

## Free Trade Area of Kenyir Lake: Potential of Developing Framework for Waterway Routes and Traffic Separation Scheme

<sup>1</sup>Madzli Bin Harun, <sup>2</sup>Wan Mariam Binti Wan Abdullah and

<sup>3</sup>Tengku Muhamad Hamdan Bin Tengku Zainuddin

<sup>1</sup>Department of International Trade Policy and Law,

<sup>2</sup>Department of International Law of The Sea,

<sup>3</sup>Department of Maritime Management, Universiti Malaysia Terengganu,  
Kuala Terengganu, Malaysia

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**Abstract:** Kenyir Lake is an artificial lake created in 1985 which is located in the state of Terengganu. It is rich with landscape attractiveness and biodiversity. With the recent introduction of Free Trade Zone (FTZ) at Kenyir Lake, it will indirectly affect the natural ecosystem and a cause for safety concern with passenger boats transporting tourists to islands hosting the free trade zone and other attractive islands. With the absence of a single management authority to regulate the movement of the waterway transports and conservation of its natural resources, it is a grave concern for the state to consider immediate action to avoid foreseeable damage to Kenyir Lake. This study aimed to examine the potential of formulating waterway route and traffic separation scheme at Kenyir Lake. Using qualitative method of SWOT and PES analysis, this study will look into the need of waterway route and traffic separation scheme at Kenyir Lake. In conclusion, a designed systematic waterway route and traffic separation scheme as well as a single management authority seem to be very important to curb the deterioration of the natural ecosystem and to minimize accidents between the waterway transports. The waterway route and traffic separation scheme will also support the development of FTZ.

**Key words:** Water transport, waterway, traffic separation scheme, Kenyir Lake, free trade zone, support

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### INTRODUCTION

Kenyir Lake is an artificial lake located in the state of Terengganu created in 1985 to generate electricity by creating the Sultan Mahmud Hydro Electric Power Plant. The Kenyir Lake which spans 65,417 ha with 340 islands hosts to many fauna and biodiversity, attracting tourist to explore its natural beauty. Waters transports such as boats and houseboats licensed by the local council are used to transport tourist to destined islands. The largest man-made lake in Southeast Asia is now being aggressively developed by the state government as a Free Trade Zone (FTZ) which will become another attractive location in the state that will be developed as the best tourist destination in the Asian region in the quarter of 2016. Pulau Bayas will be developed as a FTZ and few other islands are also to be developed such housing projects, a duty free complex and 10 parks namely: Bird Park, Orchid Park Butterfly Park, Botany Park, Rambutan Park, Heliconia Park, Ecopark, Cactus Park and Grape Park.

With this new development, the transportation modes will be increasingly important and the lake will become busier. It is expected that bigger passenger boats will be hired to transport tourist to the island hosting free trade zone and other islands. Although, the existing boats are licensed from the local council and their activities are being monitored, there is no specific waterway route prescribed to the boats and houseboats. No written regulation to the manner of how boats navigate through the lake have ever been synchronised. A question arises whether the lack of the regulation is caused by the absence of a single local authority to manage the lake. The objective of this study is therefore, to examine potential of formulating a waterway route and separation scheme to the Kenyir Lake and to identify whether there is a need for a single local authority to manage the lake.

**Literature review:** It has been generally, agreed that industrial and urban development caused large-scale environmental degradation to the lake water. Kenyir Lake itself witnessed the alarming increase of e-Coli and

one of the contributed reasons was the houseboat without proper sewage system. It has also been reported that, strong thermal stratification with an anoxic hypolimnion during dry and wet season which may significantly affect to the biodiversity of fish at the Kenyir Lake.

The attractiveness of Kenyir Lake is largely placed on its natural beauty. While development is necessary, it is however a primary concern for ecotourism development to minimize the negative environmental impact and protect the natural resources from degradation. In fact, natural resource had a positive influence on community and tourism.

When Kenyir Lake is developed as a FTZ, volume of waterway transports are expected to be significantly increased. There were several old literatures established the importance of waterway in busiest lake and river (Bauer, 1988; Bruch and Bond, 1999; Mainguet and Baye, 2006). Waterways continues to be critically important to the transportation of people and goods throughout the world (Akaso *et al.*, 2011). At the same time, the speed and low cost of transporting goods by water influenced the locations of population settlements near navigable water (rivers, lakes, canals and oceans) (Vidal, 2009). For waterways, traffic separation schemes and other ship routing systems have now been established in most of the major congested, shipping areas of the world and the number of collisions and groundings has often been dramatically reduced.

## **MATERIALS AND METHODS**

The data obtained in this study are collected from structured interviews with the officers from some countries, the main developer of Kenyir Lake, Hulu Terengganu District Council, the local council who license the boats and houseboats, Unit Perancang Ekonomi (UPEN), the founder of the Kenyir Lake and FTZ, Jabatan Pengairan dan Saliran who has responsibility to the affair of Kenyir Lake and boat and houseboat operators. The data are analysed by using two methods to prove the importance of waterway route and Traffic Separation Scheme to Kenyir Lake. The methods used are PESTL and SWOT analysis. SWOT analysis is a structured planning method used to evaluate the significant internal (strengths and weaknesses) and external (opportunities and threats) factors involved in the research. PESTL analysis is a term used to describe a framework of macro-environmental factors used in the environmental scanning component of strategic management. This analysis focuses on the effect of the research towards political, economic and social, technology and legal.

The aspect of strength is used to analyze the abilities of waterway route to be used by users. The existing waterway route need to be identified and examined. Meanwhile, the weaknesses aspect describes about the problems arise at the existing waterway route at Kenyir Lake. The major problem that was identifies was there is no specific authorities monitoring the waterway route. According to the officer at Marine Department at Kuala Terengganu, the authority that is responsible to monitor the Kenyir Lake is Hulu Terengganu District Council. Kenyir Lake should have its own authority to monitor over the waterway route to ensure t safety of the users and the transportation modes do not damage the surrounding biodiversity. Opportunity refers to the establishment of FTZ which requires new regulation regarding to the waterway route and traffic system at Kenyir Lake because these area will become congested once the FTZ is launched. Threat that has been identified as danger to the passengers and all the users due to absence of traffic system at Kenyir Lake. Traffic system is very important to ensure safety of users.

Political factors are basically to what degree the State government intervene in supporting the development of waterway route and traffic separation scheme at Kenyir Lake. Economic factors include economic growth interest rates, exchange rates and the inflation rate. With the development of FTZ, it is expected to increase the economic factors to the State and to the community as a whole. Social factors include the cultural aspects and health consciousness, population growth rate, age distribution, career attitudes and emphasis on safety. The communities near the Kenyir Lake will improve their life with the job opportunity. Technology factors include the incentives that will help to improve the waterway route and traffic separation scheme to reduce accidents and conserve the nature. TSS will be controlled by using a monitoring system called vessel traffic service, a monitoring system established by harbor or port authorities, similar to air traffic control for aircraft. Legal factors is the need for regulations to manage the waterway route and traffic separation scheme as well as the waterway transports.

**Data analysis:** In this research, SWOT analysis and PESTL analysis will be combine and relate to each other. According to research designs which have been explaining detail about what is SWOT and PES analysis. The explanation will continue and will try to relate between strength, weakness, opportunity and threat factors with the political, economical, social, technology and legal factors.

The aspect of strength is used to analyze and to improve the abilities of waterway to be used by users. The existing waterway needs to be identified and examined. This existing waterway is very important because traffic separation scheme that is intend to be created need to use the existing waterway. Strength refers to Kenyir Lake existing waterway that is use by houseboat at Kenyir Lake to move from one island to another.

The strength and opportunity factor seems to be relating to each other. With the establishment of TSS, there will be required of job opportunity to the communities around Kenyir Lake. Apart from that, the FTZ that will be launched will help communities to improve their life even more. Furthermore, the economical factor has merge from these job opportunity creates by the TSS. Economical factor is about the economy of the communities around the focus area. Hence, not only the tourist and boat operators but the communities also will get the benefit from the formulation of traffic separation scheme.

Weaknesses are also include in the internal factors which is related closely to the lacking of authorities whom is responsible to monitor the waterway and boat at Kenyir Lake. This involve political aspect which is government is not interfere in this problem. Clearly, till this day, there still no agency that is specifically in charge in monitoring and regulate the area of Kenyir Lake regarding the waterway itself. The lacking of authorities in monitoring and regulating the waterway is one of the causes that the waterway have no traffic lane to regulate the waterway. This will eventually cause the waterway to be congested in the future when FTZ is establish.

This factor which is weakness and threat is related to each other. The weakness that has been identified at Kenyir Lake is lacking of authorities that monitoring over the entry, the exit and the waterway itself. Weakness factor relate to the political factor which require intervene from the government. Several problem will arise because of this situation. There is no one to fully regulate the activities at Kenyir Lake. Hence, this will cause the environment at Kenyir Lake affected because there was only signboard that try to regulate people. If someone are about to pollute the natural surrounding at the area, they will not be hesitate to do it because no action will be taken on him. For the threat factors, danger will cause upon the users of the lake because there is no traffic separation scheme to regulate the boat to prevent collision such as collide front to front. This case will be happen if there are no further action taken by government.

## **RESULTS**

**SWOT and PESTL:** The methodology chosen for this study is the qualitative methods for analyzing information

obtained from the relevant agencies and stakeholders. Therefore, the information obtained from field work which refers grounded theory. For which a detailed study was conducted through personal interviews (open ended questionnaire). It aims to get answers about their views, experience, knowledge and ability as an expert. Such an interview is particularly important to assess the extent of the information obtained from stakeholders will answer the questions and problems of this study.

An analysis of this study is divided in two, namely the nature of the internal analysis and external analysis. In this case, the SWOT method will be applied to analyze the elements of strength, weakness, opportunity and Threat. Therefore, for internal analysis, it revolves around strength and weaknesses of the study. As for the external method will be discussed referring element opportunity and threat. Indeed, this method is very helpful for direct practice of setting the traffic separation scheme in the lake. SWOT analysis serves to assess the extent of the requirements of Article 10, Law of Ship Collision to be transformed into lakes water transportation. In fact, to assess the need for the use of Legal and Technical Traffic Separation Scheme (COLREGS), the strategic analysis have been used, PESTL Analysis. In this case, the review process will focus on the elements of political, economic, social, technology and legislation. PESTL is important to evaluate to what extent the rule in COLREGS is useful to the stakeholders involved.

**Internal analysis:** Internal analysis will seek to obtain the strengths and weaknesses of consumerism boats operating on the lake. Then, the study will range from the obligations under the boat operator. Indeed, the potential for the introduction of operating a boat in the lake will be viewed in terms of its strengths and advantages that relate to the capacity of the responsibility of the boat operator and the authorities in the lake.

**Strength:** Aspects of force used to analyze and to increase the capacity of the lake to the waterway used by passenger boats, house boats and boat trailers. Therefore, the existing route is impractical because no thread safe passage in the operation of the boat around the lake, then this study will identify in particular the safe passage through the waterway detection method that touch on the depth of water, the safety route, topography island the island to prevent the occurrence of a boat collision in the narrow passage. Indeed, the water in the lake is very important because the traffic separation scheme which is intended to be applied in the lake to create comfort for the operator of the boat where the use of these routes is increasing as development in an integrated manner in a lake environment will exist primarily for the development of future FTZ Tasik Kenyir. With the existing capacity of

the lake area, it will contribute capacity on the lake water is used wisely to ensure the welfare of the water in the lake system. This will strengthen the natural state of water transport consumerism is increasingly important. According to the operator of houseboats on the lake, Mr. Razak Ismail, he said that there are 340 islands in the lake. Therefore, there are several routes that can be used for each island. The main reason for boat operators using different routes because of the draft of the lake water often change over time and with trees block the path of the existing stack. Therefore, it is necessary to steer the boat operator with caution to avoid boats from colliding with a tree floating pile and incredibly dangerous. With the knowledge and experience of the operator of the boat is very familiar with the routes of water in the lake, a new route can be developed to apply as TSS. Then, the route of Bayas Island and Pulau Poh possible to formulate it as a new lake water routes. It certainly would support the establishment of the FTZ in the lake by the state government, it will be a force to Tasik Kenyir when TSS has been applied in the lake water lines later.

**Weakness:** Whereas in assessing the vulnerability of existing aspects, it will directly unlock the problems that exist in the path of the existing lake. Therefore, the main problems occur in the lake route is no effective enforcement route by boat operator, this means that rigorous monitoring and efficient and conscientious should be preceded. Hence, the existing narrow paths with trees old trees that often hinder boat traffic will potentially apply collision boat on the lake. Thus, the application of the rules of TSS as an appropriate method to prevail as a rule can only be applied TSS which are declared narrow paths. According to officials at the Marine Department in Kuala Terengganu, the authorities responsible for monitoring the lake is Hulu Terengganu District Council. However, no specific authority responsible for controlling the transport routes in the lake because Hulu Terengganu District Council only has the authority and responsibility for dealing with licenses and permits to the boat operator. So, in this case, the lake should have extensive authority to monitor the operation of the route to ensure the safety of multi-modal transport in the lake. Weaknesses are related to political factors and the law. For political factors, the causes of the lack of authority is that the government does not intervene in the matter of inland water transport as a whole and no law enforcement agencies really have experience and be able to control the safety of transport on the lake. No detailed monitoring and systematic form, otherwise it will invite the occurrence of a collision. Added to that when the free trade zone will soon be operational but until now no

specific authority to control the lake specifically. This situation must be undertaken promptly to avoid any risk in future. This is because the lake is now very popular among tourists as a destination for aquatic tourism. So, it is important to have an effective power for the operation of a comprehensive monitoring of the technical and legal aspects of the operation of the waterways in Lake Kenyir. According to Mr. Junaidi Hashim of the state Economic Planning Unit (EPU), the state government is planning to create a new enforcement agency to take care of all the activities at the lake include water route to ensure the safety of the boat operator. The new authority called the Development Council of Lake Kenyir.

In fact, factors such as legislation on existing waterways that are not regulated because there was no power and no expertise. Actually, the new agency will be established will be responsible for ensuring that waterways are safe for the boat operator. Route traffic is very functional to regulate waterways and to avoid any accidents from happening involving three capital transportation system. As such, agency and governance as well as legislation and regulation of ship collisions in the lake must be designed and established to ensure a controlled waterways.

**External analysis:** While the external analysis was used to assess how the external factors will contribute for the opportunities and threats to the existence and the drafting of a new governance and TSS regulations and legislation that is more comprehensive and integrated.

**Opportunity:** There are some new opportunities in particular for overseeing the operations of the FTZ boat traffic when it opens. Opportunity is meant is to enact traffic in the waters of Lake Kenyir that cramped and crowded in the absence of a strategic control is performed. Therefore in order to prevent congestion from occurring, traffic routes in the lake is a must to formulate and implement the traffic separation scheme. Traffic Separation Scheme will help to technically enforced and regulations with fully supervised by the agency concerned. Likely at the beginning of the introduction of this regulation, it may seem odd for water traffic lane is mainly to boat operators but boat operators will realize the benefits of the traffic separation scheme that facilitates their work and ensure the safe operation of the boat and safety of their passengers.

In fact, opportunities are also concerned with the use of communication technologies that can detect traffic irrigation practical movement of boats around the lake supported a comprehensive traffic regulations enforced traffic for later. The introduction of technical methods has

benefited TSS will be swift and safe movement through the GIS system (detecting boat traffic for improved communications technology) and high-tech radar. Therefore, to support these technologies, then the matter should be taken into account because the tools used by all boats operating on the lake and so on may be contained in the TSS regulations. Therefore, the operating system will change the air transport of the traditional route or the normal route traffic to a separate route for passage in and out of Gawi Jetty to Pulau Bayas through TSS system concerned. This is because the TSS is under rule 10 of the rules adopted under the Collision Regulations stated that, a comprehensive and solid relation with regulatory requirements and the methods used for technical TSS.

According to Ketengah manager in 2006, the number of tourist visits the lake is about 60,532 people. The number of visits increased tenfold in 2014 to about 645,953 people to visit and this increase is due to the establishment of the free trade zone of the lake. This indicates that the traffic separation scheme should be formulated as soon as possible in order to avoid congestion on the waterway from the lake. Congestion will increase the probability of an accident occurring. The formulation of the traffic separation scheme should continue to ensure that congestion comes to strategically controlled. In fact, this is a good opportunity to formulate the Traffic Separation Scheme in the lake because of the free trade zone which will open later would impact the increase in passengers to these destinations and if you do not take the first step by the government to control congestion untoward incident happens, according to officials from the Marine Department, Mr. Saiful that the process for creating the TSS to Tasik Kenyir inland waterways have positive consideration to be adapted and it is one that is not impossible. Only the relevant agencies is important to monitor and maintain most of the technical aspects and regulations applicable TSS. This is because so, it's not just apply but give impact to the boat operator and the safety of all parties. Indeed, TSS can be summarized as the separation between the two lanes of the opposite direction to have a separate line separating the lanes.

Formulate TSS, the first thing to do is to make measurements of the water depth. Minimum draft of water is dependent on the boat that will operate in the area. Typically, the TSS need water depth of about 25 m to avoid a boat or ship aground. In Tasik Kenyir, the minimum draft of water about 30 m. Channel navigation should be established to assist the boat through TSS to prevent accidents from happening. To that end, release a will be sent to every boat in the channel navigation to

inform of any relevant information regarding trafik paths and lanes. Vessel traffic system to be set up around the lake to help the boat is being operated at the time. VHF-FM communications network is an important cornerstone of most major transportation services on the lake. Ships transiting make a report to the center position by radiotelephone ship traffic and thus provide information on the safety of navigation in an accurate, complete and timely. Increasing the range of radar, AIS and close circuit cameras for surveillance and computer-aided detection, similar to those in use in air traffic control, it will allow the VTS to play a more important role in the management of marine traffic, thereby reducing shipping congestion, meeting critical condition and the probability of future marine causing environmental damage. Then when opening Kenyir FTZ will provide an opportunity to apply directly for TSS comprehensive regulation of all boat operators with the technical support of the TSS system. When the number of boats increased as either a passenger boat, container boats and houseboats commodity then, it is a very effective opportunity to use the TSS system.

**Threat:** Through this study it was found that there was great danger that will happen if the TSS system was not introduced to prevail in this land water transport routes. Furthermore, it not only as a requirement but merely TSS shall also be used to address various problems that will exist when the lake will FTZ operations. Therefore, a threat that has been identified as a danger to passengers is if the traffic route allocation system of the lake was not understood by the operator operating the boat. The traffic system is actually very important to ensure operator safety boats are in safe and secure circumstances. Therefore, without any guarantee, then, the boat operators and passengers will be in a high risk situation towards a collision with either a collision between boats or tree and tree branches that appear on the surface of the lake. The next threat is related to the use of boats operating illegally without license around the lake. If it happens, it will cause the boat does not comply with existing TSS system at the time which will ultimately potential collision with another ship or boat is in operation. The increased when the boats are not aware of the TSS system and indirectly concerned irregularities.

The third threat is the feeling that matters had been identified is the lack of compliance or lack of compliance with the TSS system among users of the lake routes due to boat operators felt that they knew the movements of the boats around the lake. However, when inland water transport system is increasingly busy and congested. So, it will be exposed and at risk of a collision. Further,

according to Hood, "I learned about the traffic separation scheme in England where it is in use in the English Channel and the North Sea". In this area there is a tremendous amount without separation scheme delivery and shipping accidents are going to happen. In fact, "they essential, so that, even the captain of a recreational boat across the channel to France has received a heavy fine for failing to comply with the law". This indicates that the traffic separation scheme should be applied in crowded areas to prevent accidents from happening.

Referring to the views of Mr. Kamarul Zaman bin Muda, Administrative Officer in Ketengah, Gawi etty, he believes that there will be a house boat and a speed boat that does not have a license to operate in the vicinity of the lake and it is illegal because there is no power for the new agency that will appointed to monitor the lake itself. This is a significant disadvantage and when there is no one agency that has the power to harmonize inland water transport in Lake Kenyir. With the establishment of the free trade zone of Lake Kenyir, the customs authorities will be created by the state to cover all activities in inland water transport system of the lake including monitoring transport routes waterways and boats.

## DISCUSSION

**Introduction:** In this study will be discussing about the overall of the research that have been carried out. A brief review of the research is presented. In this part, all issues such as the research objective and research methodology will be discussed briefly.

**Issues of the research study:** The first issue of this study is to identify potential patterns of paths existing waterways in order to formulate a traffic separation scheme in the lake. The objective is to identify potential patterns waterway route through the existing observation and interviewing the stakeholders of boat on the lake. By observing the existing route of the lake and interviewing the boat in the lake, the answers obtained is positive. Waterways that have multiple routes that have been used by the boat operator. The reason behind this is more than one path is due to a heap of dead trees that block the passage of a certain time period are dependent on the draft water of the lake.

The second issue is to explore the potential traffic separation scheme regulations applicable to inland waterways of Lake Kenyir. The objective is to find out whether it is possible to apply the traffic separation scheme in the lake. According to officials from the Ministry of Transport, apply the traffic separation scheme in the lake is possible but to apply the traffic separation

scheme in the lake, good reasons should be stated. Because this study was to provide for acceptable and free trade zone which will be launched soon in the lake. With the launch of the free trade zone of the lake, the area will be crowded, boats and commodities will be overcrowded and measures should be taken to ensure that no accidents will occur in waterways of Lake Kenyir.

The last issue is to identify the authorities leading the establishment of inland waterways traffic separation scheme in the lake. The objective is to find the potential power that will be responsible for monitoring the Traffic Separation Scheme in the lake. According to there is still a certain power that is being monitored over the lake. Meanwhile, stakeholders Kenyir Lake is now on the way to creating new powers to monitor over the lake. The name of this authority is the Council of the Corporation of Lake Kenyir. Power is still in the process of discussion and collaboration with the state government.

This study used a SWOT analysis and analysis of PESTL. SWOT analysis is a structured planning method used to evaluate the significant internal (strengths and weaknesses) and external (opportunities and threats) factors involved in the study. Analysis STL is a term used to describe a framework for macro-environmental factors used in environmental scanning component of strategic management. This analysis focuses on the impact of research into political, economic and social, technology and legislation. Analysis of the two combined and used to determine whether an objective that can be achieved or not.

The aim of this study was to investigate the potential use of the traffic separation scheme waterways of Lake Kenyir. The results of this study indicate that the key success factors are internal factors and external. Factors major internal and external related and affect each other's existing waterways and the potential to formulate traffic separation scheme. With these two factors, the objective of this study is likely to be positive. This study presents the factors associated with the lake's waterways. This research has stated quantitative research methods describing all the waterways of the lake. In addition, this study has integrated the internal factors and external can be prohibitive but also can be the key to the success of the traffic separation scheme formulation of the lake.

**Great lake as a model for TSS scheme at Tasik Kenyir:** The Great Lakes are a potential model for the formation of the traffic separation scheme in the lake. The Great Lakes system including Lake Ontario, Erie, Huron, Michigan and Superior, their connecting waters and the St. Lawrence River. It is one of the largest concentration of fresh water on Earth. System including the St. Lawrence River to

Iroquois Dam has a total coastline of about 11,000 statute miles (9559 nm) a total water surface area of about 95,000 square statute miles (24.6 million ha) and a number of drainage basins statute of nearly 300,000 m<sup>2</sup> (77700000 ha) (Pritzler *et al.*, 2015). Navigable waterway stretching from the Atlantic Ocean in the Gulf of St. Lawrence through the St. Lawrence River and into the Great Lakes. It consists of channels through St. Lawrence, Detroit, St. Clair and St. Marys rivers, dug where necessary to provide adequate draft vessels. It also consists of canals and locks that allow boats to bypass rapids and falls in these rivers.

International Maritime Organization (IMO) is recognized as the only international body responsible for establishing and recommending measures at the international level about the route of the ship. In deciding whether or not to adopt or amend a traffic separation scheme, IMO will consider whether the scheme complies with the design criteria for traffic separation scheme and the rules established routes. IMO also, take into account whether the aids to navigation proposed will enable mariners to determine their position with sufficient accuracy to navigate this scheme in accordance with Rule 10, the international Regulations for Preventing Collisions at Sea (72 COLREGS).

The issue of low tide and high tide levels is necessary to know in depth by the authorities of the lake. Where it is understood that the water levels of the Great Lakes are subject to three types of fluctuations: seasonal, long distance and a short period. The annual seasonal fluctuations or covers a period of about 1 year, the volatility of long distance couple of years or more and short-term fluctuations of a few minutes to several days. And a variety of seasonal fluctuations usually affect the entire length of the lake while the short-term volatility is local in scope. The water levels of individual waters of the Great Lakes and their connecting evolving. To simplify the chart depth and vertical height, it became necessary to adopt a standard or fixed reference level for each lake in the Great Lakes system.

Another issue is related to aid navigation in US waters of the Seaway between St. Regis and the head of the St. Lawrence River is operated and maintained by the Saint Lawrence Seaway Development Corporation and described in US Coast Guard Light List. Buoys outside the station, the lights went out or does not work and other circumstances that are damaged should be reported immediately, through radio or other, to the nearest Coast Guard unit or to Massena Traffic Control Center.

Meanwhile, a Vessel Traffic Service (VTS) was established in St. Marys River. The service was established in order to avoid collisions and groundings, to protect improvements to the waterway and to protect

navigable waters from environmental hazards. Vessel Traffic Services Vessel Traffic Centre provides (VTC), voice dialing which can regulate the passage and movement of vessels with the movement of vessels, eyes, customizable reports and radio communication VHF-FM. These services include the one and two way traffic, the permitted and prohibited anchorage and the speed limit. Canadian Coast Guard Vessel Traffic Service operations (VTS) in Canadian waters of Long Point on Lake Erie with the Detroit and St. Clair River to De Tour Reef Light on Lake Huron. The service provides users with information on traffic conditions related to the prohibition of meeting space and information to the pilot, the Seaway St. Lawrence, the public, ship-owners and shipping agents.

**Kenyir Lake traffic separation scheme proposal:** To increase the safety of navigation, particularly in converging areas of high traffic density, routes incorporating traffic separation need to be adopted at Kenyir Lake. In the interest of safe navigation, it is recommended that through traffic use these schemes as far as circumstances permit by day and by night and in all weather conditions. In order to formulate traffic separation schemes, there are things that need to be consider such as the westbound and eastbound lane, water level, aids to navigation, vessel traffic service, vessel traffic centre, automatic identification system and light house.

**The commitment Vessel Traffic Service (VTS):** A Vessel Traffic Service (VTS) need to be established at Pengkalan Gawi and Pulau Bayas. The purpose of Vessel Traffic Services (VTS) is to provide interactive monitoring and navigational advice for vessels in particularly confined and busy waterways. There are two main types of VTS, surveilled and non-surveilled. Surveilled systems consist of one or more land-based radar sites which transmit their signals to a central location where operators monitor and to a certain extent, control traffic flows. Ships contact the VTS authority at predetermined, charted callin in points.

Non-surveilled systems consist of one or more calling-in points at which ships are required to report their identity, course, speed and other data to the monitoring authority. Vessel traffic services in the US are implemented under the authority of the ports and Waterways Safety Act of 1972 (Public Law 92-340 as amended) and the St. Lawrence Seaway Act (Public Law 358). They encompass a wide range of techniques and capabilities aimed at preventing vessel collisions and groundings in the approach, harbor and inland waterway phases of navigation. They are also designed to expedite ship movements increase transportation system capacity and improve all weather operating capability.

**The application of Automatic Identification System (AIS) in navigation system:**

AIS is an automatic communication and identification system intended to improve the safety of navigation by assisting the efficient operation of a Vessel Traffic Services (VTS), ship reporting, ship-to-ship and ship-to-shore operations need to be placed at Kenyir Lake. AIS is similar to the transponder in an aircraft which sends out a radio signal containing information such as the name of the vessel, course, speed, etc. This data appears as a text tag, attached to the radar blip, on systems designed to receive and process the signals. It enhances the ability of VTS operators to monitor and control shipping in busy ports.

**The importance of aids to navigation:** Aids to navigation in the lake proper set up. It is a method of navigational aids (also known as aids to navigation, ATON or NAVAID) referring object types of markers to help navigation in the sea and can be used in the lake, this interpretation is commonly used to refer to nautical or air travel. As examples of the types of aid including a lighthouse. Each buoy outside the station, turn off the lights or do not work and other circumstances that are damaged should be reported promptly to ensure that such an accident could have been avoided. In fact, the lighthouse should be built around the lake to help navigate if navigational aids such as VTS is not functioning properly or is damaged. The lighthouse is a tower, building or other type of structure designed to emit light from a system of lamps and lenses and used as a navigational aid for maritime pilots at sea or on inland waterways. The lighthouse marks the coast is dangerous, hazardous shoals, reefs, safe entries to harbors and can also assist in aerial navigation. To date, no emergency markings as a reference by boats that operate around the lake and it is weighted for regulatory agencies to build a structure called the lighthouse.

### CONCLUSION

Indeed, the formulation of the TSS system was deemed necessary at this point to coordinate the progress and development of the FTZ as security surveillance inland water transport route which is currently not very functional, efficient and organized, FTZ until later when the lake will be open soon. Then, it will have a significant impact in which the role of passenger boats, boat trailers are increasingly important that there be a risk of collision. Therefore, the TSS system in legal and technical aspects needed to help risk will exist. Distribution routes around the lake will create will travel faster, safer and more

orderly. Thus, cooperation among relevant agencies and form a new agency is needed to oversee land water transport routes, coordinate any security measures should also be emphasized in a comprehensive manner. TSS system understanding through training should be given to the boat operator that they are competent to handle the TSS system of technical and legal aspects. This exercise is necessary to increase the capacity of each operator safety boots and so coordination is easier and more secure. The introduction of these systems at least TSS will help all stakeholders in line FTZ Lake. As a result investment in the FTZ will be increased because of the network of inland waterways strategic and structured as a pull factor in the FTZ investment because it has a strategic relationship orderly and efficient manner. Finally, the introduction of the TSS system would also create a new security scope in inland water transport which so far is not given due attention by the government and relevant agencies with transport and water. In fact, through the TSS system would also produce experts in the field of security in an integrated manner involving all the relevant agencies and new governance will be established as an agency that will supervise, control and coordinate the inland water transport system of the lake. If it is successful it will be able to become a model of any system of inland water transport in the country.

### RECOMMENDATIONS

Kenyir Lake have a huge potential to be the first one to establish traffic separation scheme at Lake in Malaysia. This research should be continued and extended to gain more information regarding the formulation of traffic separation scheme. The most critical aspect that should be considered before formulating traffic separation scheme is to find specific authority to handle Kenyir Lake itself. Without specific authority to monitor Kenyir Lake, Kenyir Lake will have difficulties to growth especially with free trade zone that soon will be launched. The area of Kenyir Lake especially around the area of Pengkalan Gawi to Pulau Bayas will be congested if government does do something about this problem. With the establishment of free trade zone Kenyir Lake, the illegal stakeholder will be increased if the authority of Kenyir Lake does not taking any action on the unlicensed boat operator and as famous place, image of Kenyir Lake will be affected if these case is not handled immediately. Besides that training center for the boat operators to learn on how to navigate correctly at traffic separation schemes need to be build and facilitate by expert to ensure that navigation at the waterway running.



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