

# APPLICATION OF THE VESSEL MONITORING SYSTEM (VMS) TO TACKLE THAILAND'S ILLEGAL FISHING PROBLEMS

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## ABSTRACT

*Although Thailand is considered one of the world's major seafood exporters, it has encountered the European Union's decision to issue a yellow card since April 21, 2015. This was due to its lack of concrete solutions to illegal, unreported, and unregulated fishing (IUU) that meet international standards. In other words, there still exist the use of illegal fishing equipment and the lack of fishing vessel number control which result in declining marine animal resources, over fishing, and problems of forced labor stemmed from Thailand's downgrade to Tier 3 in the June 2014 US's Trafficking in Persons Report (TIP Report) [1]. Regarding to this, SCB Economic Intelligence Center (EIC) used to anticipate that Thailand may lose up to 500 dollars worth in revenue. In case the import of seafood from the EU is suspended.*

*The present problems include illegal, unreported, and unregulated fishery activities. In the case of Thailand, it is currently found that the means of fisheries have changed from those in the past and are mostly prone to being illegal, posing various negative consequences. Subsequently, International organizations have encouraged the Thai government to impose legal measures, applying technologies, and seek cooperation from every related sector--in order to come up with the appropriate measures for eliminating and encountering illegal, unreported, and unregulated fishing. These aim at bringing about effective management and sustainable use of marine resources.*

*This research reveals that Thailand has already applied technologies effectively as well as proposed concrete operational approaches, resulting in international organizations' acceptance of Thailand's fishing standards.*

**Key words:** Application, Vessel Monitoring System, Illegal, Fishing Problems, Thailand.

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## 1. INTRODUCTION

From the control and monitoring through the VMS and fishing logbook, there has been transshipment of marine animals outside the Thai waters: at the high sea around the Indian Ocean. This particular area has been under the surveillance and control of several international organizations including Indian Ocean Tuna Commission (IOTC) founded to manage tuna and tuna-like species; and South Indian Ocean Fisheries Agreement (SIOFA) founded to ensure the sustainable use of other fishery resources apart from tuna and tuna-like species. In transshipping several species of marine animals [4], there is a high risk of international law violation. Therefore, it is the responsibility of Thailand, as a flag state, to comply with the international obligations to take responsibilities to prevent Thai vessels from illegal fishing or marine animal transshipment.

The EU has been the first to introduce some measures, which prevent and eliminate illegal, unreported, and unregulated fishing; enforced since January 1, 2010 [3]. According to the EU's regulations, illegal, unreported, and unregulated fishing (IUU) can be separately defined as follows:

**Illegal fishing** takes place when there is fishery activity without formal permission in the waters of other nations, violation against the enforced laws, or disobeying of international fishing regulations as well as other related regulations made in accordance with regional fishing agreements.

**Unreported fishing** takes place when a fishing report has not been delivered or has failed to be delivered; according to legal requirements or other regulations, to national fishing control bodies or regional fishing management organizations, as the case may be.

**Unregulated fishing** takes place when a fishing vessel without nationality or a flag state operates in any waters, which violates the proposed measures. This includes the operation of fishery activities in the reserved areas where conservation measures have been imposed.

In order to tackle the problems conscientiously and hastily and to deter illegal, unreported, and unregulated fishing, the Order of the Head of the National Council for Peace and Order no. 10/2558 [4] regarding the combating of illegal, unreported, and unregulated fishing has been issued. This order requires that owners of a fishing vessel or fishing operators, owners of a refrigerated fishery cargo carrier as well as every type of watercraft with the size of up to 30 Gross Tons, or as specified by the Command Center for Combating Illegal Fishing (CCCIF), must install the Vessel Monitoring System (VMS) of which the performance standard and functional requirements meet those defined by the CCCIF [5].

## 2. METHODS FOR OBTAINING A TELECOMMUNICATIONS OPERATION LICENSE FOR PROVIDING VESSEL MONITORING SYSTEM SERVICES

The Department of Fisheries has commanded that the VMS equipment has to meet several performance standards That is to say, it should be applicable for mobile communication service providers, such as Inmarsat (The International Maritime Satellite Organization), Iridium, Thuraya or equivalent foreign satellites; and being able to send data to the GPS Gateway System of the Department of Fisheries. As the VMS equipment is considered satellite telecommunication equipment, the NBTC must grant a Type I telecommunications operation license, a license for providing Store and Retrieved Value Added Services, a license for GPS Tracking, and a license for Vessel Monitoring System, when it is used in telecommunications operation so as to provide vessel monitoring system services under the following conditions [6].

- The license holders are able to use foreign satellites to provide VMS services.

- The license holders are able to provide VMS services to fishing vessels, fishery cargo carriers, refrigerated vessels as well as every type watercraft used for fishing, transshipping, and storing marine animals caught by every type of the watercraft specifically used for fishery activities.
- The telecommunications equipment used for the VMS is excluded from requiring the license to possess, use or export telecommunications equipment as well as the license to build telecommunications stations. Here, the license holders or importers have to be granted the license to produce, import or trade, as the case may be.

Regarding the methods for investigating and verifying telecommunications equipment, the NBTC has prescribed that VMS telecommunications equipment must be of Class A as specified in the NBTC announcement about investigation and verification of telecommunications equipment standards [3]. Furthermore, there must be some documents guaranteeing that the qualifications of such telecommunications equipment are in line with the technical regulations of the satellite-based VMS service providers and the technical regulations at the international level, regional level or national level, as deemed appropriate.

As the Department of Fisheries has issued the announcement to set regulations for the fishing vessels operating outside of Thai waters; it is required that fishing vessels have to install the VMS, based on the VMS's performance standard and functional requirements, as specified in the announcement of the Department of Fisheries issued on December 28, 2015 [7]. Moreover, all the VMS equipment must be fully functional at all times and the VMS equipment must be installed based on the performance standard and functional requirements and the standards for monitoring fishing vessels outside Thailand's territorial waters. Here, telecommunications equipment must be connected to the vessel monitoring system and electronic monitoring system, based on the performance standard and functional requirements and the standards for monitoring fishing vessels operating outside Thailand's territorial waters.

In addition, the Department of Fisheries has also issued the announcement prescribing that the vessels transshipping or storing marine animals must install the vessel monitoring system, based on the performance standard and functional requirements for the monitoring system of the vessel which is registered as a fishery transshipping or storing vessel. Furthermore, the vessel monitoring system of fishery transshipping or storing vessels must be maintained to be fully functional at all times. Also, the VMS based on the performance standard and functional requirements as well as the monitoring system for the vessel, registered as a fishery transshipping or storing vessel, which transships marine animals outside the Thai waters must be installed. Here, the telecommunications equipment must be connected to the vessel monitoring system to enable the use of the electronic recording and reporting system (ERS) and the electronic monitoring system (EM), based on the performance standard and functional requirements and the standards for monitoring fishing vessels operating outside Thailand's territorial waters.

### **3. VESSEL MONITORING SYSTEM (VMS)**

The Vessel Monitoring System (VMS) is comprised of vessel tracking equipment functioning through a Global Navigation Satellite System. The data will be sent to users through various channels appropriate for each particular type of fishing vessels. This also depends on fishing locations and distance from the shore, including information as to the location of the vessel, directions, velocities, etc. Such communication system includes [8]:

- Global Service Mobile Communication (GSM)
- Auto Identification System (AIS)
- Satellite Service Provider

The three communication systems enable us to know fishing routes and behaviors so as to hinder illegal fishing and be able to differentiate the fishing vessel without the VMS, which operates illegally, by allowing the VMS to function through naval radars and high-definition satellite images.

Such information will be sent to the GPS Gateway of the Operations Center for Fishing Vessel Controlling and Tracking, the Department of Fisheries; whereas the use of shipping route details will be in accordance with the Official Information Act, B.E. 2540 [9]. Here, the owners are able to monitor only their vessels or groups of vessels via communication equipment, such as a smartphone or tablet.

#### **4. HOLDERS OF A LICENSE FOR PROVIDING VESSEL MONITORING SYSTEM SERVICES**

Holders of a license for providing vessel monitoring system services [8], who submit the approval for additional satellite-based communication services, may install such equipment on service users' vessels in order to support the functions in accordance with the announcement of the Department of Fisheries of which the patterns of service provision are various as follows:

- Provide services by installing Fleet One, satellite-based communication equipment, for the clients. The Fleet One equipment installed on fishing vessels will receive the data from CCTV cameras and send the data via the Inmarsat Satellite toward the Satellite Land Earth Station. Then, the data will be transferred via the Internet to the server of the holder of a license for providing vessel monitoring system services. Here, the vessel owner who remains on shore is able to monitor, receive, and send data through web applications or mobile applications. As well, the service user based on shore will be made aware of the specific location of a vessel, and will then be able to track the vessel in real time.
- Provide data transfer services via satellites so that the vessel owner is able to transfer data between vessel and shore. Here, the service users include the owners of the fishing vessels registered as a vessel which transships and stores marine animals outside the Thai waters; and the owners of the fishing vessels operating outside the Thai waters, who are required to install the electronic monitoring system, to report to the Department of Fisheries, and transship marine animals at sea.

The data in the form of snapshot from CCTV cameras on the vessel will be sent via Fleet One, satellite-based communication equipment, installed on the vessel so that the crew is able to report all fishery activities and transshipment. (The current satellite-based communication equipment used in vessel tracking cannot report any activities in the form of pictures. Consequently, it is required that the satellite-based communication equipment in the system of Fleet One must be installed.) Then, the system will send data via the Inmarsat Satellite to the Land Earth Station through the Inmarsat Gateway. Here, the service provider will enable the system that supports the data from the Inmarsat Gateway before transferring such data to Fisheries Monitoring Center (FMC), where can report fishery activities all the time.

- Provide the service of supplying satellite-based communication equipment in the system of Fleet Broadband (Fleet One), a high-speed data communication system via Inmarsat satellite networks which cover extensive service areas worldwide. Based on this, the service provider will install the Fleet One on the fishing vessels; connect the systems of data storage, fishing logbook, duration, and report by electronic means of fishing vessels; and be able to transfer images from CCTV cameras via satellites to the Network Operation Center of Inmarsat. Then, the data will be directly sent to Inmarsat PoP, the gateway connecting to the Internet system, and eventually delivered to the Department of Fisheries by electronic means.

## **5. ELECTRONIC RECORDING AND REPORTING SYSTEM (ERS)**

The electronic recording and reporting system is a system which uses information and communication technology in reporting fishery data in electronic forms, so that the officials of the Department of Fisheries are able to receive the information directly from the vessel operating at sea. The matters to be delivered include the data on transshipment of marine animals, direct fishing logbook reports from the vessels operating at sea—based on the cycle determined by the Department of Fisheries, as well as seaman placement activities in order to investigate the behaviors towards fishery operation [10].

The Electronic Recording and Reporting System (ERS) must have the scopes of standards as follows [5]:

- Improve the investigation of fishing activity report to be correct, initially from actual sources of information, by using the electronic system of which the referential data can be investigated from the VMS.
- Regulations on data transfer in the electronic reporting system
- Patterns of the data used for reporting in the electronic reporting system

The Electronic Recording and Reporting System (ERS) should have the following features [5].

- The vessel owner, holder of the license that allows operation of fishery activities outside the Thai waters or the registrar as a marine animal transshipping and storing vessel must manage to install the information technology system on the fishing or transshipping vessel, as the case may be, in order to support the reception of reported data by electronic means. That is to say, such vessel must be furnished with electronic equipment such as computers, notebooks, tablets, etc. Which can input data in an easy way for users; and sort data in the preformatted text message before sending such data via the VMS equipment installed on the vessel to the Department of Fisheries. Here, system users has to select inputting data to the menus related to themselves based on the regulations of data transmission, by using such information technology.
- All of the preformatted text messages must be able to retain their integrity since they would have been sent from the VMS equipment installed on the vessel to the Department of Fisheries.
- The distributor, entrepreneur or the vessel owner must not reveal the data concerning the adjustment of VMS equipment or each particular component of the system in order to bring about the competence in modifying the data, directly sent from the VMS equipment installed on the vessel to the Departments of Fisheries.
- There must be an emergency generator to enable the availability of the VMS system and equipment.

## **6. ELECTRONIC MONITORING SYSTEM (EM)**

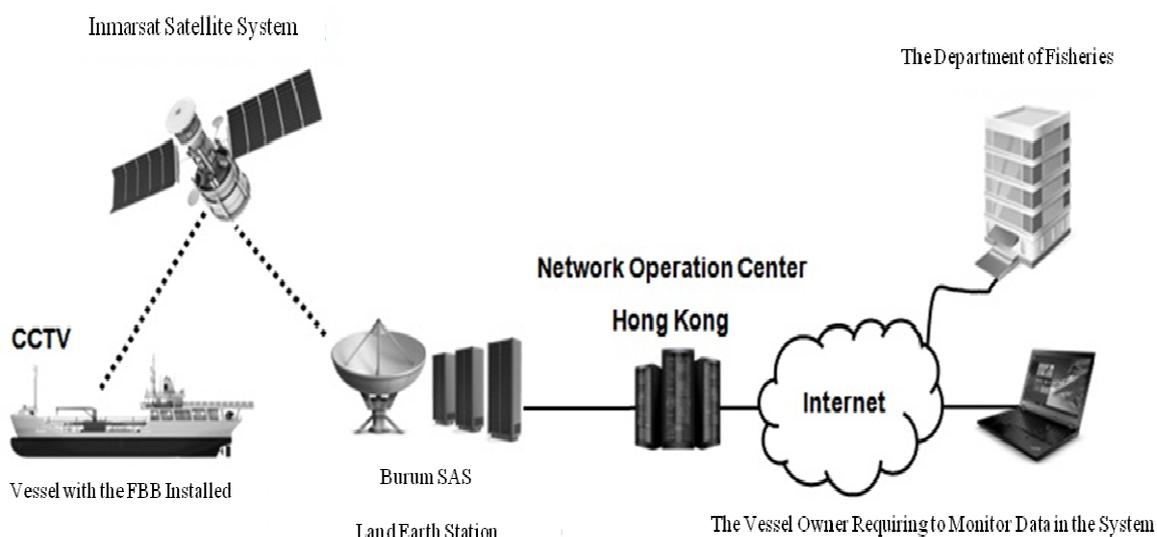
The Electronic Monitoring System (EM) is a system which uses the satellite-based information technology in transferring the data on fishing equipment usage and transshipment of marine animals at sea, detected by electronic sensors on the fishing vessel directly connected to the fishing and marine animal transshipment equipment. The data obtained from such equipment will be verified by the data on sailing obtained from a vessel tracking system and CCTV cameras in the form of snapshot sent through the satellite-based communication system in real time, and will be able to be investigated after the video has been recorded. In using such technology, RFID and electronic signals from the capstan or crane on a fishing vessel will become the detector which indicates the beginning and end of fishery activities and marine animal transshipment.

## 7. FLEET ONE

In providing Fleet one services [11], the equipment installed on vessels will receive data from CCTV cameras. Then, such data will be sent via the Inmarsat Satellite and the Satellite Land-Earth Station to service providers, through the Internet channel. Here, the vessel owner can monitor all activities from the shore and transfer data via web applications or mobile applications, as determined by the service providers.

As for the operation of Fleet Broadband [12], it is the high-speed data communication system via Inmarsat satellite networks, which covers extensive service areas worldwide and will be able to transfer data in the form of both voice and data up to the speed of 492 kbps. The system installed on the vessel will collect data on fishing activities: the fishing logbooks, durations, reports by electronic means of Thai fishing vessels, fishery offices outside the Thai waters or other vessels in the system. Besides, it can send images from CCTV cameras via satellites to the Network Operation Center of Inmarsat before the data will be directly sent to Inmarsat PoP--a gateway connected to the Internet--and eventually delivered to the Department of Fisheries by means of electronics, so that the government sector can monitor the data based on their objectives.

Inmarsat is an international organization comprising various country members worldwide which provide communication services for vessels, airplanes, and other vehicles travelling within the areas of 4 oceans [13] --Pacific Ocean Region, Indian Ocean, Atlantic Ocean Region West, and Atlantic Ocean Region East--between Lat. 70° N and 77° S, which covers most of the areas worldwide [12].



**Figure 1** The Figure Showing Operations in the Fleet Broadband System via the Inmarsat Satellite

**Table 1** Statuses of Rental Telecommunications Networks, Locations, Routes, and Connections

Lists	Details	Connection / Installation
Inmarsat Terminal	It functions as a satellite-based signal transmitter installed on fishing vessels. Fleet One will send data to the Inmarsat satellite.	It is installed on the vessel of service users.
Satellite Inmarsat	It is an Inmarsat satellite signal which receives data from the vessel to process.	It sends data on the vessel to the Land Earth Station (LES) through Inmarsat satellite signals.
Land Earth Station	It receives the vessel data and locations from the Inmarsat satellite.	It sends the vessel data to Inmarsat Network Operation.
Inmarsat Network Operation	It functions as a server transferring data, sent via the Inmarsat satellite, from the Land Earth Station (LES).	It sends the vessel data to the Solution Provider (Server).
Solution Provider (Server)	It functions as a server receiving the vessel data from the Inmarsat Network Operation.	It processes data in the server system and sends the data to be displayed in the form of web applications and mobile applications, so that the vessel owner or Fishing Vessel Control Center is able to monitor vessels through websites or mobile phones.
User Monitoring	It receives vessel data from the Solution Provider.	It is the web application which the vessel owner uses for tracking vessels or telling vessel locations. It can be in the form of websites and mobile applications.

## 8. CONCRETE ACTIONS

Because of Thailand's problems with illegal, unreported, and unregulated fishing, there should be some concrete actions to tackle illegal fishing. This requires cooperation from every related sector to carry out the following activities:

- **The service providers should ensure the availability of technology** by developing the technology to provide data communication via satellites for tracking fishing vessels and every vessel related to fishery operations, under the scope of a Type I telecommunications operation license which has already been authorized. Here, foreign communication satellites such as Inmarsat, Iridium, and Thunraya which are the satellites in the same group previously granted for providing VMS can be used. Moreover, the Electronic Recording and Reporting System (ERS) and Electronic Monitoring System (EM) have to be developed. Also, there should be the provision of Fleet Broadband to transfer high-speed data via satellite networks through the Internet channel and the transfer of data through web applications and mobile applications, as determined by the service providers.
- **Improve and create laws** with the primary aim of tackling illegal fishing and supporting sustainable fishing industry. Here, we must carry out 5 strategies which are as follows: licensing system, fishing vessel investigation system, vessel investigation, traceability system, and effective law enforcement as well as the method of putting laws into practice. Besides, the

government sector has to come up with a manual to create understanding and knowledge for fishermen.

- **There must be some execution to follow up, monitor, and investigate** both the granting of new fishing licenses and the development of Vessel Monitoring System (VMS), so that local centers can be coordinated to enable the effective monitoring and investigation of illegal vessels. This includes the appointment of an observer on board to observe all activities carried out on the fishing vessels operating outside the waters, formulation of a Fishery Management Plan (FMP) by setting aside fishing areas between local fishing vessels and commercial fishing vessels, increased strictness in investigating the correctness of granting a Catch Certificate (CC) and a Processing Statement (PS) for every factory filing the application to sail a cargo vessel. Such a vessel must be certified under the EU's name list. Moreover, several competence enhancement projects such as knowledge training for observers on board, knowledge training for officials working in centers, and production of working handbooks for related officials must be undertaken.
- **Enforcement laws** on fishing vessels and in marine animal processing factories. As for the enforcement of laws on fishing vessels, there must be a special integrated working group that investigates and enforces the laws by interdisciplinary means, based on EU's regulations.
- **Seek international cooperation.** In deterring illegal fishing, there must be some close cooperation among alliances: countries, government organizations, public-private partnerships. Also, there should be 1) a Memorandum of Understanding (MOU) regarding fishing activities and labors made among neighboring countries, Pacific Island countries as well as EU member countries. Regarding to this, 2) International organizations such as Greenpeace, Environmental Justice Foundation (EJF), and International Labor Organization (ILO) accept that Thailand has taken efforts to tackle illegal fishing and given importance to supporting the investigation of vessels as well as encouraging labor standards.
- **Provide help for the affected fishermen and fishing laborers.** The Thai government determines to help the people who fall prey to human trafficking. There should be some discussion among all related sectors to differentiate characteristics of commercial fishing vessels from local fishing vessels, so as to help local fishermen survive in the business.

## 9. SUMMARY

The problems arising from illegal fishing can be tackled and improved. Though the current affected group is the commercial vessel operating fishery activities illegally, such as using devastating fishing equipment, push nets, and trawl nets; local fishery can survive the circumstance and do fishing activities without being lessening the chance of making use of marine resources. In the meantime, problems concerning vessels often include holders of illegal licenses, but some current punishment strategies include just restriction of rights to operate fishing activities. Therefore, in case they insist not to improve the vessels to be in line with the laws or restrictions, the government sector should not grant absolution or allow such vessels to operate again.

Besides, power-generating vessels, trawlers, and pushers, which are illegal and deplete marine resources should be conscientiously eliminated from the Thai waters. This is considered a sustainable way of reformation, tackling the problems concerning the EU and steadily facilitating the restoration of declining marine resources.

Furthermore, though some serious concrete actions have been taken to tackle such problems, there may be some severe damage caused to the nation in case the laws fail to be strictly enforced, such as Thailand's case of illegal fishing vessels. Therefore, the reformation of bureaucracy and law enforcement is considered very necessary. Also, there must be some revolution of people's point of view, so that they will abide by the laws since this is considered a very vital part for Thailand's sustainable reformation in the future.

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