developed Countries

participation of local fishers but may or may not involve stakeholders					Common Practice
Regional Cooperation	✓		✓		Mostly seen among RFMOs



## **CHAPTER FOUR: OVERVIEW OF LIBERIAN IUU FISHING SITUATION AND CURRENT PRACTICES**

### **4.1 Introduction**

Liberia, a West African developing coastal State has a coastline of 565 km<sup>2</sup> with a territorial zone of 12 nautical miles and an exclusive economic zone of 200 nautical miles (USAID, 2008). The country is endowed with abundant fisheries resources that account for 10% of national GDP and provide 15% of animal dietary proteins (USAID, 2016).

The fisheries sector provides food security, coastal livelihood and job opportunities for 37,000 persons and small-scale fisheries jobs for 33,000 persons, of which 60% are women (USAID, 2013). Liberia's fisheries generate an annual fish production of 7,616 metric tons of fish and 126 metric tons of marine invertebrates, including mollusks and crustaceans wherein marine fisheries account for 85% and inland fisheries 15% of the total annual catch production, while aquaculture annual capture production is 22 metric tons (Nyenka, 2009).

However, Liberia is faced with enormous challenges of IUU fishing, which has led to economic and social crises. For example, IUU fishing contributes to an economic loss of \$ USD75 million annually (displacing thousands of local fishers out of a way of life that has existed for years), as well as food insecurity. As a result, 49% of the country's population is faced with food insecurity because of an inadequate food consumption pattern, consisting of a large intake of cereal and low amount of protein (USAID, 2013), which affects the food provision sector.

This Chapter discusses current IUU fishing in the Exclusive Economic Zone, Liberia's government management approach and the challenges faced by the government in implementation of its management approach.

## **4.2 Overview of the Fisheries Sector**

The coastline of Liberia is approximately 350 miles in length with 200 nautical miles extending offshore and a Continental Shelf with a width of 34m that extends from the Ivory Coast to Robertsport of Liberia. It also has an Inshore Exclusion Economic Zone (IEZ) of 6 nautical miles, introduced in 2010 by the Fisheries regulation, which extends from the shoreline. The IEZ is extensively used for subsistence, artisanal and semi-industrial activities but strictly prohibits industrial or commercial fishing activities (sheriff 2014).

The EEZ of Liberia was established in 2008; however industrial fishing in Liberia began in 1955 (Belhabib et al., 2013). During that period, catches were underestimated and there were unmonitored fishing and transshipment activities at sea as described in New Partnership for Africa's Development (NEPAD, 2006). As a result, 38% of the industrial vessels were under reporting catches, and from 1950 to 2010, illegal foreign catch accounted for an estimated 1.3 million tonnes, which is equivalent to more than 60% of illegal capture fisheries and also includes an estimated 249,000 tonnes of illegal bycatch discards (Belhabib et al., 2013).

See Figure 3 below for an overview of Liberia's territorial maritime boundaries and zones.

# Liberia Maritime zones

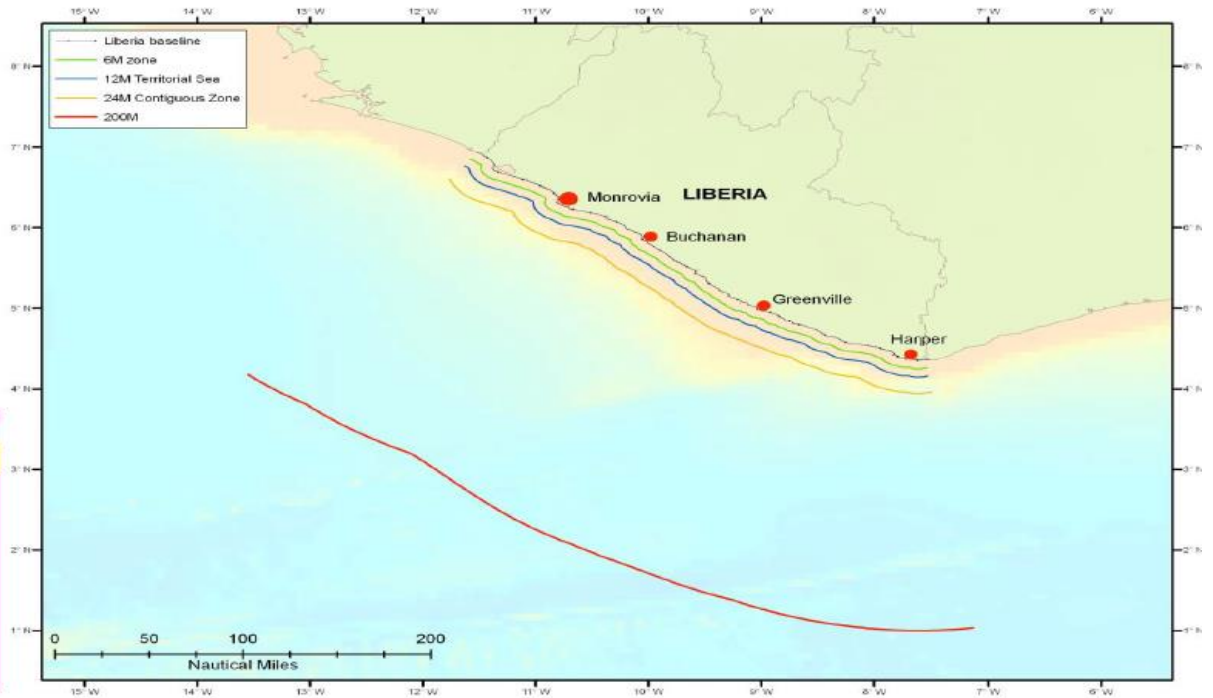


Figure 3 Map Showing IEZ,CZ,TW and EEZ of Liberia's Maritime Domain Source (Braimah, 2012)

Liberia's industrial fisheries sector accounted for 41% of the total landings of capture fisheries between 1997 to 2007, increasing to 70% in 2008 (Subah,2010) and was dominated mainly by foreign commercial fishing trawlers (Glasgow, 2008). The main fisheries species exploited are Barracuda, Croakers, Sharks, Sardinella and *Ilisha Africana*, which is an export market of Europe, Asia and North America and an import market from Spain, Morocco and Mauritania (Glasgow, 2008). There are other highly migratory offshore pelagic species such as yellowfin tuna, bigeye and skipjack including common demersal species such as are Lutjanidae, Sparidae and *Dentex* Spp. as well as crustaceans including shrimps, lobster and mollusk seen along the continental shelf of Liberia (Hahn et al., 2014). The continental shelf area produced a Maximum Sustainable

Yield of approximately 180,000 metric tonnes per year with a biomass estimate of 27,000 and 152,00 metric tonnes of demersal and pelagic species respectively (Subah, 2010). The current fishing (in yellow) areas and potential fisheries (in red) areas are highlighted in Figure 4

However, Liberian civil war (of 14 yrs. duration) from the early 1990s and weak governance resulted in illegal fishing activities that have been prevalent in the EEZ of Liberia's territorial waters. This can be attributed to the dominance of distant waters operating fleets, lack of domestic fishing vessels and illegal transshipment in the EEZ amongst others (Belhabib et al., 2013).

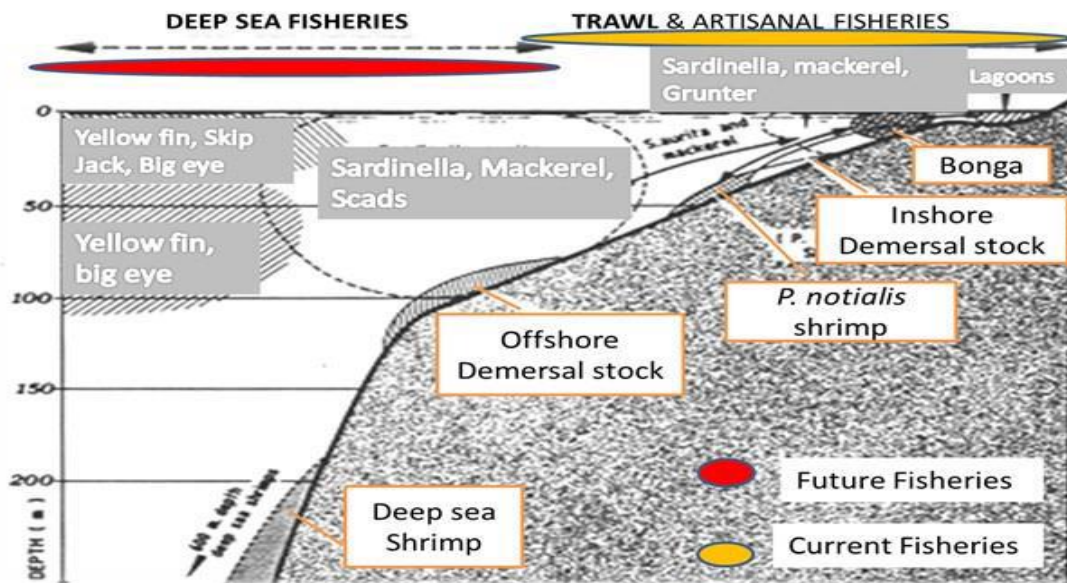


Figure 4 Location of current and future on Liberia's continental shelf . Source (Subah, 2010)

### 4.3 Dominance of Distant Water Operation Fleets

Since 1955, industrial fishing activities in the EEZ of Liberia have been dominated by foreign companies; Western European countries dominated the fishery from 1955 to 2010 and Asian countries such as Korea (26%) and China (26 %) dominated from 2010

onwards, with relatively few Liberian Flagged Vessels or domestic fishing vessels operating in the EEZ (Belhabib et al., 2013). The main foreign vessels engaged in illegal fishing activities in Liberia's EEZ are trawlers from China, Korea, Spain, Portugal and Greece along with a few large motorized canoes from Senegal and Ivory Coast (McConnell, 2008). They target deep fishery pelagic tuna species, and shrimp as well as offshore demersal species (Subah, 2010).

According to Braimah (2012), between 200 and 300 illegal fishing vessels are suspected to be operating within the EEZ with 85% associated with serious infringement; An estimated 150 to 200 illegal vessels, equivalent to 53%, were targeting tuna fisheries, which led to an economic loss of approximately \$ USD 12 million annually from tuna fisheries. Only 50 of the vessels were licensed trawlers. The majority of the illegal fishing vessels use illegal fishing gears below the required or standard size operating within the 3 nautical mile limit reserved for subsistence and artisanal fisheries (USAID, 2008). Example include gear nets with mesh sizes below the required size of 25 mm for shrimp and 70mm for fish (USAID, 2008). Illegal fishing in Liberia accounts for 59.4%, unreported fishing for 38% and unregulated reported for 2.8% of the total catch (Braimah, 2012). A further breakdown of illegal and unreported fishing in Liberia are highlighted in Figure 5 (Braimah, 2012).

	encountered	
<b>ILLEGAL FISHING (58.9%)</b>		
<b>1. Use of illegal fishing gear</b>		
<b>a. <u>Banned fishing gear/methods</u></b>		
i. Pair trawling	4	5.6
ii. Fishing gear with mesh sizes not compliant with Fisheries Regulations	1	1.4
i.i.i. Use of dynamites, chemicals, poisons (artisanal and semi-industrial boats)	5	7.0
<b>b. <u>Fishing gear and methods not authorized by a valid license issued</u></b>	1	1.4
<b>2. Unlicensed fishing vessels</b>	<b>15</b>	<b>21.1</b>
<b>3. Fishing out of season (moratorium period)</b>	<b>5</b>	<b>7.0</b>
<b>4. Harvesting prohibited species</b>	<b>5</b>	<b>7.0</b>
<b>5. Fishing in restricted areas</b>	<b>6</b>	<b>8.4</b>
Type of IUU	No. of vessels encountered	% occurrence
<b>UNREPORTED FISHING (37.9%)</b>		
<b>1. Non reporting</b>		
a. Fishing without observer	15	21.1
b. Fishing with MTU switched off	3	4.2
<b>2. Misreporting in contravention of laid down procedures</b>	<b>1</b>	<b>1.4</b>
<b>3. Unauthorized transshipment</b>	<b>4</b>	<b>5.6</b>
<b>4. Discarding of fish (non target, juveniles)</b>	<b>4</b>	<b>5.6</b>
<b>UNREGULATED FISHING (2.8%)</b>		
<b>1. Fish importation without accompanying documentation from source</b>	<b>2</b>	<b>2.8</b>
<b>Total IUU fishing vessels encountered</b>	<b>71</b>	

Figure 5 Documentation of IUU fishing Activities in Liberia Source: (Braimah 2012)

Prior to the ban of pair trawling in December 2007, (Glasgow, 2008), earlier in that year (8) Chinese paired trawlers were actively engaged in industrial fishing activities, operating

30-40 licensed fishing vessels which harvest twice the regular amount of Total Allowable Catch (USAID, 2008) and accounted for an estimated 80% of discards of low value fish species (Belhabib et al., 2013). For example, firstly, during a fishing operation by Chinese pair trawlers (F/V Hong Li 22 & 23), the inspector on board reported that three out of every 10 fish pans sorted for on-board freezing was discarded or thrown overboard; Due to the unselective nature of the fishing gear a large number of juvenile fish were caught in the gear. Secondly, these trawlers were consistently in conflict with the artisanal fishers by competing for user space in the IEZ and destroying their nets (Glasgow,2008). Also, according to WARFP/BNF – LIBERIA (2012), in 2012, forty foreign fishing vessels were fined for committing minor infringements or major infractions; for example, unlicensed fishing (21.1%), fishing without observers (21.1%) and minor infringements by licensed vessels fishing within the IEZ (8%) (Braitham, 2012).

However, with the introduction of the MCS program which was established by the West Africa Regional Fisheries Program- World Bank sponsored project of the Ministry of Agriculture, Bureau of National Fisheries in 2009, Liberia has been able to curtail illegal fishing by a considerable level (Braitham, 2012).

In Figure 6 below, Liberia reduced level of IUU fishing activities is evident in compare to many other African countries affected by IUU fishing as reported by MRAG.

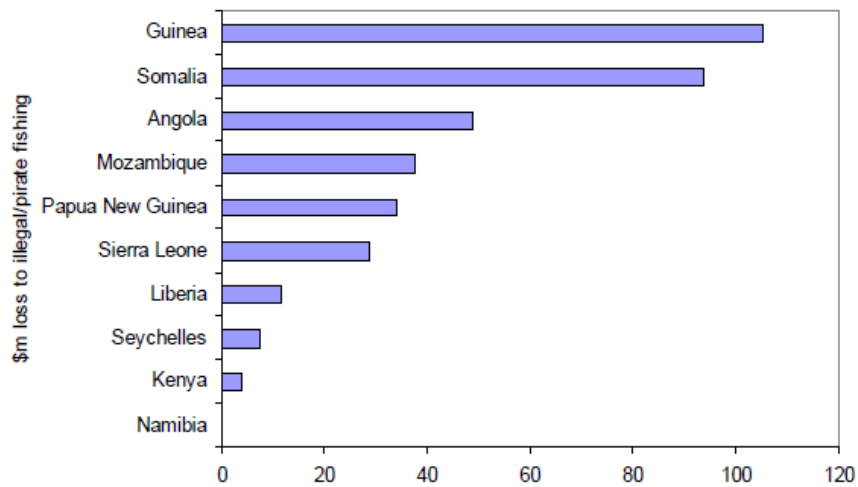


Figure 6 IUU fishing in the EEZ of few African Countries *Source: (MRAG,2005)*

#### 4.4 Illegal Transshipment

“Transshipment means the transfer over the side of any quantity of fisheries products, thereof retained on board, from one fishing vessel to another vessel, which includes transporting fish product, participating in joint operations such as resupply or refueling of vessels engaged in fishing activities” (Liberia Maritime Authority, 2015). Most often refrigerated cargo vessels particularly specialized in frozen fishery products, transship from one fishing vessel to another on the high seas. Transshipment can occur on the high seas or in port between vessels, or in controlled harbors anchored close to shore under favorable atmospheric conditions monitored or supervised by a fisheries inspector (INTERPOL, 2014).

Unauthorized or illegal transshipments are banned on the high seas or in the EEZ of Liberia with the exception of a legal permit which is subject to control by a fisheries observer or inspector (Brimah, 2012). Illegal transshipment undermines sustainable management of fishery resources, and deprives the government of revenue; Catches are misreported or underreported and it also reduces the value of the catches (MRAG, 2005).



One example is transshipments interaction between the industrial sector and the artisanal sector, wherein canoes or small fishing vessels sell captured fish to industrial vessels or refrigerator vessels (Reefers) in the EEZ or the high seas prior to inspection (INTERPOL, 2014).

According to USAID (2008), several licensed industrial Liberian fishing vessels are engaged in illegal transshipment on the high seas and EEZ and are repackaging their catches in Liberia's territorial waters and pronouncing it as imports. Subah (2010); stated that a majority of the industrial shrimp and tuna catches from Liberia's waters are exported and transshipped on the high seas or EEZ by both licensed and unlicensed vessels. In 2012, the MV INESA a commercial fishing vessel was an example of a vessel that was suspected of illegal transshipment activities in Liberian territorial waters (INTERPOL, 2014).

Most recently, in February 2017, another trawler, Hispasen 7 with a former name of Piex Cameroun, flying a Senegalese flag, was caught by the Liberian Coast Guard for illegal transshipment and fishing activities in the territorial waters (Azango, 2017).

#### **4.5 Lack of Fishing Vessel**

Fishing activities in Liberia's territorial waters have drastically declined since the introduction of the six nautical mile IEZ under the 2010 Fisheries Regulation. In 2011, there were only four licensed fishing vessels; other fishing companies with licensed vessels departed because they could not cope with the IEZ regime and considered it as being inflexible (Sheriff, 2014). Two out of the four vessels were Liberian owned domestic industrial trawlers named Global 8 and Global 7, both of which are now unseaworthy; and therefore, prohibited from fishing activities since late 2013 (Sheriff, 2014).

According to Sheriff (2014), in 2012, there were absolutely no licensed fishing vessels operating in the territorial waters, which has left the EEZ prone to illegal activities as

evidenced in Figure 7 below. The presence of more registered fishing vessels engaged in legal fishing activities serves as a deterrent for those engaged in illegal fishing activities. For example, due to lack of domestic fishing vessels, illegal fishing vessels enter the zone towards night time and conduct illegal fishing activities and leave during early morning hours (Sheriff, 2014).

Another major issue concerning the lack of fishing vessels is that; little or no revenue is generated from fishery resources. This affects the economy because fisheries accounts for 10% of GDP and, secondly, the unemployment rate for fishermen increases (USAID, 2016).

However, the Inshore Exclusive Zone as established by the Fisheries Regulation of 2010, was reduced from 6 nautical miles to 3 nautical miles by Executive Order number 84, in April 2017, to ensure that industrial and semi-industrial fishing regain viability (Executive Order, 2017).

Year	Fishery	Number of Licensed Foreign Vessels	Number of Licensed Domestic Vessels
2011	Demersal	4	2
	Pelagic (Tuna)	NA	NA
	Reefers	NA	NA
	Other	1	NA
2012	Demersal	0	2
	Pelagic (Tuna)	0	0
	Reefers	NA	NA
	Other	NA	NA

Figure 7 Number of Registered Vessel in Liberia *Source: (Sheriff, 2014).*

#### 4.6 Liberia’s Government Response

The Liberian government, in an effort to combat IUU fishing activities and sustainably manage the country’s fisheries resources has taken a major initiative. The first response was a sixty-day Marine Control and Surveillance project conducted by the Ministry of Agriculture and the Bureau of National Fisheries in February 2008, with an objective to combat illegal fishing, which led to the arrest of several pirate ships (USAID, 2008).

During that same period, Liberia engaged in joining the International Maritime Organization's security division illegal fishing program, which aimed at 25 countries in West and Central Africa and links local coast guards with Interpol, FAO of the United Nations, the United Nations High Commissioner for Refugees (UNHCR), insurers and many other partners (USAID, 2008).

Secondly, the intervention of West Africa Regional Fisheries Program (WARFP)- World Bank sponsored project in late 2009, coordinated by the Sub-Regional Fisheries Commission and established in eight other African countries (Ghana, Mauritania, Cape Verde, Sierra Leone, Guinea, Guinea-Bissau, Gambia, Senegal) has led to several major achievements in the fisheries sector of Liberia (Viridin, 2012). See Figure 8 for a geographical overview of the countries involved.

According to Viridin (2012), the project aims to increase the net economic benefits from fisheries, strengthen the governance of the fisheries sector, reduce illegal fishing and increase the local value added from fisheries.

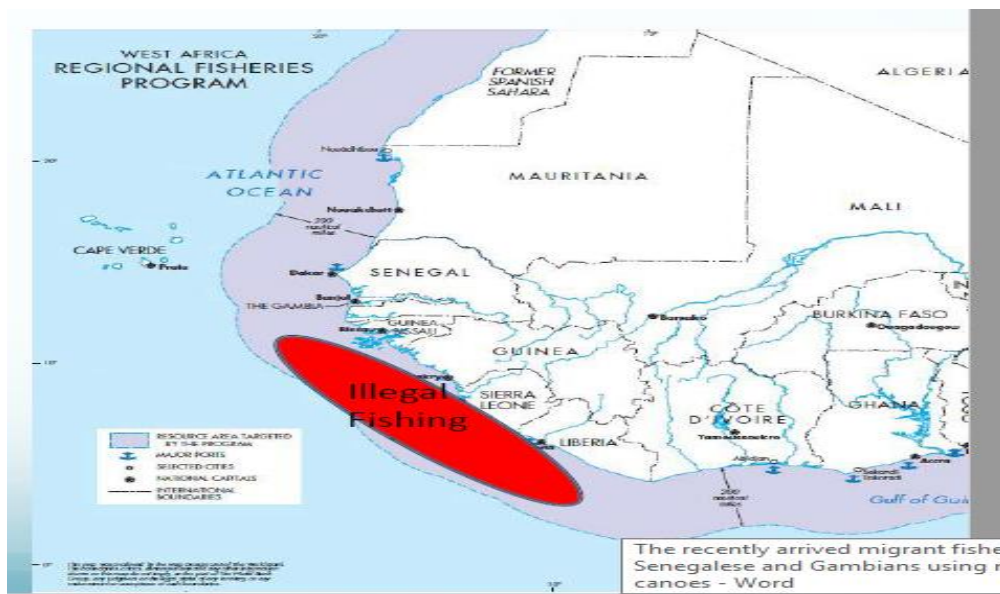


Figure 8 West Africa Regional Fisheries Programs in Developing African Countries Source: (Viridin,2012)

Since the inception of the WARFP project, Liberia's fisheries sector has experienced significant progress. The rate of illegal fishing activities has been reduced within the first two years from 83% to 45% as reported earlier (BNF, 2013); The fisheries department has generated more than \$ USD 6 million from fines from six trawlers arrested between 2011 and 2012, adopted the New Fisheries Regulation in 2010, and established the IEZ for subsistence and artisanal fishing activities; In addition 100% observer coverage has been established on registered fishing vessels, and fisheries inspectors have been trained (McMillan,2015). For example, the number of trawlers has decreased drastically, from 40 trawlers and pair trawlers fishing up to the beach, down to two trawlers with a considerable increase in fish catch (INTERPOL, 2014). Other major achievements include; the introduction and effective implementation of the Monitoring, Control and Surveillance program, establishment of the Fisheries Monitoring Center (FMC), VMS, and Inspector and Observer Program, set up of the Monitoring Control and Surveillance Committee (MCSCC), development of Patrol Capacities (sea and air patrol), introduction of the Port State Measures Agreement (PSMA) and collaboration with the Fisheries Commission for West Central Gulf of Guinea (FCWC) and other organizations to fight against illegal fishing activities (Braimah, 2012).

#### **4.6.1 Monitoring Control and Surveillance Program**

The implementation of the MCS program in Liberia; has improved the fisheries sector by generating an estimated \$ USD 7 million from fines, licensing of vessels and fees (INTERPOL, 2014), increased catch for local fishers through the IEZ regime, reduced illegal fishing, introduced fisheries fines and; service charges and set up a transparent vessel registry system (McMillan, 2015).

#### **4.6.2 Observer Program**

The Liberia Observer program was established in 2011 under the new Fisheries Regulation of 2010 and requires 100% observer coverage on registered industrial fishing

vessels (Sherif, 2014). The observer program consists of 18 observer personnel trained by NOAA of the US Department of Commerce (BNF, 2011). The observers were trained on concepts of survey information, data collection, and stock assessment as well as a trial training at sea on safety measures and scientific knowledge on how to obtain information on fish catch, bycatch and marine debris on board the vessel (Bryson, Lubchenco, & Rauch, 2012).

According to Sherif (2014), the Bureau of National Fisheries in collaboration with the WARFP has established a data base for observer information, vessels registry and IUU activities. The fisheries observers are mandated to report issues of non-compliance and collect scientific data, which has led to a reduction in illegal discards, increased knowledge of fish stocks and compliance within the national jurisdiction (Sherif, 2014).

#### **4.6.3 Inspector Program**

Liberia Fisheries has only three (3) fisheries inspectors trained by MCS experts and other partners such as NOAA, with competence under the 2010 fisheries regulation (BNF, 2011); They are responsible for inspecting all fishing vessels operating within national jurisdiction as well as monitoring landing sites and documenting landed catch data of species (Sherif, 2014).

#### **4.6.4 Vessel Monitoring System**

The VMS is a pre-licensing condition for industrial fishing vessels that exceed 299 Gross Tonnage (GRT) operating in the Liberian EEZ for the purpose of monitoring and enforcement (Sherif, 2014). The Faria Watchdog 750 VMS used in Liberia is mounted on board the vessel as a Monitoring Transition Unit (MTU); The VMS hardware has an integrated satellite communication that transmits information to FMC (base station) staff for computerized interpretation (Sherif, 2014). The VMS was introduced in Liberia in

2011; by the WARFP project and has been very useful in detecting illegal fishing activities in the IEZ and EEZ of Liberia (Sherif, 2014).

#### **4.6.5 Fisheries Monitoring Center**

The Fisheries Monitoring Center (FMC) was commissioned on February 2<sup>nd</sup>, 2011 by the Minister of Agriculture and assisted by the World Bank Representative (BNF, 2011). The purpose of the FMC (personnel) is to efficiently monitor, record and track vessel's activities through satellite-based software programs such as the VMS and AIS (BNF, 2011). In accordance with Liberia's New Fisheries Regulation, all commercial and industrial fishing vessels are required to be mounted with a VMS and ensure that it is on at all times (24/7) during fishing operation or anchorage as a licensing condition (Sherif, 2014).

The FMC Staff are trained to receive calls from HR and VHF Radio from the high seas, record, monitor and track vessel activities, and report infringements along with several other responsibilities.

Since the establishment of the FMC center, several vessels have been sighted through the VMS and AIS (satellite imagery) system engaging in illegal fishing activities, and reports generated from the FMC have led to prosecution and generated revenue for the government (BNF, 2013).

#### **4.6.6 Monitoring Control and Surveillance Coordination Committee**

The MCS Coordination Committee is a civilian led body composed of stakeholders within the maritime domain that was established by the Government of Liberia through a Memorandum of Understanding on Fisheries MCS issues to promote interagency collaboration and provide safety and security within the 200 nautical mile EEZ of Liberia (Sherif, 2014). For example, the Liberia MCS Coordination Committee includes several parties such as; the Ministry of Defense (Coast Guard charged with responsibility for

security and protection of the territorial seas), Liberia Maritime Authority (responsible for vessel seaworthiness), Bureau of Immigration (responsible for immigrants or emigrants on board the vessel), Ministry of Justice (responsible for prosecuting the vessels), National Port Authority (responsible for loading and clearing of fishery cargo) and Bureau of National Fisheries (responsible for sustainably managing and conserving fish stocks).

The MCS Coordination Committee is the legal framework within the MCS program strictly associated with fisheries surveillance activities prior to the legal and financial aspects as well as the gathering of evidence and prosecution in fisheries matters (Sherif, 2014).

#### **4.6.7 Development of Patrol Capacities**

The Surveillance component of the MCS program of Liberia comprises both Sea and Aerial patrols. The sea patrols are conducted by the Liberian Coast Guard (LCG) accompanied by one or two Fisheries observers or inspector using LCG patrol boats (Brammah, 2012). The aerial patrol is a joint collaboration between the United Nations Mission in Liberia (UNMIL) and WARFP project for the AIS snapshot of Liberia's maritime zone to be given to UNMIL prior to surveillance flights in exchange for the project to receive maritime aerial patrol reports accompanied by personnel from both UNMIL and the project (BNF, 2011). See Figure 9 below, for a visual picture of the aerial and sea surveillance patrols in preparation.



*Figure 9 Joint Aerial Patrol with UNMIL, BNF/Project Staff, & Sea Patrol with LCG and BNF/Project Staff*

Through successful implementations of sea patrols, in August 2011 the Liberian Coast Guard made its very first arrest of a South Korean flagged trawler Seta 70, for illegally fishing in the IEZ and destroying the nets of local fishermen (Environmental Justice Foundation, 2011). Subsequently, there have been prosecutions of fishing vessels from aerial patrols; For example, in 2012, Korean owned tuna trawler, PANOFI 3, was captured on long lens camera by aerial patrols. The images were used as evidence to prosecute PANOFI 3, and led to a fine of \$ USD 500,000 for fishing illegally in Liberia's EEZ (WARFP/BNF - LIBERIA, 2012). Hence, the sea and air patrols have been very effective in reducing illegal fishing in Liberian territorial waters. A typical aerial surveillance report used by the BNF is shown below in Figure 10.





Figure 10 Example of Aerial Surveillance Report Source: (Braith,2012)

#### 4.6.8 Introduction of Port State Measures

Liberia, as a cooperating non-contracting member to certain member Regional Fisheries Management Organisations (RFMOs) must ensure that it adopts and implements international measures, which include the FAO Port State Measures Agreement adopted by the FAO in 2009. The PSMA is a legal framework to prevent, deter and eliminate IUU activities; it requires parties to exhibit strong port control measures in order to keep IUU fish out of the market (FAO, 2016).

Liberia Fisheries Port State measures for export requirement include an application form with name and address of consignee, details of consignee, including value, method of capture, fishing area of the fish and vessel used for capture as well as an export permit as certificate of traceability and importation requirements such as attestation or certificate from source authority, certificate of clearance as well as an importation permit (Braith, 2012).

#### **4.6.9 Collaboration with FCWC**

Liberia has initiated regional cooperation with FCWC for collaboration on MCS programs, regional observer programs and information or intelligence gathering and sharing to assist in combatting IUU fishing activities within the region (Braithwaite, 2012). In this light, Liberia also seeks cooperation with other partners such as the Ministerial Conference on Cooperation of African States Bordering the Atlantic Ocean (ATLAFCO), the Sub-Regional Fisheries Commission, SRFC and ICCAT (Sherif, 2014). However, it is yet to become fully functional as they are still in the negotiation phase (Sherif, 2014).

#### **4.7 Challenges faced in Liberia's Management Approach**

Even though it seems that Liberia; has achieved a significant reduction in IUU fishing activities within the region, the country is still faced with several constraints towards achieving Goal 14 of the United Nations Sustainable Goal, target 14.5, to eliminate IUU fishing by 2020 in commitment to the UN 2030 agenda (United Nations, 2015). Some of the challenges include maximum enforcement and compliance issues with vessel captains, lack of standard operation procedures required for processes of coordination of arrest and prosecution and non-functional sub-regional cooperation, as well as many other financial, administrative and legal constraints (Braithwaite, 2012). The immediate challenges are lack of inter-ministerial coordination, lack of scientific data and lack of sea and air patrol capabilities for the EEZ.

##### **4.7.1 Lack of Inter-Ministerial Cooperation:**

Interagency collaboration is still a major issue because the ministries exhibit poor management response in tackling IUU fishing (Sherif, 2014), most often they delay in prosecuting illegal vessels; they are subject to bribery from vessel owners, and there are delays in developing policies and regulation.

#### **4.7.2 Lack of Scientific Data**

The lack of scientific data on fish population has an impact on fisheries and biodiversity in Liberia. Secondly, further from shore, less scientific information is available because of the high cost of information (Nyenka, 2009). For example, the last acoustic survey of the country's total marine resources was conducted in 1984 (Hahn et al., 2014).

#### **4.7.3 Lack of Sea and Aerial Patrols**

There are two Coast Guard speedboats, neither of which can operate beyond 8 nautical miles and the one of which is unseaworthy. This reduces the number of patrols expected. Secondly, the UNMIL joint aerial patrol has been hampered because the UNMIL helicopter has mechanical issues and needs extensive repairs and servicing (WARFP/BNF - LIBERIA, 2012).

## **CHAPTER FIVE: COMPARISON & SWOT ANALYSIS OF LIBERIA AND GLOBAL APPROACHES**

### **5.1 Introduction**

Fisheries management is crucial for protecting and conserving the sustainable exploitation of marine resources so as to ensure long term social and economic benefits (Cochrane & Garcia, 2009). However, there have been several global approaches on national, subregional, regional and international levels used as best practices to curtail illegal fishing and sustainably manage marine resources.

A comprehensive and extensive literature review on best global practices was undertaken in chapter 3 and a review of current IUU fishing practices in Liberia as well as its management response in tackling IUU fishing was made in chapter 4. This chapter provides an analysis of strengths, weakness, opportunities and threats for combatting IUU fishing in Liberia and shows a comparison of Liberian and global approaches used against IUU fishing activities.

### **5.2 SWOT Analysis based upon Liberia's Management Approach**

The SWOT analysis below analyzes the Strengths, Weaknesses, Opportunities and Threats of Liberia's management response to IUU fishing. This tool will be used to identify indicators lapses and constraints and also serves as a solution in addressing issues discussed.

**Table 2 SWOT Analysis of Liberia’s Management Response**

Management Response in specific areas	Strengths	Weakness	Opportunities	Threats
MCS Operations	Well defined organizational structure	Inadequate staff to carry out MCS operations	Funding from World Bank and interagency collaboration	Sustainability of funding to maintain the MCS program
Zonal Integrity (a)	Limited illegal fishing within the EEZ	No Liberian owned domestic fishing vessel operating in the EEZ. Dominance of foreign industrial fishing companies	Artisanal and subsistence local fishers have improved catch rates	Low revenue generation from marine fisheries because of the lack of industrial fishing vessels
Monitoring (b)	Fisheries Monitoring center	Poor internet facilities, delayed in receiving radar from fishing vessel’s VMS	Ongoing improvement of VMS applications and operations as well as training and	Maintenance of FMC’s equipment and infrastructure

		Inadequate staff to operate a 24/7 shift functional FMC	capacity building programs for FMC staff	
VMS (c)	Mandatory VMS on all registered industrial fishing vessel	Poor internet connectivity in receiving signals from the VMS satellite	Added value to safety and security of domestic fishing vessels	National Fisheries face challenge in monitoring the coastline
Surveillance (d)	Surveillance development capacities that includes well organized sea and air patrols.	Only one functional LCG patrol boat which cannot go beyond 8 nautical miles. UMMIL operational helicopter has mechanical issues which has hampered the regular air patrol	Improved Surveillance will have both a deterrent effect and reduce fishing pressure	EEZ will become prone to greater IUU fishing
Port State Control (e)	Implementation of Port State Measures	Fishing harbor facilities and infrastructure is	Non-functional regional	Strengthening the legal framework of

	including standardized requirements for export and import	in deplorable working conditions. Inefficient port services at the Liberia National Port Authority, therefore vessels stay longer than the required time in port. PSMA yet to be rectified by Liberia	cooperation which reduces the capabilities to effectively control IUU fishing	MCS program by adopting International standards and laws
Vessel Registry (f)	Transparent Vessel registry	Insufficient licensed vessels operating in the EEZ	Lack of revenue from vessel registry	Improving the resilience against illegal fishing vessels
Legislation and Regulation	Adoption of New fisheries regulations which includes the IEZ regime and the enforcement	yet to be validated Industrial fishing companies are pulling out , according to	No industrial fishing activities	Developing legal tools to combat IUU fishing. Restoration of depleted marine

	of VMS on all registered industrial fishing vessel operating in Liberia's territorial waters so as to monitor and control fishing activities	them the IEZ regime is inflexible.		resources and protection of the spawning sites for juvenile species of the IEZ.
Ministerial-Commitment	MCSCC interministerial collaboration	lack of standard operation procedures required for process of coordination of arrest and prosecution. Interministerial cooperation is very slow	Promotes transparency, builds trust and understanding among various governmental agency	Industrial fishing companies will conveniently engage into illegal fishing activities because the risk of apprehension and prosecution procedure are slow



### **5.3 Comparison between Global Responses and Liberia's Management Response**

#### **Discussion**

There are several global approaches discussed in Chapter 3, which are applicable to Liberia's fisheries management response even though full implementation of these approaches has been a serious challenge. Below is a comparison of various global fisheries best practices common to Liberia's management response. Some of the global approaches which include the Monitoring Control and Surveillance components, with the exception of Catch Documentation Scheme (implementation is expensive and fully implemented by only few RFMOs), Governance, Enforcement, Deterrent Effects as well as Community-Based Management approaches are applicable to Liberia's Fisheries Management Response. Other global approaches such as Genetics, and Regional Cooperation are yet to be adopted by Liberia's National Fisheries Management Regime.

MCS systems are widely used in RFMOs through cooperation with member states by harmonizing IUU vessel lists, vessel registries, log book records and all relevant fisheries related documents (Lodge et al., 2007). The majority of the RFMOs have effectively used almost all the MCS components as regulatory tools against IUU fishing activities. The CCAMLR is an example of an RFMO that reduced the amount of illegally caught Patagonian toothfish in its convention area. The CCAMLR ensures that all member States within its region comply with all international standards set by the RFMOs including a regional VMS program so as to ensure that illegal fishing is reduced to a minimal level (Davis, 2000).

Liberia being a cooperating and non-contracting member State of certain RFMOs has adopted the MCS program as a means to prevent, deter and eliminate illegal fishing activities; however, because of its lack of financial capabilities and infrastructure, it has been unable to effectively implement this program.

### **5.3.1 VMS**

The Vessel Monitoring System is widely used by RFMOs, including members and non-members as a surveillance method to monitor illegal fishing activities (Lodge et al., 2007). Although, the VMS is also a mandatory regulatory surveillance tool under the 2010 Liberian fisheries regulation for all registered industrial fishing vessels above 299 GRT, it is challenged by poor internet connectivity, which makes it difficult for the FMC staff to receive VMS data and to ensure accurate monitoring of industrial fishing vessel activities (BNF, 2012). In order to effectively monitor fishing vessel activity on the high seas, there is a need to boost the internet connectivity for accurate monitoring and reporting.

### **5.3.2 Fisheries Patrol**

Fisheries patrols include land, sea and aerial patrols as the primary surveillance tools used in detecting fisheries violations and enforcing compliance. However, unlike developed countries and RFMOs that have several patrol boats and helicopters for the purpose of monitoring their EEZs, such as Canada (Meltzer & Fuller, 2009), Liberia has only one patrol boat which cannot capably patrol beyond 8 nautical miles. Therefore, it is unable to cover the 200 nautical mile EEZ, thereby allowing the territorial waters to be vulnerable to IUU fishing activities. Fewer patrols make it difficult to enhance effective monitoring and surveillance, as a deterrent effect against IUU fishing activities.

Secondly, the UNMIL patrol helicopter has mechanical issues and is not operating as frequently as possible. Therefore, Liberia National fisheries need to further explore the possibilities of joint aerial patrols within the region; since; they do not have the financial capabilities to purchase and maintain their own surveillance aircraft.

### **5.3.3 Inspector Program**

The Inspection programs are implemented throughout fisheries regimes globally to ensure compliance with fisheries conservation and management measures. According to fisheries regulation of RFMOs such as ICCAT, CCAMLR and NAFO, they mandate the inspection of all fishing vessels including non-member State vessels which harvest fish within any part of the convention area as a standard requirement to land or transship in the port of a member state (Wold et al, 2000). However, Liberia has yet to develop strong inspection measures to be implemented as criteria prior to the trading of fisheries products with other nations. Such measures will help to promote compliance with international fisheries instruments and prevent illegal fish products on the market.

Liberia, has an inadequate number of fisheries inspectors. There are only three trained and certified fisheries inspectors with relevant skills and knowledge to carry out inspections at sea and at landing sites. Liberia needs to recruit and train more fisheries inspectors with the competence, under the national fisheries regulation to investigate, monitor and ensure compliance with both local and international fisheries regulations as well as to promote an effective enforcement program.

### **5.3.4 Observer Program**

Fisheries observers equipped with scientific knowledge to collect relevant data on species, by-catch and total allowable catch are deployed on industrial fishing vessels as a mandatory requirement for commercial fishing vessels of 42 fisheries worldwide; Depending on the weight and length of the vessels, the percentage of observer coverage may vary (Porter, 2010). For example, the North Pacific Fisheries require 100% observer coverage for vessels 125m long and 30% for vessels with 60m long (Porter, 2010).

However, Liberia National Fisheries has at least 18 fisheries observers trained by NOAA, as there is a mandatory requirement under the 2010 fisheries regulation for 100% observer coverage for industrial fishing vessels above 299 GRT (Sherif, 2014). The Liberia

National Fishery should explore the establishment of a regional observer program with the FCWC in regard to the gathering of information and intelligence sharing as an effort to combat IUU activities within the region (Braumah, 2012).

### **5.3.5 Governance**

Good fisheries governance could be implemented through the co-management approach, whereby local fishers of indigenous coastal communities, stakeholders and all concerned parties are empowered to participate in fisheries management decision-making, affording them the opportunity to gain control over their natural resources and also the ability to cope with the impact of globalization as practiced in South Asia and Southern Africa as best practice in fisheries management (Nielsen et al., 2004).

Liberia has also adopted the co-management approach specifically applicable to sustainable management of small scale fisheries between 3 nautical miles and 6 nautical miles (Subah, 2010). For now, the co-management approach is implemented in two of the provinces, Robertsport county and Buchanan county, but is yet to be implemented in all the rural coastal communities of Liberia (Subah, 2010).

### **5.3.6 Enforcement**

Fisheries Enforcement as a standard best practice is employed by harmonization of international fisheries instruments into national legislation as practiced by member states of RFMOs, including CCAMLR, ICCAT, NEAFC, WCFC and NAFO (Lugten, 2014).

However, fisheries enforcement is a major challenge in Liberia because of lack of adequate enforcement capacity such as legal fisheries instruments, patrol boats and helicopter for surveillance, which has made it difficult to implement international fisheries conventions (BNF, 2011). Also, the Standard Operating Procedure (SOP) required for processes of coordination of arrest and prosecution does not cover all aspects of the MCS activity (Sherif, 2014). Additionally, the government has been unable to expedite the

completion of maritime zone and enhance the sovereignty of Liberia's EEZ (Braitham, 2012). For example, most often the vessel captains are unwilling to accept observers on board their fishing vessels and sometimes find it difficult to subject to pre-license conditions (Braitham, 2012). The enforcement challenges could be eliminated by Liberia; through incorporating international fisheries instruments (such as UNSFA, IPOA-IUU, 1993 FAO Compliance Agreement amongst others) into its national legislation and also ratifying international fisheries conventions. For example, according to Sherif (2014), Liberia has not ratified the Port State Measures Agreement (PSMA).

### **5.3.7 Deterrent Effect**

Like many other fishing and trading nations around the world, Liberia has adopted a system of fines, sanctions and confiscation of fishing vessels, equipment and fishery product of illegal fishing vessels caught in its EEZ. However, Liberia does not confiscate upon arrest like Canada, New Zealand and Australia and has not established a trading ban on nations that do not apply precautionary conservation and management measures in fishing as a best practice like other nations such as the United States of America (Tyler, 2006). The 2010 fisheries regulation should be reviewed so as to increase the penalties of particular fines, sanctions, and confiscation including automatic seizures and imprisonment in cases where an enforcement officer has been threatened or obstructed.

Hence, Liberia Fisheries Management needs to improve their management response so as to review its fisheries regulation, thereby incorporating into national legislation, international fisheries instruments and adopting best practice global approaches in regard to fisheries management, as discussed extensively in Chapter 3, in order to eliminate or reduce IUU fishing activities from the present state of 45% (Braitham, 2012) to zero percent or to a minimal number as achieved by fishing nations such as Canada, Iceland and many others mentioned in this paper.

## **CHAPTER SIX: CONCLUSION AND RECOMMENDATION**

### **6.1 Conclusion**

The findings of the literature review and analysis highlight several global approaches used against IUU fishing activities. Many of these approaches are employed by developed countries and implemented most especially by RFMOs. Therefore, RFMOs are the best medium for implementing and coordinating these approaches because they are implemented through regional cooperation between member states as a mandatory rule (Lodge et al., 2007). According to the findings of this dissertation, the most common approaches include Monitoring Control and Surveillance, which is comprised of several components such as the VMS, Observer Program, Inspector Program, Fisheries Patrol and CDS, Fisheries Governance, Enforcement, Deterrence Effects, Genetics, Community-Based Approach, as well as Regional Cooperation.

These approaches have proven to be effective with measurable evidence in the fight against IUU fishing activities. There are also international legal instruments developed by the United Nations such as UNCLOS, UNFSA, PSMA, FAO Code of Conduct, as well as the IPOA-IUU fisheries that govern fisheries globally. Most of these legal international fisheries instruments are used by both member and non-member states by incorporating them into their national legislation as mandatory rules or by applying them as State practice.

However, Liberia being a non-contracting member of certain RFMOs, is still obligated to employ these approaches in order to sustainably manage its fisheries. Although, Liberia has started the implementation of the MCS program through a World-Bank initiative of the WARFP project, which includes all the components (VMS, Observer Program,

Inspector Program and Surveillance Patrols) with the exception of the CDS. The Liberian fisheries administration is still challenged by IUU fishing activities due to weak governance, lack of scientific data, which has an impact on both inland and wild fisheries, including technical challenges in conducting aerial and sea patrols, and lack of human resource capabilities. Due to this and several other reasons, IUU fishing activities in Liberia are prevalent, mainly attributed to the lack of domestic fishing vessels, and dominance of foreign distant-waters operation fleets, predominately Asian commercial fishing vessels from China and Korea, and illegal transshipment at sea.

Even though; Liberia is not a member to any RFMOs, Liberia is exploring opportunities for regional cooperation with the FCWC, ATLAFCO, ICCAT and the SRFC (Sherif, 2014). Furthermore, in regard to legal international fisheries instruments, Liberia has adopted and begun the implementation of the Port State Measures Agreement, but is yet to ratify the convention (Brammah, 2012).

The Liberian fisheries sector accounts for 10% of the national GDP and provides 15% of dietary protein; However, the country sustains an economic loss of \$ USD 75 million annually to IUU activities. As a result, 49% of the population is faced with food insecurity and an increasing rate of unemployment (USAID, 2013). Furthermore, the reduction of the Liberian IEZ from 6nm to 3nm puts the fisheries sector at higher risk and exposes the wild fisheries to overexploitation, increased juvenile catches, increased risk of malnutrition for vulnerable populations residing along the coast, which depend solely on fisheries for livelihood, ecosystem degradation caused by destructive fishing practices and overfishing, conflict between industrial fishers and artisanal fishers competing for ocean space in the 3nm zone, and displacement of coastal livelihood caused by increased unemployment mainly affecting artisanal fishers. Eventually, if precautionary measures are not taken, Liberia's wild stock fisheries will collapse because of the intense pressure from human activities. Thus, the recent action taken by the Liberian government through executive order 84 released on April 2017, also warranted a yellow card warning from the

EU fisheries commission to Liberia (European Commission, 2017). This hampers the core objective of UN Ocean Conference recently held on June 5-9, 2017 with the aim of supporting the implementation of Sustainable Development Goal (SDG) 14, and calling upon all States to sustainably manage and conserve their marine resources, seas and oceans. As a result of the UN Ocean Conference, one thousand three hundred and forty-seven (1,347) voluntary commitments were made by various governments, legal entities, intergovernmental organizations, non-governmental organizations, academia and several others, without any voluntary commitment from Liberia (UN, 2017).

Hence, Liberia must revise some of its poor fisheries management decisions which threaten the sustainable management and conservation of its fisheries resources and adopt the best fisheries practices discussed in this dissertation so as to obtain cooperation with other fishing nations both at the regional and international levels in order to enhance the management of the country's fisheries.

## **6.2 Recommendations**

Liberia's fisheries management regime has taken a bold and pragmatic step through the implementation of its MCS program in an effort to combat IUU fishing activities which have been reduced to 45% (of roughly 300 fishing violations) since the inception of the program in 2010 (BNF, 2013). However, the fisheries management regime still has several lapses which were identified in chapter 4 of this dissertation.

Listed below are some recommendations by the author that should be considered for implementation by Liberia's fisheries sector in order to achieve and develop a robust fisheries management regime which shall be tailored towards enhancing sustainable fisheries and eliminating IUU fishing activities;

- Become a functional member of the ICCAT regional fisheries management organization because Liberia has pelagic tuna species such as yellowfin tuna, skipjack and bigeye tuna species which resides within the ICCAT convention area.



Furthermore, being a member of the RFMO, Liberia would be compelled to strengthen its fisheries regulation and enforcement of its tuna management.

- Revise the ill-advised decision undertaken through executive order 84 released on April 2017, to reduce the 6nm Inshore Exclusion Zone (IEZ) to 3nm. A reversal of this decision will reduce conflict between artisanal and commercial fishers and enhance sustainable fisheries.
- Explore partnership opportunities with relevant fisheries management bodies (RFMO) in order to invest in and develop a robust fisheries regime.
- Enhance and improve scientific data collection on fisheries and biodiversity within Liberia's coastal and marine zones to help improve stock assessment and fisheries management.
- Explore opportunities for regional cooperation, for joint aerial and sea patrols with coastal neighboring states for the enforcement of a more robust surveillance and fisheries management program which will drastically reduce IUU fishing activities within the region.
- Review Liberia's Fisheries Act to increase the impact of penalties in particular fines, sanctions, confiscations and perhaps prison sentence in cases where enforcement officers have been obstructed or threatened.
- Harmonize national legislation with international fisheries instruments including administrative sanctions to be in conformity with international conventions.
- Consider ratification of conventions and codes such as the FAO Code of Conduct for Responsible Fisheries, PSMA, 1993 FAO Compliance Agreement, IPOA-IUU so as to enhance cooperation with other fishing nations both at the regional and international levels and enhance sustainable management of fisheries.
- Invest in and develop a robust aquaculture program in order to reduce pressure on wild fisheries. In so doing, it will reduce fishing pressure and enhance wild fisheries and shellfish for harvest, and assist in restoring threatened and

endangered marine and aquatic fish while at the same time creating job opportunities.

- Foster stronger cooperation and coordination between ministries and agencies in relation to the fisheries administration and also identify ministries that will play a central role in developing and formulating measures to give effect to a revised or new legislation as deemed necessary.
- Create fisheries subsidiaries that will encourage more domestic fishing vessels to become actively involved in fishing activities.
- Conduct capacity building programs, particularly in fisheries science, to enhance the technical knowledge of fisheries observers, inspectors, and other fisheries officers in order to achieve an effective SOP and implementation support of national fisheries policies and regulations.
- Create awareness of best fishing methods and standards in all the coastal regions including fishing communities and conduct training programs on basic fisheries knowledge and skills for local artisanal and subsistence fishers.
- Decentralize to a community-based fisheries co-management approach in all the provinces. In so doing, it tightens the relationship between the fishing communities and the government, creates opportunities for local fishers to participate and become involved in decision making processes and assists in implementation of surveillance, management and enforcement.
- Encourage the registration of fishing vessels and licensing of fishers within the territorial waters, particularly domestic or national flag fishing vessels, to engage in legal fishing activities, which will serve as a deterrent for those engaged in illegal fishing activities.

In order for Liberia to effectively manage its fisheries resources which are geared toward long-term sustainability, there is a need to consider the recommendations listed above.

Otherwise, there is a high probability that the fisheries resources, which are rapidly depleting and declining, will collapse causing serious economic crisis.

## APPENDIX 1

### List of Regional Fisheries Management Organization

**Source:** (FAO, 2001 & Lodge et al 2007) as adopted by Glassco (2017)

**Table 3 List of Regional Fisheries Management Organization**

<b>RFMOs (Acronyms)</b>	<b>Name of the Regional Fisheries Body</b>	<b>Advisory Bodies or RFMOs</b>
APFIC	Asia-Pacific Fisheries Commission	<b>Advisory Bodies</b>
CECAF	Fishery Committee for the Eastern Central Atlantic	
GFCM	General Fisheries Commission for the Mediterranean	
IOTC	Indian Ocean Tuna Commission	RFMOs
RECOFI	Regional Commission for Fisheries	RFMOs
SWIOFC	South West Indian Ocean Fishery Commission (in process)	
WECAFC	Western Central Atlantic Fishery Commission	RFMOs
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources	RFMOs
CCSBT	Commission for the Conservation of Southern Bluefin Tuna	RFMOs
COREP	Comité régional des pêches du Golfe de Guinée	`
CPPS	South Pacific Permanent Commission	
CSRP	Commission Sous-régionale des pêches	
CTMFM	Joint Technical Commission for the Argentina/Uruguay Maritime Front	
CWP	Coordinating Working Party on Fishery Statistics	
GLOBEC	Global Ocean Ecosystem Dynamics	

FFA	South Pacific Forum Fisheries Agency	RFMOs
IATTC	Inter-American Tropical Tuna Commission also serves as the Secretariat for the	RFMOs
(AIDCP)	Agreement on the International Dolphin Conservation Program	
IBSFC	International Baltic Sea Fishery Commission	
ICCAT	International Commission for the Conservation of Atlantic Tuna	RFMOs
ICES	International Council for the Exploration of the Sea	`
ICSEAF	International Commission for the Southeast Atlantic Fisheries	
IPHC	International Pacific Halibut Commission	RFMOs
IWC	International Whaling Commission	
MHLC	Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western-Central Pacific Ocean (Convention signed, Commission not yet established)	
NAFO	Northwest Atlantic Fisheries Organization	RFMOs
NAMMCO	North Atlantic Marine Mammal Commission	
NASCO	North Atlantic Salmon Conservation Organization	
NEAFC	North-East Atlantic Fisheries Commission	
NPAFC	North Pacific Anadromous Fish Commission	RFMOs
OLDEPESCA	Latin American Organization for the Development of Fisheries	RFMOs
PICES	North Pacific Marine Science Organization	
PSC	Pacific Salmon Commission	RFMOs
SEAFO	South East Atlantic Fishery Organization (in process)	RFMOs
SPRFMO	South Pacific Regional Fisheries Management Organization	RFMO
SIOFA	South Indian Ocean Fisheries Agreement	RFMOs
WIOTO	Western Indian Ocean Tuna Organization	
WCPC	Western and Central Pacific Fisheries Commission ((Commission for the Conservation and Management of Highly Fish Stocks in Western and Central Pacific Ocean)	RFMOs

CCBSP	Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea	RFMOs
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