

**YANGON UNIVERSITY OF ECONOMICS
MASTER OF PUBLIC ADMINISTRATION PROGRAMME**

**A STUDY ON PRIVATE SECTOR SERVICES IN
INLAND WATER CARGO TRANSPORT
(Case Study: Yangon-Mandalay Cargo Transport)**

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MASTER OF PUBLIC ADMINISTRATION PROGRAMME

A STUDY ON PRIVATE SECTOR SERVICES IN
INLAND WATER CARGO TRANSPORT
(Case Study: Yangon-Mandalay Cargo Transport)

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Master of Public Administration (MPA)

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This is to certify that this thesis paper entitled “**A Study on Private Sector Services in Inland Water Cargo Transport (Case Study: Yangon-Mandalay Cargo Transport)**”, submitted as a partial fulfilment of the requirement for the degree of Master of Public Administration, has been accepted by the Board of Examiners.

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ABSTRACT

This study was conducted to identify the services, capabilities and the challenges for private sector services in inland water cargo transport from Yangon to Mandalay. The respondents were 181 key stakeholders (67 shippers, 30 agents and 84 vessel owners) of private inland water transport. Data was collected using the separate self-administered questionnaires. The study found that the quality of services on private shipment is fairly good: cost effectiveness, providing timely service as per standard, experience on the incidence of loss/damage goods, but for which timely actions are undertaken and timely informed of service delay. The facility of ports and cargo handling system are not good. Challenges for shippers and agents are inconvenience of port operating, lack of machine cargo handling, insufficient warehouse at ports, no door to door service, and most importantly no regular goods flow in dry season. Major challenges are inadequacy of draught for navigation of Ayeyarwaddy River waterway, undeveloped infrastructure and facilities of ports along the Ayeyarwaddy River.

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
BIWTA	Bangladesh Inland Water Transport Authority
DMA	Department of Marine Administration
DWIR	Directorate of Water Resources and Improvement of River System
IFGRD	Indonesia Forum for Rural Transport and Development
IFCL	Irrawaddy Flotilla Company Limited
IWAI	Inland Waterways Authority of India
IWT	Inland Water Transport
JICA	Japan International Cooperation Agency
LAD	Least Available Depth
MOTC	Ministry of Transport and Communications
MPA	Myanmar Port Authority
MTPDP	Medium-Term of Philippines Development Plan
PUSTRAL	Center for Transportation and Logistics Studies
UNDP	United Nations Development Programme

CHAPTER I

INTRODUCTION

1.1 Rationale of the Study

Inland Waterway Transport (IWT) is an efficient, cost-effective, and environmentally friendly way to move bulk commodities over long distances. A major advantage is that the main infrastructure—the waterway is often accessible naturally, and must then be built, maintained and upgraded. Transport through waterways is particularly effective when waterfront areas are the source and/or destination.

This research attempts to assess the viability of IWT freight movement in Myanmar. For Myanmar, inland waterways are an important transportation route. Myanmar has an extensive network of rivers well placed to serve the main transportation corridors of the country, including the Yangon-Mandalay link. The nation has 6,650 km along major rivers with navigable waterways. Ayeyarwaddy River runs north-south in the middle of the country, with a 2,170 km long streamline. The river, whose navigable channel length spans 3,938 km, including many of the delta area's branch flows, provides waterways for freight and passengers. The waterways link Yangon city in the south to major northern cities including Pyay, Mandalay, and Bhamo.

The governmental IWT fleet has a capacity of about 100,000 tons and some 500,000 tons per year can be served by private ships. The IWT fleet is made up primarily of barges and mixed cargo and passenger ships. Because of the large private ships, IWT is currently facing financial problems. Developing inland water transportation is important to the national transportation system. It is aimed at the introduction of multimodal transport systems and the provision of reliable and efficient maritime logistics services.

Myanmar's river transport is largely underdeveloped. Given its large river network, shipping uses just 6,650 km and river transport moves just 5 percent of the total cargo volume. By comparison, the People's Republic of China's inland waterway systems account for 16% of the total freight moving in the country. In Viet Nam, which

has some 6,000 km of waters (about 30% is navigable), inland water transport accounts for 45% of 20 million tons of freight. There is room to expand the use of river transport in Myanmar. The river systems have an outreach to a great part of the country. More than 70% of the population has access to a river which provides a right of way at minimum cost. Development of the country's rivers for commercial navigation is a viable option.

Investments in transportation are often seen as crucial to economic growth by governments. Within this framework, private sector participation is integral to achieve government objectives. This helps to reduce deprivation by providing public infrastructure and services. Without sufficient transport infrastructure and services, various public measures aimed at reducing poverty cannot be effective. Historically, The State has provided transport infrastructure and services. The huge demand for investment, long gestation period and uncertainty of return is primarily responsible for the private sector's lack of interest.

As a result of private sector participation in the development of transport infrastructure and services, the most obvious benefit will be the expansion of transport infrastructure. In addition, private sector participation is expected to help upgrade the technology, improve the quality of infrastructure services and more effectiveness costs of services for both the service providers and service users.

1.2 Objectives of the Study

The objectives of the study are:

- to identify the services and capabilities of private sector services in inland water cargo transport
- to analyze the challenges of private sector services in inland water cargo transport such as ports' infrastructure and navigations from Yangon to Mandalay

1.3 Method of Study

This study used the descriptive method based on the quantitative methods. The structured survey questionnaire is used to collect the primary data through a sample of respondents including vessels owners, shippers and agents those who agree to participate in study. Then the self-administered questionnaires were delivered to the respondents who came to Inland Waterway Vessel Owners 'Association. Data

collection was done at this association located at 5th street, Lamadaw Township. A total of 181 (67 Shippers, 30 agents and 84 vessels owners) respondents completed the survey questionnaires. The secondary data is collected from the Department of Marine Administration, Asia Development Bank Report, JICA reports, and other countries reports (e.g. India, China), press and publications.

1.4 Scope and Limitations of the Study

This study focuses on the movement of cargo along Ayeyarwaddy River as well as on an assessment of private sector services in inland water cargo transport. In order to meet the objectives of the study, total numbers of 181 respondents were selected from the shippers, agents and ship owners. Cargo transport and passenger transport of state owned enterprise are not covered in the study. The study focus on private owned cargo transport services in inland water transport, merely cargo shipment from Yangon port to Mandalay port along Ayeyarwaddy River.

1.5 Organization of the Study

This study consists of five chapters. Chapter one introduces the study by highlighting the rationale, objectives, scope and limitations, method of study and organization of the study. Chapter two reviews the literature on cargo transport in inland water transport and other countries experiences. Chapter three is about the Inland Water Transport in Myanmar, the existing laws, rules and regulations of the government organization, the challenges for the private sector of water transport. Chapter four is the core of the study. In this chapter, the survey data are analyzed and the results are discussed. Chapter five is the findings of the study as well as recommendations.

CHAPTER II

LITERATURE REVIEW

This chapter determines the literature in the context of Inland Waterway Transport. The discussions examine the definition of Inland Waterway Transport, the role of stake holders and the role of private sector participation. This chapter discusses the impacts of the laws, rules and regulations of the governmental organization on the inland waterway transport and the economy of the country. Furthermore, this chapter include other countries' experiences of the development of private sector in inland water way transport and how they overcome their challenges.

2.1 Inland Water Transport

Inland waterway is a network in the form of rivers, canals, backwaters and creeks that may be used for transportation in region of or similarly to roads and rails. Through the ages, rivers have served as effective waterways, sporting people and items over long distances. Even today, many nations depend heavily on inland water transport, especially for big and bulky cargo, as it is cheaper, extra dependable and less polluting than transporting items by road or rail.

Inland waterway transport is one of the oldest economically and environmentally sustainable modes of transportation for passengers and cargo and in some areas the best way of mobility and get admission to simple services. The sector encompasses vessels ranging from simple non-motorized boats to noticeably automated pushers, running on waterways starting from small tributaries to foremost rivers.

The fact that inland water transportation gives the most economical, energy green and environmentally friendly method of transporting all styles of cargoes from place to vicinity. It additionally offered safe and less expensive transportation in areas with water-courses. This allows commerce, promote wealth creation, poverty alleviation and create job opportunities for the youths within such regions. The constructing industries also generate employment through lively engagement of the youths in welding and fabrication process (Gray, 2004).

2.2 Cost Effectiveness

Water transport can be a very cost effective opportunity to road transportation as the transport network already exists obviously and regularly calls for little improvement to be functional. Many industries together with construction, mining, and forestry depend upon low cost transportation through inland waterway systems to reach the market. For Rural Water Transport in particular, landing centers are often no longer required for small vessels and, if required, can be notably low-cost. Investing in small improvement of the water transportation system alongside the promoting of development to present means of shipping can be a very low-price and low renovation opportunity.

Operating price in inland transportation rely on the draft of the fleet, payload, transportation technology (motor barges, pushed trains). German literature data, calculations for Oder Waterway situations indicate massive influence of draft and payload. Draft and payload are closely related to the simple parameters of the fleet. The structure of the scale of the fleet in Europe for decades shows a clear upward trend in the fleet with a capability of extra than 3,000 tons. It uses driven barges with unique parameters from the currently built.

Internal waterways are reliable which they meet the minimal navigation requirements essential for the cost-effectiveness of the navigation. If this region is included in the intermodal shipping network, the increase in the percentage of inland waterway distribution in the supply bid marketplace can be achieved. A precondition for that is raising the extent of reliability of waterways and constructing the most important infrastructure project within the inland waterway shipping of the multipurpose. The preconditions for the inland waterway shipping marketplace are being created by way of the initiation of development cycles in Croatian river ports, the technological updating of the port buildings and items and the connection of ports to the main road-rail corridors. The River Information Services network, reflecting the center of IT interconnection and electronic information exchange, is an important factor in this process (Ministry of the Sea, 2008).

The load for a vessel's utilization rate is very significant, and this rate is strongly related to a vessel's round trip time. A short round trip time allows more round trips to be made in the same period of time. As a result, the cost of transportation is distributed over more transportation services and thus the cost of transportation per unit of load will be decreased. The passage time of locks and bridges (if they need to be opened) as

well as the handling and waiting times of vessels at ports are the key determinants for the round trip time. In addition, bridges can also affect IWT transport's cost efficiency, as bridge clearance can limit the number of layers of containers that can be transported. The geographic route of an IWT service and the terminal's performance will therefore impact the cost efficiency of IWT transport (Bart, 2015)

Inland waterway transport is the competitive alternative to road and rail transport. In particular, it offers the environment-friendly alternative in terms of both energy consumption and noise emissions. Its energy consumption per km/ton of transported goods is approximately 17 % of that of the road transport and 50 % of rail transport. In addition, the inland waterway transport ensures a high degree of safety, in particular when it comes to the transportation of dangerous goods. Finally, it can help decongest crowded road networks in densely populated areas (Putz , 2016).

Water transport is the most cost effective and the fuel efficient mode of transport. According to estimates, one liter of fuel can move 24 tonne-km of freight by road, 85 tonne-km by rail and 105 tonne-km by IWT. Also, government figures establish the fact that a shift of one billion tonne-km of freight to IWT will bring down the fuel cost by about INR 250 million and the cost of transportation by about INR 450 million. Inland waterways especially makes a strong case for transportation of bulky and heavy materials likes steel, iron ore, coal, cement and fertilizers etc. which occupy large volume. These materials are usually transported in large quantities with high shipment capacity. Fuel consumption per tonne of freight shipped by water is only 15% of that of road and around 54% of that used by railways (Sharma, 2017).

With regard to the specific energy use, inland navigation can be described as the most effective and most environmentally friendly mode of transport. An inland vessel can transport appropriately four times more than one ton of freight than a truck using the same energy consumption. The environmental cost of inland navigation, i.e. the risk of atmospheric pollution, air pollutants, injuries and noise, is the lowest relative to other modes of transport. In comparison to other modes of transport, CO₂ emissions are especially low and this enables inland navigation to contribute to the achievement of climate goals set by the European Union.

The infrastructure costs consist of costs for building and maintaining transportation routes. Natural infrastructure is generally available for inland navigation, resulting in comparatively low infrastructure costs. For Germany, detailed comparisons

of issues concerning inland modes of transport are available: infrastructure costs per ton-kilometer are about four times higher.

In Germany, Danube navigation has significantly higher transport capacity per unit of transport compared to other land transport modes. A single convoy of four pushed lighters will move 7,000 tons of goods, equivalent to a load of 175 railway wagons with 40 net tons each or 280 trucks with 25 net tons each. As a result, the amount of goods shipped on the Danube has increased. (Putz , 2016).

2.3 Private Sector Participation

Investments in transportation are often seen as crucial to economic growth by governments. Within this framework, the participation of the private sector is crucial to the achievement of policy objectives. However, the private investors exhibit a cautious attitude towards this type of investments. The financial and regulatory disadvantages discourage investment in private transport. The availability and the structure of transport financial mechanisms should consider and respond to the needs of private investors. Therefore, regulatory requirements are advocated as key levers for governments to encourage investment and attract participation from the private sector. The total amount of infrastructure investment required to sustain economic growth in OECD countries, given the temporal horizon of 2030, is estimated to be above \$50 trillion, and although the majority of these future investments are anticipated to be funded by the private sector, the level of private transport investment is still insufficient (Panayiotoua, Meddaa, 2013).

Private investment in transport has always been part of the financial system, but new developments have started to expand on the market in recent years to encourage private transport financing. In the early 2000s, an investment vehicle known as Infrastructure Funds, first developed in Australia in the mid-1990s, gained recognition in Europe and North America in response to the need for an alternative grouping of investments following the financial crisis of the early 2000s and the availability of cheap debt. Because of its specific investment characteristics, infrastructure began to emerge as a new asset class that could deliver steady returns and better diversification benefits (Inderst, 2009). The World Bank (2011) has claimed that ‘Investing in infrastructure is the fastest way to stimulate growth and employment’. The new structured finance technology and the large number of financial instruments available on the market give governments many financial tools that can be customized and fine-

tuned to achieve effective results. However, the private sector does not actively seek to invest in the infrastructure (WorldBank, 2011).

World Bank data shows that the cumulative total of infrastructure sector investments with private sector involvement in all developing countries amounted to about US\$ 754 billion between 1990 and 2001. Within that period, private sector involvement in infrastructure development increased dramatically between 1990 and 1997, but declined gradually from its 1997 peak as a result of the financial crisis that began in mid-1997. The global analysis of private activity in developing countries showed that in Asian developing countries (excluding Central Asian countries) about 33 percent of total investment was made. Seven of the world's top 10 countries, Asia, China, Malaysia, the Republic of Korea, the Philippines, Indonesia, India and Thailand (in that order according to size of investments) received a total commitment of approximately US\$ 236 billion, representing approximately 95% of total investment in Asian developing countries. During the period 1990-2001, the transport sector's share of private participation in all developing countries was 18%. Although total investment flows to developing countries in South-East and East Asia fell slightly between 2000 and 2001, investment flows to the transport sector in those countries grew from \$5.4 billion to \$7.5 billion in the same period. (Quium, 2003).

Nevertheless, resource constraints are not the only reason to encourage the involvement of the private sector in transport sector growth. Improving the quality of transport operations is also considered necessary. As a result of private sector involvement in the development of transport infrastructure and services, the number of benefits will increase. Expansion of transport infrastructure will be the most obvious benefit from it. In addition, the private sector participation is expected to help upgrade the technology, improve the quality of infrastructure services and lower the costs and prices of services.

In the development of transport infrastructure and services, it is generally not easy to associate the private sector. In addition, the degree of performance varies from one sub-sector to another in this regard. In what follows, the government's policy measures to include the private sector in the development of various transportation subsectors, which are highlighted and the current situation regarding the involvement of the private sector is reviewed. The development of the transport sector is a prerequisite for sustained growth of the economy. Availability of adequate transport services is also a key to encouraging foreign direct investment. It can be pointed out

that an enhanced transportation network has played a crucial role in becoming China's largest recipient of foreign direct investment.

In assessing the role of the private sector, a distinction is made between infrastructure and services. The long-term goal is to provide all modes of transport with open access to fixed infrastructure and engage the private sector in providing infrastructure facilities. With this in mind, in order to develop transport infrastructure and services, market principles are being applied. Budget funds are used to increase the attractiveness of private investment in fixed infrastructure (Puri, 2003).

2.4 Safety of Navigation

Establishing, maintaining and improving safe and reliable inland navigation conditions is a government's ongoing mission. The aspect should be analyzed separately regarding the type of cargo and the expected growth in demand of dangerous goods transport. Although the number of accidents in Croatia has not been significant over the past five years, the expected increase in traffic and the consequent increased risk of accidents and the impact of potential incidents on the water require a higher level of the existing level of safety. In order to reach this in Croatia, besides the implementation of the River Information Services and the availability of timely and accurate information regarding the movement of vessels, It is important to establish specific guidelines for actions to be taken in the event of incidents and to upgrade existing marking and monitoring systems for inland waterways navigability (Ministry of the Sea, 2008).

Kuldeep Sharma suggested that the basic need for the Inland transportation is sufficient water flow. Over the years, water levels have been reduced due to industrial, agriculture and housing, which may also have decreased due to the impact of dams on the rivers. Due to insufficient depth of the water channel, large vessels cannot pass through the rivers without adequate water. This along with the seasonal dependency of rivers makes difficult to operate many ports (Sharma, 2017).

For river training, dredging and navigation, the criteria are required that the river is trained and provides adequate depth to the draft of the vessels required to travel on it. It is possible to maintain the necessary depth for certain types of riverbed and may require regular maintenance of banks and dredging of the riverbed. In India, the principle of IWT commits to maintain a draft of (2) m along the National Waterways throughout the year. This is not found to be the case in practice. One possibility is that by evaluating the commercial traffic potential on each waterway, it is usually

strategically justified to provide this draft on appropriate channels. The other alternative is for operators to design a practical (1.5) m draft if this is operationally viable. Channel markers, night navigation aids, including the potential installation of GPS and river maps and navigation charts are the navigation criteria. The National Institute of Inland Navigation in Patna was set up to monitor this development through the use of appropriate technology (Praveen, Rajakumar, 2015).

Due to geographical prerequisites, countries may have a lot or little available waterways. At a global level, China and Russia have the most available navigable waterways. Therefore, due to the availability of navigable waterways, inland navigation prerequisites vary at continental and country level.

Its political importance is another factor affecting the use of inland waterways as a mode of transportation. In Europe, inland waterways are important for freight transport. The European Commission aims to strengthen inland navigation through a variety of measures such as promotion programs and cost benefits. In China, The movement of water can also be viewed as a very important part of freight. For many years, inland waterways have been the most important mode of transport and consequently of economic importance. In contrast, inland waterways in Brazil are not an important transport mode and waterway management is very inefficient (Putz , 2016).

2.5 The Development of Infrastructure and Inland Ports Performance

The inland waterway transport infrastructure consists of the waterways with associated buildings, objects and equipment for safe navigation, ports and quays. Its management and development are specified by multiannual development plans (Ministry of the Sea, 2008).

Economic development of the IWT is closely linked with the development of the infrastructure. Expected developments of inland ports have a significant impact on improving the transport net serving the area surveyed four regions. This phenomenon will result into improved routes passing through the region, and this will increase the interest of entrepreneurs in the area. The increased interest in the business will increase the level of employment among local residents, but also expand their career choices. These situations will contribute to increasing the level of citizen satisfaction, but also increase the level of wealth and economic development in the region (Nowakowski, et.al , 2015).

The inadequate inland ports and logistics system- The inherent disadvantage of IWT is the need for double handling. The inland ports play an important role in facilitating supply chain flows through the efficient logistics. Interfaces with other transport modes, such as roads and railways, are crucial to overcome the disadvantage of double handling. There is the evidence that the PRC's inland ports are not rationally developed and that port administration is cumbersome. The transportation system is organized by transport mode, and no single mode is focused on creating multimodal chains and seamless transfers at nodes that are needed to lower transport costs (ADB, 2016).

The benefits of investing in inland water transport infrastructure are not limited to travel-time saving that improved freight services lead to growing trade, followed by improved labor supply and technical diffusion. Some port of the USA, European countries, China and South Africa have observed significant impact of port activity on regional/national economies. Investments in physical infrastructure creates a better business environment and improves transport efficiency which facilitates export growth. The quality of port service, logistics costs, regional connectivity, hinterland condition and port accessibility contributes significantly to a port's competitiveness. A combination of port facilities, including sufficient investment, supportive government policies, excellence in operation and information technology can help a port attain sustainable competitiveness which will produce higher seaborne trade compared to the less competitive ports. The quality of port infrastructure has a positive effect on national economy mediated through logistics performance and seaborne trade.

Investment into transport facilities improves logistics ability and reduces freight costs. An increase in port efficiency from the 25th to the 75th percentile is expected to reduce shipping costs by 12%. Additionally, an efficient port system with enhanced logistic abilities is a key determinant of foreign direct investment into a country. On the other hand, inefficient ports reduce national and international trade and affect economic growth adversely (Wałkowska, Felski, Ptaszyński, 2019)

The development of the inland ports forces logistics infrastructure to adapt to the new structure of the flow of goods. There will be required investments in equipment handling, storage, computing, identity, etc. The impacts of the development of inland ports on the socioeconomic environment are presented in Table (2.1).

Table (2.1) The Economic and Social Effect of Activities of Inland Ports

The effects of activities of inland ports	
Economic	Social
<ul style="list-style-type: none"> – The economic revival in the districts lying on the ports area. – Development of companies cooperating with inland ports. – Increase the availability of products and services, transported by inland and maritime transportation. – New investments generating jobs - an increase in employment for the residents of regions. – Increase in budget revenues of municipalities in respect of the activities of the ports. – Increasing the area of the transportation through the development of transport infrastructure, road and railway leading to ports and other communication areas such as port facilities, marinas, and structures for water transport. 	<ul style="list-style-type: none"> – Increase of road and rail traffic in the area of ports. – Increase of industrial and traffic noise in the area of ports. – Increase of the region's road safety by reducing traffic (some cargo will be transferred to inland waterway transport). – Improving the quality of life through professional activation of local residents. – The inflow of young people to the region, interested in working in the port. – Reduction of emigration inhabitants of the surroundings. – Raising the "live ability" defined as the perceived level of satisfaction with life in the region because of the features that the place has.

Source: (Nowakowski, et.al, 2015)

The inland ports are the critical links in the supply chain and efficient port services are a prerequisite for IWT's competitiveness. The inland ports should be linked to the hinterland through a variety of transport modes and designed as comprehensive transport junctions linking production, procurement, consolidation, transport and distribution in order to improve overall utilization levels and minimize logistical costs. The scale and level of inland ports should be sufficient for their hinterland's economic development and trade volume, and ports should be designed with a rationalized architecture to be large-scale, standardized, and eco-friendly. Also, the different ports

should strengthen integration in order to create a relatively complete inland transportation system and coordinate their operations to form an operational unity (ADB, 2016).

The key issues are investments in national waterways and associated infrastructure. The proportion of traffic carried by IWT in India is very small. One of the reasons is the development of the road and the rail traffic, which have become very viable modes of transport. But the case can also be made that investment in the IWT sector has been small and compared to the other two. Worldwide experience suggests that strategic investments in some modes of transport can impact on overall costs and competitiveness. In this context, IWT can at least be examined for selective sector enhancement.

The general principle of government investment in such sectors is that it extends to infrastructure and activities outside a normal business domain. The large investments with the long term impact which are likely to be used by the numerous commercial entities are candidates for the government participation. The river training, including dredging, mapping of the river and providing navigational support are some tasks in this domain. Tasks such as the terminal construction and operation are viable for the private participation where appropriate. The private sector has the capability and will to invest in the barge ownership, operation and supporting services such as the barge building, maintenance and repair (Ranjaraj, Raghuram, 2006).

The specific policies are designed within the framework for each sector in order to meet the national goals and objectives (Puri, 2003). The promulgation of the policy directives suggests that the government has elevated the production of inland waterways as a strategic priority in the creation of a comprehensive transport system, and that technological innovations are essential to achieving policy goals. The benefits of inland waterway transport, the development of a new integrated transport system and the creation of a low carbon economy are paramount importance. (ADB, 2016).

2.6 Other Countries Experiences

In India, The Government of India is committed to the development of IWT as a viable and energy efficiency mode of transport. The Inland Waterways Authority of India (IWAI) was constituted in 1986 for the development and the regulation of inland waterways for shipping and navigation. The authority primarily undertakes projects for the development and the maintenance of IWT infrastructure on the national waterways

through the grant received from Ministry of Shipping, Road Transport and Highways. The Government has also formulated an IWT policy with the view to accelerate IWT development and encourage the private sector participation in IWT sector. Further, the States were given the liberal grant under 'centrally sponsored schemes' for the development of IWT mode.

In Bangladesh, IWT provides access to the basic socio-economic needs and services for millions of people as the cheaper and more accessible mode of transport. The importance of the national transport has been reflected in the national budget as it received the largest allocation of the annual development budget in 2000-2001 at 22%. The initiatives under the five-year plans of the Bangladesh Inland Water Transport Authority (BIWTA) include increasing waterway depths through the dredgers, channel widening and major overhauls to work vessels. New waterways introduced around the urban areas to improve and expand the movement opportunities and new infrastructure facilities that include additional passenger terminals. The major shares of funds were allocated to annual dredging program.

A rural transport forum under the Indonesia Forum Group on Rural Transport and Development (IFGRTD) has conducted research on waterway in the several locations in Indonesia with similar conditions to Malaysia. In 2003-2004, they developed a system called "Buy the Service" for waterways to be included in rural water transport master plan in Indonesia. The objective of this system is to achieve the high quality service in the remote areas with the reasonable price by encouraging competition among the operators. This is achieved by tendering the system of water transport based on the quality service provided by the operators to the customers. The advantages of this system are the flexible tariff based on the destination, the integrated ticket for tourist, visitors and the pre-paid system.

In China, an inland waterway has more than 5600 navigable rivers and 2000 inland ports. IWT development is being concentrated on the 5 specific areas which are Yangtze River, Pearl River, Beijing-Hangzhou Grand Canal, Yangtze River Delta and the Pearl River Delta. The \$220 million project with World Bank funding aimed at bringing the greater prosperity to a region where 6 million people live at subsistence level. The funds were directed at the power generating dams by passing the ship locking systems and a deeper waterway throughout the system permitting the large vessels to undertake trade. The other notable initiatives include the extremely big project, Three Gorges which will improve the electric power and navigation safety, reduce the

transportation costs, and improve the development along the Hang-Yong Canal connecting the network of six rivers with the country's largest river. The emphasis in these plans for the construction and development of the inland waterway network over the next decade is being placed on the inland port development and the construction of 20 inland river channels in the major north-south, east-west corridors and localize networks.

It has adopted a National Plan for Inland Waterways and Ports with a planning horizon from 2007 to 2020. The plan details the improvements to each of the main IWT systems in the China those based in the Yangtze River, Pearl River, Grand Canal and Huaihe River, Heilongjiang and Songliao Rivers, and the Minjiang River. In each case of this plan, it is taking a network approach of creating interlinked high-standard routes. The improvements include a combination of channel dredging, ship lifts, new and upgraded terminals for both bulk and container traffic. The planned “high-class” waterway (Class III and above) which will be around 19,000 km compared to less than 9,000 km in 2006. The high-class system will extend to 20 provinces, including 56 cities with populations greater than 500,000 and will serve a catchment area that contains approximately a quarter of the population of China.

The plan acknowledged the importance of supporting policies to seek a secure and stable long-term financing model, external sources of finance, enhance cooperation with other relevant departments in the areas of shipping services, power supply, flood control, irrigation and water supply, enhance the planning of ports, strengthen measures to standardize and modernize the vessel fleet, increase and improve the application of information technology to IWT management, ensure safety and environmental performance, and attain a sustainable development of the system.

The foreign trade has increased rapidly within the Philippines as the result of globalization in the past two decades. However, these benefits were seen in the coastal regions and the different islands rather than being widely dispersed among the geographic areas. The Medium-Term of Philippine Development Plan (MTPDP) for 2005-2010 was developed as the attempt to provide the prioritization and the development of the Roll-on Roll-off (RO-RO) shipping through the establishment of the Nautical Highway System composed of the Western, the Eastern and the Central Nautical Highway System. The project aims to improve investment opportunities for agro-industrial, commerce, trade and tourism, as well as providing local and international visitors and investors with secure and comfortable travel movement

through shorter travel times and lower transportation costs. In particular, the objective of the nautical highway is to accelerate the development of the southern islands of the country by opening an alternative and low-cost trade, travel and tourism route in the emerging western growth corridor of the country by making the Oriental Mindoro as its gateway. The nautical highway system, which was introduced in 2003 to maximize the use of the RO-RO system, has been reduced travel time and reduced cost by 40 per cent for the passengers and 30 per cent for cargo.

Setting international standards for waterway regulation is particularly important for incorporating river transport into intermodal logistics chains and increasing the level of reliability and accessibility of inland waterways. Croatian inland waterways are mainly borderline rivers. Therefore, the projects of technical maintenance should be coordinated with the neighboring countries. Croatia sees these joint projects as a priority, as they help to establish better transport links and build preconditions for joint economic prosperity (Ministry of the Sea, 2008).

2.7 Review on Previous Studies

Hnyin Sandar Oo (2008) stated that the role of inland water transport in transport sector in Myanmar which focused on the importance of inland water transport along the navigable waterways of Ayeyarwaddy River in the Delta area, Chindwin River in Mon and Kayin state. She also analysed the difference between water way and road transport in Delta area. She stated that using inland water transport is very cheap and the people of grass root level prefer the cheapest means of transport locally. The IWT is still playing a vital role in the transport sector of the union of Myanmar. When there were some developments of heavy industries near the river's banks, the inland waterways will be more essential in the future.

Maung Maung Aye (2009) stated the performance of state owned enterprise of IWT in waterway transportation through the country. He found out the strength and weakness of IWT which provided services for the public with the intention of providing smooth, safe and economical transport in inland waterways in order to facilitate their requirements. He also pointed out that apart from other types of transportation, Inland Water Transport can enhance economic activity including trade and commerce. The development of IWT encourage improvements in infrastructure and safety operation of cargo movement. Moreover, the benefits of improvement of IWT are environmentally

friendly, creating less noise and air pollution than other modes of transport and it is safer than other modes of transport with a lower incidence.

Khin Zaw Win (2011) analyzed the performance of inland water transportation of IWT in delta region in Myanmar. He compared the performance of inland water transportation and other transportation modes in Delta region. He also pointed out that the most people in Delta region used the waterways transport rather than other modes of transport due to geographical advantages which have numerous navigational rivers and streams. Transport by waterways is the cheapest mode of transport compare to road ways and railways for supporting the growth of economy in the Delta region. Inland water transport is more energy efficient than other modes of transport. IWT units ' greater capacity means that it can transport more tons per mile per unit of fuel than other modes can.

CHAPTER III

INLAND WATER TRANSPORT IN MYANMAR

The main target of transport services performance is to provide national and regional development through the effective support to e.g. agricultural and industrial production, tourism, or regional integration. The inland water transport (IWT) is a mode of transport that has the advantage of being cheap, energy efficient, relatively safe, and environmentally friendly.

3.1 Inland Water Transport in Myanmar

IWT performs inland waterways transport functions under the Ministry of Transport and Communications, the Union of Myanmar. The main functions of IWT are passenger cum cargo transport along the navigable waterways of the Delta region, the Ayeyarwady River, the Chindwin River and rivers in Mon, Karean and Rakhine states in Myanmar and operating ferry services for easy transport of vehicles at major river crossing points. Inland waterways are an important transport route for Myanmar. The country has 6,650km of navigable waterways along major rivers. Ayeyarwaddy River, which has 2,170km long stream line, runs in a north-south direction in the middle of the country. The river, whose navigable channel length extends 3,938km, including many branch flows in the delta area, provides waterways for cargo and passenger ships. The waterways connect Yangon city in the south to major northern cities such as Pyay, Mandalay, and Bhamo.

The primary network is made up of the Ayeyarwaddy and Chindwin rivers and a network of streams and canals in the Ayeyarwaddy Delta. The Ayeyarwaddy is the spine of the system. It is navigable year round up to Bhamo, and up to Myitkyina during the dry season. During the wet season, rapids on the stretch of the channel between Bhamo, and Myitkyina render navigation hazardous. The Chindwin is navigable for some 730 km from its confluence with the Ayeyarwaddy. Many streams of the Ayeyarwaddy Delta are navigable and are interconnected by a web of canals. The Sittaung and the Thanlwin are used to a lesser extent for commercial navigation due to

physical constraints. The Sittaung experiences heavy siltation, while rapids are prevalent on the Thanlwin. The coasts of the Rakhine and Tenasserim regions are also served by small steamers and country vessels.

Water transportation of freight and passengers is an attractive proposition *prima facie*; it is one of the world's oldest modes of freight transport. In Myanmar, inland water transport on the Ayeyarwaddy River may have provided among the earliest organized transport movements over significant distances, well before rail and road networks developed. The movement and flows of commodities like rice, fishery products, salt in the lower regions connected to the upper region have been among the early commercial drivers since the Myanmar Kings era. During the British period the Ayeyarwaddy, Chindwin and Sittaung river systems were extensively used for transport and trade between port of Yangon and rest of the other ports of Myanmar.

Before the colonial age, there were only small boats and yachts for the transportation of cargo and passengers along the rivers. During the colonial age, a private enterprise under the name of Irrawaddy Flotilla Company Limited (IFCL) was set up in 1865. The IFCL was nationalized on 1st June 1948 after gaining Independence from the British Colonial Rule. Under the plan to practice new administrative order, “Inland Water Transport Board” was renamed as “Inland Water Transport Corporation” in 1972. It has been changed to the present name of “Inland Water Transport” with effect from 1st April 1989. At that time, the private sector in inland water transport was very weak due to the constraint of government policies.

The development of inland water transport is of critical importance to the national transport system. It is aimed at the introduction of multimodal transport systems and the provision of reliable and efficient maritime based logistics. Difficult ship operations in low-water regions are a problem in the low-water season. The Ayeyarwaddy River is a wide river with plenty of turning, grounding, river erosion and rapid route change, rendering navigation. Besides inland waterways, the Chindwin Valley has no other means of transportation and therefore relies heavily on the Chindwin River river transportation. It shows the importance of river transport in Myanmar in certain regions.

3.2 Cargo Movement in IWT

Historically, the location of industrial activity was influenced by the logistical convenience of river transport possibilities, at a time when road and railway networks

were not so well developed. This may not be to the same extent today, although access to water for processing and in some cases effluent treatments is still a consideration in location. The viability of the movement of goods using IWT should be analyzed from the perspective of carrier and associated agencies' technological and physical viability, commercial potential and operational policy. As in any mode of transportation, certain considerations affecting the economy and function of a transportation are the availability of the channel or right-of-way, facilities at the ends of travel and carriers or vessels, along with all the administrative and supporting flow control infrastructure systems. In the IWT, these translate into waterway availability, terminal facilities such as jetties and ports, barges and other navigable vessels, and finally the management part.

River transport is not a dominant transport mode on any corridors. The main freight transport is mainly between Yangon and Mandalay (76% of long-distance river transport) and to a lesser extent between Yangon and the Ayeyarwaddy Delta (11%), the upper Ayeyarwaddy (9%) and Chindwin (4%).In the river transport, freight mainly comprises liquids (31.6%), construction materials (14.8%), food (13.8%), grain (12.8%) and household items (12.8%). By international comparisons, Myanmar's river transport market for coal, metal, chemicals, ore, sand, or wood is small. Most of the goods transported are general cargo, e.g., those carried in bags, boxes, drums, and barrels.

In 2017, it accounted for 22% of long distance movements of goods (both by volume and production) 2.6 million tons annually and 983 million ton-kilometer (ton-km). Goods transported were mainly paddy and rice (25%), petroleum (18%), and cement (11%). It was the mode of choice for the long-distance movement of petroleum (58%), cement (50%), fertilizer (45%), and paddy and rice (35%). The Comprehensive Transport Study estimated transport of passengers to be about 1.5 million long-distance passenger trips (262 million passenger-km, 3% of all passenger trips (ADB Report, 2016).

Table (3.1) shows cargoes carriage by inland vessels of Private Sector (ton in unit) from 2014 to 2018.

Table (3.1) Cargoes Carriage by Inland Vessels of Private Sector

No.	Year	Cargo carriage by Inland Vessels(Tons)
1	2014	3,761,257
2	2015	4,907,037
3	2016	5,531,160
4	2017	6,450,351
5	2018	7,383,810

Source: DMA Shipping Division, 2019

River transport's main customer base consists of commodity items that are essentially related to the farming community (foodstuffs and grain products, animal feed, fertilizer) and bulk cargo (oil, cement, sand, construction materials, and wood products). The affinity to the agricultural sector may be explained by the proximity of farms to the rivers, and hence better connectivity and access to the vessels.

3.3 Water Way

In Myanmar's main waterway, along the Ayeyarwaddy and Chindwin Rivers, river water levels vary greatly between the rainy season and the dry season. For example, in Mandalay, the water level becomes 8 m and in Monywa, 9 m. The dry season water depth is shallow; for example, the downstream water depth from Mandalay is 1.5 m, while upstream from Mandalay to Bhamo is just 1.1 m. The Chindwin River depth is shallower, typically below 1.0 m.

The DWIR rule prevents the night-time navigation of cargo ships and barges. Due to the large variations in water flow during dry and rainy seasons, which are repeated every year, navigation routes are unpredictable. The study reports released by the UNDP in 1988 and 1993 recommended a navigation channel river training plan in Ayeyarwaddy River and Chindwin River, but the survey records are old and should be revised. Within the DWIR's budget each year, the Myanmar government is building groynes in the rivers, Navigation routes were not adequately completed to stabilize. River training works and the improvement of channels are vital for transport efficiency and safe navigation. The inland transport sector in Myanmar requires not only modern port development and introduction of machine cargo handling, but also survey, planning, and improvement of the river channels.

For safety reasons, navigation is confined to daylight hours. Water level is down during the dry season, and the channels are not well defined. Navigation channels are unstable due to the shallow water and the migration of sandbanks. Extensive knowledge of the waters is required to navigate the channel safely; as a rule, a pilot who knows the waters intimately should operate in restricted waters. A journey from Yangon to Mandalay will, in all cases, rely on several pilots for different sections of the river.

For many years, the rivers, a major mode of transportation, have essentially been used in their natural state. Development of navigation channels has been sporadic at best and mainly a response to heavy sedimentation and riverbank protection. Navigation channels are not well defined and sufficiently marked. Nautical charts providing crucial information for safe navigation are not available. Transport service providers using the rivers are left to fend for themselves as best as they can when navigating.

Geography and climate cause instability of river flows. Myanmar, with an area of about 676,000 km², is bordered by a series of mountains and the sea. It is bordered by mountains that are an extension of the Himalayas in the west, and by a continuation of the Yunnan Plateau in the east. The two mountain systems join in the north with elevations as high as 5,000 m. Between the mountain ranges and the sea are alluvial lowlands dissected by the five large rivers. Most of the lowland area is less than 100 m in elevation but the elevation in the far north may be as high as 1,500 m.

The water level of all rivers rises in May and June, peaking in September and October. Changes in water level in the Ayeyarwaddy Delta due to the influence of tides can complicate but is less disruptive of navigation, and vessels unable to sail due to insufficient depth may still have to wait for the water to rise. The volume and intensity of water discharge has other physical effects. In particular, sedimentation is severe and rivers change course frequently. Sedimentation reduces the depth (free flow) of water and, in tandem with changes in the course of flow, destabilizes the channel. The severity of sedimentation is evident; in many places, accumulation of sand on the rivers is visible. The causes of river instability cannot be eliminated; they can only be mitigated.

During the dry season peak, navigating of the Upper Ayeyarwady is challenging, with only specialized vessels capable of moving into the shallower water. Usually the lowest water levels are seen in February, and in August the rivers reach their maximum flows. A twelve-day shipment from Mandalay to Mingun, Pakokku,

Bagan, Magwe, Pyay, Htonbo, Zalon and Danuphyube travels south along the Ayeyarwady to the former capital of the country, Yangon.

Table (3.4) shows the least available depth of the Ayeyarwaddy River (meter in days) between Yangon port and Mandalay port.

Table (3.2) Least Available Depth of the Ayeyarwaddy River (meter)

Stretch	Draught Limitation in Meter for Durations in Days							
	10	20	30	60	90	120	150	180
1. Yangon–Pyay	2.10	2.30	2.40	2.55	3.30	4.50	5.70	6.90
2. Pyay–Magway	1.05	1.20	1.30	1.50	2.05	2.85	3.70	4.50
3. Magway –Confluence	0.95	1.10	1.20	1.35	1.85	2.65	3.45	4.20
4. Confluence–Mandalay	0.95	1.25	1.35	1.50	2.10	2.95	3.85	4.75

Source: United Nations Development Programme, Comprehensive Transport Study. 2017

River Confluence is described as a meeting point for two or more rivers. In other words, it usually refers to the point where a tributary meets a major river, called the mainline. Chindwinn River is the largest tributary of the country's chief river the Ayeyarwady. Mu River is a river in upper central Myanmar, and a tributary of the country's chief river the Ayeyarwady. It is flowing south to the Ayeyarwaddy River west of Sagaing.

3.4 River Ports

There are more than 50 designated ports along the Ayeyarwaddy, the Chindwin, and the Ayeyarwaddy Delta. The main river ports are Yangon (0.7–1.0 million tons just for river transport annually), and Mandalay (0.5–0.6 million tons annually). Insufficient data are available to determine the volumes of traffic at other ports. In river ports in Myanmar, all cargo handling is carried out by manual labor where no lifting crane is available. The river ports of Myanmar have no cargo jetties except for some small floating piers for passenger use. The cargo barges are anchored near the waterline of natural riverbanks, and wooden walkways are fixed between the sandbank and the ships, which are also erected by labor force. Cargos are carried by laborers by walking along the narrow wooden walkway. Cargoes are placed on the inclined dusty riverside for temporary storage. There is no surface pavement on the riverside, where dust of fine soil is blown up by running cargo trucks and cargoes are spoiled by the soil dust. Every

river port suffers large water height changes according to the seasons which is generally more than 6m ~ 10m. The cargo space during the dry season goes underwater during the rainy season, while cargo handling sites change every season. In port areas which have roads near the river, such as Mandalay Port, cargo is offloaded onto the road in the rainy season, which causes traffic congestion.

There is no other way to carry cargo except by manual labor, cargo is limited to light and small pieces which can be lifted and handled by manpower. Waterway transport is fundamentally suitable to carry large or heavy cargo which is unsuitable for truck transportation. These advantages which waterways provide have not been utilized because machines and equipment are not used for cargo handling. It is estimated that the current cargo handling efficiency is nearly 30% of machine handling. When a port facility is built, the suitable cargo efficiency should raise the revenue of port operations. Replacing manual labor with machines is a vital subject for the inland water transport sector.

Apart from a few jetties at Yangon, there are no proper facilities available for the handling of cargo and passengers. Access from land to vessel is generally via a gangplank. In the absence of a platform upon which equipment can be positioned to load and unload cargo, mechanical handling of cargo hardly exists. Consignees experience long delays in the loading and unloading of cargo.

Yangon Port is a river port, but mostly operating for seaborne cargo. It handles about 90% of Myanmar cargo by volume. The Yangon main port is located 32 km from the mouth of the Yangon River. It includes six main terminals and is connected to the Ayeyarwaddy River through the 35 km long Twante Canal. Further downstream is the Thilawa Area Port, located 16 km from the mouth of the Yangon River. River and coastal shipping operations occur at 35 jetties owned by Myanma Port Authority (MPA) and operated by private operators (20), IWT (9), and MPA (6). These jetties are permanent but not mechanized, contrary to the nearby sea terminals.

Mandalay Port has small floating jetties for passengers and no handling facilities. Vessels and barges are anchored along the riverbank and unloaded through gangplanks. Freight is then placed on the riverside. Small trucks are carrying goods to larger trucks nearby on the beach. Approximately 6 km of the entire Mandalay port river is used for port operations. Loading and unloading at the Mandalay Port have essentially remained unchanged since the 1880s. Manual loading and unloading limits the size of the vessels that can be used, since larger ones take longer to service. It also

means that a very long beachfront is required several kilometers in the case of Mandalay.

Figure (3.1) Ports between Yangon and Mandalay along Ayeyarwaddy River

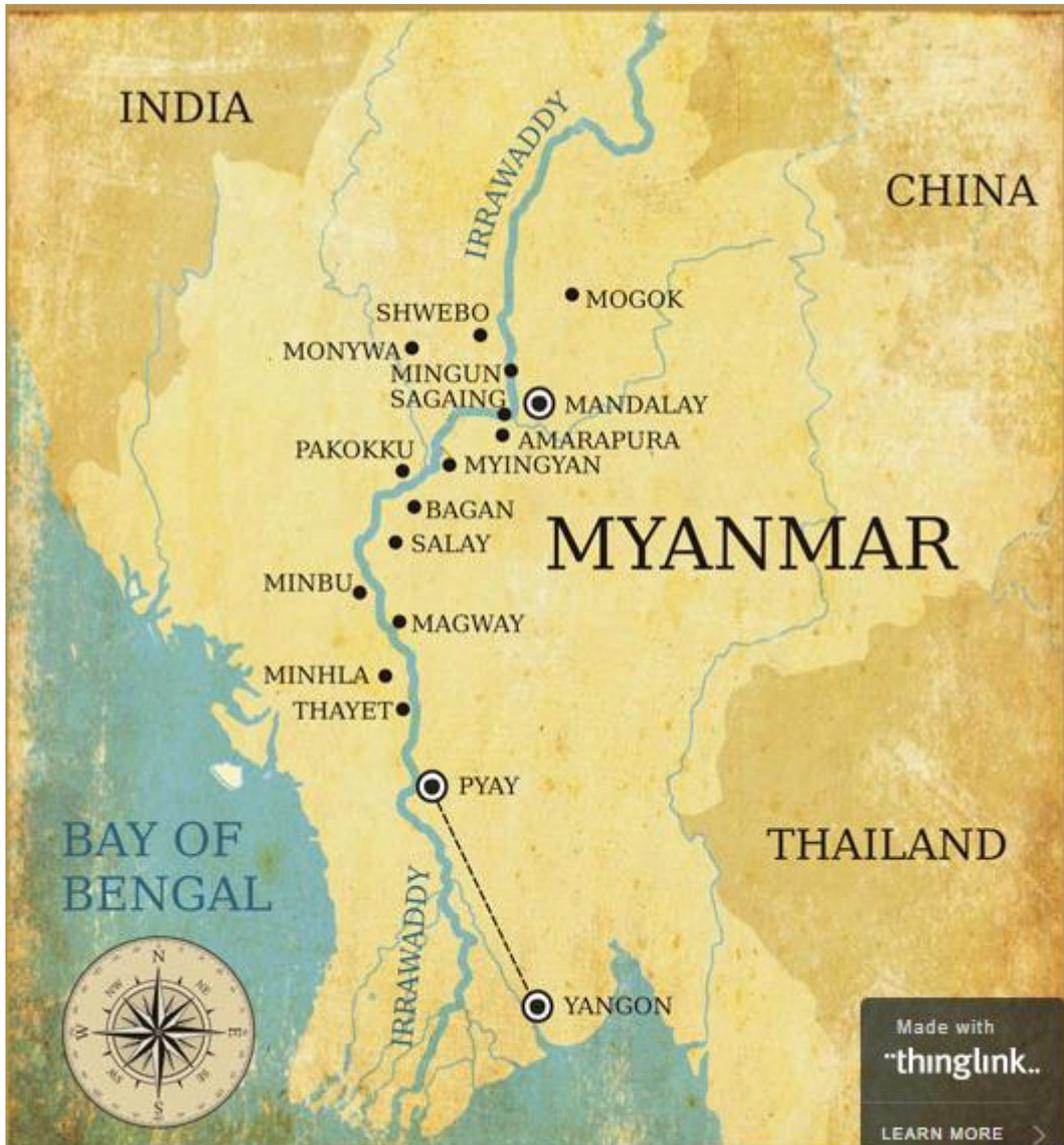


Figure (3.1) shows the main ports between Yangon and Mandalay which are Pyay, Magway, Minbu, Pakokku, Sagaing, and Mingun.

3.5 Private Owned Fleets

The private sector participation in inland waterway transport is vital role for the development of transport sector. Private sector investment, innovation and their efficiency will encourage the safe and smooth operation of cargo movement. As of

2018, total numbers of 4,108 vessels are registered at the Department of Marine Administration (DMA) for inland water operations. The fleet has a load carriage capacity of about (4,009,619) passengers and (7,383,810) tons of cargo. Private ownership vessels increase dramatically from (1,502) vessels of various sizes in 2014 to 3,488 in 2018. Private operators handle almost exclusively cargo rather than passengers, however about a third of their vessels are passenger-cum-cargo, enabling occasional passenger transport. Nowadays, almost all of new constructed private owned vessels are barges and pushing tugs, and average tonnage of vessels are about 1000 tons and maximum draft may be round about 8 feet. Some vessels were constructed for the specific purpose such as oil and chemical cargoes and container carrying vessels. (Source: DMA, 2019)

Transport in the Ayeyarwaddy Delta, which runs all year round, is often shorter than trips by road when there is connectivity and a good integration between long-distance and short-distance river transport. Transport on the Ayeyarwaddy itself up to Mandalay, subdivided between the section from the Delta area to Pakokku, which is navigable 80%–90% of the year for any kind of vessel, and between Pakokku and Mandalay, which is only navigable 70% of the year because of the sandbanks. Transport on the upper reaches of the Ayeyarwaddy is up to Katha and Bhamo, and transport on the Chindwin up to Monywa and Kalewa, where small vessels provide essential services during the wet season.

3.6 Role of Government Agencies

The water transport sector is under the direct management of the Ministry of Transport and Communications (MOTC). The MOTC was created in April 2016, through the merger of the former Ministry of Transport, Ministry of Rail Transportation and Ministry of Communications. The 2008 Constitution of the Republic of the Union of Myanmar sets the responsibilities of the union and state or region governments in the sector: The union legislature has domain over inland waterway transport, land transport, carriage by sea, and maintenance of waterways, major ports, and shipbuilding repair and maintenance. The state or region legislature has domain over ports, jetties, pontoons having the right to be managed by the region or the state; and the systematic running of private vehicles within the region or state. In Myanmar, a number of governmental departments play a role in the regulation, operation and sustenance of

inland water transport, their smooth functioning is required for IWT to be viable. The governmental departments are as follow:

1. Department of Marine Administration
2. Directorate of Water Resources and Improvement of River System
3. Inland Water Transport
4. Myanmar Port Authority

Under controlled of the Ministry of Transport and Communication, the departments of Marine Administration conduct the laws, rules and regulations for the development of inland water transport. DMA provide the Myanmar Merchant Shipping Acts and Inland Vessel Law and The Myanmar Coastal and Inland Water Transport Service License Law. DMA could be transformed into a policy and planning body, in addition to being a regulator. DMA's mandate is to ensure marine safety. Specifically, it seeks to (i) set and enforce safety standards for vessels and marine personnel, (ii) manage and develop human resources for the water sector, and (iii) respect international obligations regarding sea rescue and environmental protection.

The DWIR manages Myanmar's river system. DWIR was founded in 1972 as the Waterways Department by combining the Dredging and River Conservancy sections of DMA and parts of Hydrographic Surveying section of the Port Corporation. In 1999, the department was extended and reorganized as DWIR. DWIR is headed by a director general and reports to the Minister of Transport. The instrument that empowers DWIR in the execution of its tasks is the Conservation of Water Resources and Rivers Law. The purposes of the law enacted in 2006, as set out in the preamble, are to preserve and protect water resources and river systems for the benefit of public use, to promote protected navigation along rivers and creeks, to contribute to the development of the state economy by enhancing water resources and river systems, and to protect the environmental impact.

DWIR's objectives are to improve the navigation channel, including achieving adequate depth and stabilize the inland river ports, to protect the riverbanks from erosion, to enable use of water for drinking and agriculture; and to prevent river pollution.

DWIR's activities include for monitoring activities such as channel surveying and mapping, hydrographic monitoring, establishing databanks and research, and water quality monitoring, waterway management activities such as river training structures, dredging, navigation aids, snag removal, monitoring, marking, and maintenance of

channels, and provision of information on least available depth (LAD) and issuance of warnings, implementation of riverbank protections and facilitation works for agriculture pumping.

The Directorate of Water Resources and Improvement of River System (DWIR) provide the Conservation of Water Resources and Rivers Law. DWIR has identified 35 critical points requiring improvements on the Ayeyarwaddy, and 13 on the Chindwin. According to a 1988 Irrawaddy and Lower Chindwin Rivers study, there may be up to 46 spots that constrain navigation on the Ayeyarwaddy and 37 spots on the Chindwin. In 2014, the World Bank, in partnership with the government of the Netherlands, initiated program to model sedimentation, and design and implement river channel improvement works between Nyaung Oo and Mandalay.

Waterway improvements have been a low priority for DWIR. As directorate within the MOTC, DWIR's funding is fully contained within the annual budget provided to the MOT by the government. Among its many activities, DWIR prioritizes river protection works and works related to bridge construction across the rivers. Little funding has been allocated to survey of river channels, establishment of river navigation aids, or dredging of river channels to ensure LAD is available. In essence, river navigation is not a high priority and, as a result, river transport is carried out by each vessel probing the current river channel to determine depth and navigability. River depth changes are not surveyed regularly or published for users.

CHAPTER IV

SURVEY ANALYSIS

This study aims to find out the services and capabilities and the challenges for private sector services in IWT that effect on the needs of the private sector's development. To meet the objectives of this study, survey questionnaires were organized to take into account the current available services and challenges for the development. The survey was conducted among shippers, agents and vessel owners at the office of Inland Waterway Vessel Owners 'Association. This study explored the demographic information of respondents, characteristics, quality of service and challenges of private sector service of cargo transport in IWR.

4.1 Survey Profile

The survey was conducted at the office of Inland Waterway Vessel Owners 'Association located at 5th street, Lamadaw Township in Yangon where shippers, agents and vessel owner are engaged with their businesses. The total number of vessels is nearly 3,500 and total number of vessel owners and shippers may be more than 40,000 at the end of 2018. In this survey, 181 respondents (67 shippers, 30 agents and 84 vessels 'owners) were included. Shippers are the users of IWT services who are the sources of transport demand and normally, they choose the best service from many alternatives to satisfy their logistical requirements, vessel owners are those who own vessels to transport cargoes on inland waterways and are the main IWT suppliers. Agents are the people who stand between the shippers and the vessel owners to bridge the business links.

4.2 Survey Design

In this study, the survey was conducted from June to July 2019 to analyse the real situation and challenges of the private sector services of cargo transport in IWT. Three sets of questionnaires were prepared for the three groups of respondents. The questionnaire consists of four sections; personal demographic data, characteristics,

quality of service by private cargo transport and challenges of the private sectors in IWT. The questionnaires used in the study are presented in Appendix (A).Data were analyzed using SPSS software.

4.3 Survey Results

In this study, the survey results are analyzed in four sections. These are as follows:

1. Demographic characteristics of Respondents
2. Analysis of characteristics on private cargo transport
3. Analysis of port system and quality of services on private cargo transport
4. Analysis of challenges on private cargo transport

4.3.1 Demographic Characteristics of Respondents

Socio-demographic characteristics includes age, gender, education and types of respondents can have effects on the characteristics by private cargo transport, and quality of services and challenges of the private sector.

The socio-demographic characteristics of the respondents were shown in Table (4.1). The respondents of this study were predominantly males representing almost all of them. This could be due to the nature of the work in Myanmar, which is mostly run by males.

Among 181 respondents most of them (46.4%) were in their middle age (41-50 year) and (34.8 %) were in age 50 years and above group. Respondents in this study (25.4%) had an education status of at least high school level and most of them (72.3%) hold a diploma or bachelor degree and very few (2.3%) were post graduates. Majority of the respondents (62.4%) had more than 9 years of experience in running business related to IWT followed by 6-8 years of experience representing 31.5% of respondents.

Table (4.1) Demographic Characteristics of Respondents (n = 181)

Socio-demographic Characteristics	Shippers		Agents		Vessel Owners		Total	
	Number. of Respondents	Percent (%)	Number of Respondents	Percent (%)	Number of Respondents	Percent (%)	Number. of Respondents	Percent (%)
1. Gender								
Male	67	100	28	93.3	84	100	179	98.9
Female	0	0	2	6.7	0	0	2	1.1
Total	67	100	30	100	84	100	181	100
2. Age								
20 to 30 years	0	0	3	10	0	0	3	1.6
31 to 40 years	10	14.9	15	50	6	7.2	31	17.2
41 to 50 years	45	67.2	9	30	30	35.7	84	46.4
≥ 51 years	12	17.9	3	10	48	57.1	63	34.8
Total	67	100	30	100	84	100	181	100
3. Education								
High school	20	29.8	5	16.7	21	25	46	25.4
Bachelor/Diploma	46	68.7	25	83.3	60	71.5	131	72.3
Post-graduate	1	1.5	0	0	3	3.5	4	2.3
Total	67	100	30	100	84	100	181	100
4. Duration/Service								
< 3 years	0	0	0	0	0	0	0	0
3 - 6 years	4	6	6	20	1	1.2	11	6.1
6-8 Years	32	47.8	12	40	13	15.5	57	31.5
≥ 9 years	31	46.3	12	40	70	83.3	113	62.4
Total	67	100	30	100	84	100	181	100

Source: Survey Data, 2019

4.3.2 Characteristics of Service on Private Cargo Transport

Respondents' review on characteristics of service included other modes of transport used by shippers, shippers' reasons for choosing private shipment and the maximum types of cargo transported in private cargo transport by all stakeholders.

Table (4.2) shows characteristics of the services used by shippers.

Table (4.2) Characteristics of Service Used by Shippers

Characteristics	Percent (%)
Using other mode of transport	
Yes	15
No	85
Total	100

Source: Survey Data, 2019

According to Table (4.2), almost all of shippers (85%) did not use other mode of transport and 15% of shipper stated that they used other modes of transport when the goods must be delivered within a short period of time.

The reasons for choosing private shipment are illustrated in Table (4.3).

Table (4.3) Shippers' Reason for Choosing Private Shipment

Reason for choosing private shipment	No. of Respondents	Percent (%)
Cost effectiveness	48	72
Convenience	19	28
Total	67	100

Source: Survey Data, 2019

Table (4.3) shows that most of the respondents choose the private shipment as it was cost effective representing 72% than other modes of transport as per their experiences and as it was convenience representing (28%) to be transported the cargoes such as coal and fuel.

Table (4.4) shows the types of cargo shipment in private cargo transport of IWT.

Table (4.4) Types of Cargo Shipment in Private Cargo Transport

Ports and Ships	Shippers (n=67)	Agents (n=30)	Vessel Owners (n=84)
	Percent (%)	Percent (%)	Percent (%)
1. General Cargo	45	60	36
2. Fuel	27	10	34
3. Construction Materials	28	30	30
Total	100	100	100

Source: Survey Data, 2019

In the above table, the shippers stated that about 45% of the goods transported was general cargo such as rice, cooking oil, salt followed by construction materials such as cement, aggregates, metals, bricks, sand representing about 28% and fuel such as coal, gasoline and diesel fuel representing 27%. This indicates that most of the goods transported were general cargo.

In addition, the agents responded that about 60% of the goods transported was general cargo such as rice, cooking oil, salt followed by construction materials representing about 30% and fuel such as coal, gasoline and diesel fuel representing 10%. More than half of the agents described that most of the goods transported were general cargo which is similar response made by the shippers.

Vessel owners stated that about a third of the goods transported was general cargo such as rice, cooking oil, salt followed by fuel and construction materials representing about 34% and about 30% respectively. This indicates that main transported goods which was mentioned by shippers, agents and vessel owners were general cargo followed by construction materials and fuel.

4.3.3 Port System and Quality of Services on Private Cargo Transport in IWT

Respondents' review on port system in private cargo transport in IWT are cleanliness of the ports, adequacy of space at the ports, convenience for loading and unloading goods at the ports, machine cargo handling system at the ports and adequacy of warehouse for storage goods at the ports. Moreover, their review on quality of services on private cargo transport in IWT are fairness of freight charges, timely

services, timely informed for the service delay, incidence of lost/damage goods and timely action for the loss/damage goods and insurance for cargo transported.

Table (4.5) shows the respondents review of port system in private cargo transport in IWT.

Table (4.5) Ports System of Private Cargo Transport in IWT

Ports and Ships	Shippers (n=67)	Agents (n=30)	Vessel Owners (n=84)
	Percent (%)	Percent (%)	Percent (%)
1. Cleanliness of the ports			
Yes	4.5	3.3	4.8
No	95.5	96.7	95.2
Total	100	100	100
2. Adequacy of space at the ports			
Yes	6	13.3	4.8
No	94	86.7	95.2
Total	100	100	100
3. Convenience for loading and unloading goods at the ports			
Yes	10.4	13.3	3.6
No	89.6	86.7	96.4
Total	100	100	100
4. Machine cargo handling system at the ports			
Yes	23.9	26.7	10.7
No	76.1	73.3	89.3
Total	100	100	100
5. Adequacy of warehouse for storing goods at the ports			
Yes	4.5	3.3	4.8
No	95.5	96.7	95.2
Total	100	100	100

Source: Survey Data, 2019

The above table reveals that majority of the respondents (over 95% of shippers, agents and vessel owners) stated there is no cleanliness and no spaciousness at the ports for the service users, providers and goods to be transported.

Regarding the convenience for loading and unloading goods at the ports, majority of the respondents (about 90% of shippers, agents and vessel owners) mentioned that there is no convenience for loading and unloading goods at the ports. There was no sufficient jetties for loading and unloading goods, gangplanks and labors are used for these operations since lack of machine cargo handling system representing (about 80% of shippers, agents and vessel owners) which had not been developed at the ports. The majority of respondents (about 95% of shippers, agents and vessel owners) also stated that there were not enough warehouses to store goods at the ports. Generally the answers of three types of respondents were more or less similar. This indicated that the port system and the required facilities needs to be upgraded.

The quality of services provided by private cargo transport in IWT is illustrated in the Table (4.6).

Table (4.6) Quality of Services Provided by Private Cargo Transport in IWT

Service		Shipper (n=67)	Agents (n=30)	Vessel Owners (n=84)
		Percent (%)	Percent (%)	Percent (%)
1. Fairness of freight charges	Strongly agree	6	0	0
	Agree	77.6	93.3	79.8
	Disagree	16.4	6.7	20.2
	Strongly disagree	0	0	0
	Total	100	100	100
2. Timely service	Strongly agree	1.5	0	0
	Agree	97	93.3	96.4
	Disagree	1.5	6.7	3.6
	Strongly disagree	0	0	0
	Total	100	100	100
3. Timely inform for service delay	Strongly agree	3	0	0
	Agree	86.6	90	94
	Disagree	10.4	10	6
	Strongly disagree	0	0	0
	Total	100	100	100
4. Incidence of lost/damage	Yes	50.7	66.7	79.8
	No	49.3	33.3	20.2
	Total	100	100	100
5. Timely action for lost/damage	Strongly agree	0	0	0
	Agree	58.2	96.7	81
	Disagree	41.8	3.3	19
	Strongly disagree	0	0	0
	Total	100	100	100
6. Insurance for cargo transported	Yes	94	100	98.8
	No	6	0	1.2
	Total	100	100	100
7. Providing door to door service	Yes	3	13.3	2.4
	No	97	86.7	97.6
	Total	100	100	100

Source: Survey Data, 2019

According to the Table (4.6), most of the shippers and agents (about 80%) agreed that freight charges applied by private inland water cargo transport were fair while 93.3% of agents agreed for this statement. This is consistent with the response for the reason for choosing private inland water cargo transport services where majority of respondents stated that it was used due to its cost-effectiveness. As per the owners,

they are not able to make a big profit for this service since willingness to supply of private inland water cargo transport is more than willingness to demand of private inland water cargo transport in the market.

Almost all of the three types of respondents (over 90%) agreed that private inland water cargo transport provided the timely services as per the standards and most of them (about 90%) also agreed the statement that the service users were timely informed if there was any delays for the services.

About 50%, 66% and 80% of shippers, agents and vessel owners encountered the incidence of lost or damage of good and about half of the shippers while about 97% of the agents and 81% of the vessel owners agreed that there are timely actions for lost or damage goods by private inland water cargo transport showing some differences of responses among three different types of respondents.

Regarding insurance, almost all of the shippers and vessel owners and all of agents stated that insurance was taken out for their cargo transport by the shippers and vessel owners since the value of some goods transported were very high.

Almost all of the shipper and agents and about 90% of vessel owners stated that there was no door to door services for good delivery served by the private inland water cargo transport. Some vessel owners who invested in logistics companies can provide door to door service. This may be one of the causes which are not able to make the progress of goods flows within the country.

4.3.4 Challenges Encountered by the Respondents

Respondents review on the challenges encountered by the stakeholders in private cargo transport in IWT are operating for the business such as regular flow of commodities, freight charges, convenience of private owned vessels, getting the registration and license of the ships for the vessel owners issued by the DMA, the requirements of port infrastructure and water-way development along the Ayeyarwaddy River.

Challenges encountered by shippers and agents for using private inland water cargo transport are shown in Table (4.7).

Table (4.7) Challenges Encountered by Shippers and Agents

Challenges	Shipper (n=67)	Agents (n=30)
	Percent (%)	Percent (%)
1. Regular flow of commodities for every season		
Yes	7.5	20
No	92.5	80
Total	100	100
2. Change of freight charges based on season		
Yes	13.4	16.7
No	86.6	83.3
Total	100	100
3. Convenience of using private cargo transport services		
Yes	94	83
No	6	17
Total	100	100
4. Requirements of port infrastructure development		
Yes	98.5	93.3
No	1.5	6.7
Total	100	100

Source: Survey Data, 2019

The Table (4.7) shows that majority of the respondents (92.5% of shippers and 80% of agents) answered that there was no regular flow of goods for every season. This is due to some problems with shallow waterway in summer, again indicating the requirements to maintain the water-way of the main rivers used for inland water transport. However, regarding change of freight charges, most of the shipper and agents (over 80%) stated that there was no a lot of changes on freight charges based on the different seasons. This is due to competitive nature of service in private sector. As mentioned above by the vessel owners, willingness to supply of private inland water cargo transport is more than willingness to demand of private inland water cargo

transport. Majority of the respondents (94% of shippers and about 83% of agents) mentioned that using private cargo transport service is convenience than public transport (i.e. private owned vessels of inland water cargo transport were much more convenient than the public owned vessels). However, almost all of the respondents mentioned that the development of port infrastructure such as machine cargo handling system, sufficient jetties and specific gangplanks for loading and unloading goods is extremely required.

Table (4.8) Challenges Encountered by Vessel Owners

Challenges	No. of Respondents	Percent (%)
1. Easiness of registration/License for operation		
Yes	71	84.5
No	13	15.5
Total	84	100
2. Usability of Ayeyarwaddy river's waterway for every season		
Yes	0	0
No	84	100
Total	84	100
3. Regular flow of commodities for every season		
Yes	4	4.8
No	80	95.2
Total	84	100
4. Change of freight charges based on season		
Yes	9	10.7
No	75	89.3
Total	84	100
5. Easiness of building/repairing IWT ships locally		
Yes	76	90.5
No	8	9.5
Total	84	100
6. Convenience of currently operating ships for cargo transport		
Yes	80	95.2
No	4	4.8
Total	84	100
7. Need of ships for specific cargo		
Yes	2	2.4
No	82	97.6
Total	84	100
8. Needs of modernized ships for cargo transport		
Yes	9	10.7
No	75	89.3
Total	84	100

Source: Survey Data, 2019

Challenges encountered by the vessel owners were shown in Table (4.8). The table stated that most of the vessel owners (84.5%) stated that it was easy for them to be registered the vessels and to get services licenses from the department. These process took a short period of time to run the business.

One of the major challenges facing ship owners was the safe and reliable Ayeyarwaddy River navigation, which had insufficient draught for the vessels during the summer season causing negative impact on regular goods flow. This challenge was describe by all vessel owners. Most of respondents (95.2%) answered that there was no regular flow of goods for every season which was consequent effect of insufficient draught of navigable waterway for every season especially in dry season. However, regarding the freight charges, most of the vessel owners stated that there was no significant changes based on seasons. As mentioned the above by the vessel owners, willingness to supply is more than willingness to demand for the service. Sometimes, the service users need to deliver the cargo within a short period of time by using other mode of transport since the cargo shipment takes a long period of time in the dry season. According to these reasons, the vessel owners get less profit although they have to spend more money on the operation cost in the dry season (i.e. Yangon-Mandalay shipping takes about 20 days in the dry season instead of about 15 days in other seasons).

In addition, majority of vessel owners (above 90%) and (95.2%) of them responded that locally building/repairing ships for inland water transport was easy for them and currently operating ships using in cargo transport were convenient for them respectively. Most of the dockyards are situated in the port area of Yangon and some are in the port area of Mandalay. Surprisingly, almost all of the respondents (97.6%) stated that there was no need of specific vessels for specific goods transport. This may be due to lack of experience of using separate ships for specific cargos. Nonetheless, each category of cargo is subject to different conditions and consideration should be given to a particular mode of transport representing the various types of ships by private inland cargo transport based on the types of cargo transported. Surprisingly, majority of the respondents (89.3%) mentioned that there was no need for additional modernized ships in private inland water transport. Generally speaking, the majority of vessel owners said they did not need any modernized or separate vessels for specific goods, but it is unclear whether these vessels were not really required or whether they

understood the usefulness of those vessels. The modernized ships should be designed for general cargo and specialized cargo transport in order to develop water transport.

All of the respondents mentioned that there are many requirements for improving the facilities of ports. Their response indicated lack of specific terminal that the portion of a port dedicated to a certain type of activity, such as containers or bulks, difficulties in loading unloading goods for labor and wasting time on ports due to inadequacy of specific jetties and gangplanks and lack of machine cargo handling system at the ports. The result indicates that development of port infrastructure is highly required. All of the respondents mentioned that it is necessary to develop the waterway for IWT. This is one of the biggest challenges in inland water transportation that has an impact on operating costs, delivery time, and regular good flows and other resources. It indicates that surveying, planning and improving the river channels are desperately needed, particularly for the main rivers that are used for the country's navigation. For transport efficiency and safe navigation, channelization through river training, dredging, and river bank stabilization should be maintained and developed as waterways are an essential mode of transportation for carrying heavy and bulky material and are the cheapest means of transportation.

CHAPTER V

CONCLUSION

This chapter presents the summary of findings and discussion through a careful overview on the chapters previously presented and survey results of related respondents. Conclusions were drawn based on the findings. In this study, an attempt has been made to assess the current situation of the private sector services and the challenges for development of the private sector services in the inland water cargo transport along the Ayeyarwaddy River. Recommendations are made in the last part of this chapter.

5.1 Findings

This study was conducted among 181 respondents (67 shippers, 30 agents and 84 vessel owners) who run the related businesses with private inland water cargo transport. The socio-demographic characteristics of the respondents include their age, their education, occupation, and working experiences of the respondents (shippers, agents and vessel owners). Due to the nature of work, men are high population in the leading role of the private sector in the inland water transport. As most of the respondents were in their middle age (41-50 year) and age 50 years and above group, it is apparent that the respondents were middle-aged adults and educated as they had at least a high school level of education status and most of them hold a diploma or bachelor degree. Majority respondents in this study were well experienced in doing their business as they had a minimum of 3-6 years and two third of them had more than 9 years of experiences.

Regarding characteristics of service, majority of shippers did not use other mode of transport. The reasons for choosing private shipment was cost effective rather than other modes of transport as per their experiences and it was convenience to be transported the cargoes such as coal and fuel. Most of the cargo transported was general cargo representing rice, cooking oil and salt.

In view of the respondents, ports were not clean and not spacious enough for the customers. There were inadequate jetties for loading and unloading of goods at the ports consequently gangplanks and laborers were used and it was too risky for workers. While jetties were occupied, it caused the waste-time of operation for the workers and customers as well. Generally, port infrastructure was not developed, and loading and unloading were not safe and convenient.

Consequently, using manual laborers for loading and unloading and lack of port facilities such as cranes which could not handle the cargos with large in size and weight such as containers as the machinery cargo handling was generally not utilized at the ports. As per shippers, there was lack of warehouses at the ports along the river so the shipper cannot easily store their cargoes at the ports. All respondents mentioned that the infrastructure development of the ports for the loading and unloading goods is needed and suggested that the modernized cargo handling facilities at ports were essential requirement for the development of IWT, which will facilitate goods flows within the country.

With regards to services, there was considerable number/rate of loss or damage cargo while transported by the waterway but there were timely actions for loss or damage as per agreement made for shipping. Vessel owners and shippers took out insurance for the goods as the price of the transported goods such as fuel or rice is very high. In relation to door to door service for inland water cargo transport, the key stake holders of the private sectors IWT such as shippers, agents and ship owners are willing to have door to door cargo transportation services where the freight forwarder guarantees that the goods are picked up and delivered to the end customer's locations. Nowadays, some respondents (about 4% of vessel owners) who invested in logistics companies can provide door to door service.

Concerning the challenges, a major challenge is the requirement of the development of the waterway of IWT. The biggest challenge for vessel owners is that there is no safe and reliable Ayeyarwaddy River inland navigation that had inadequate draught for the vessels during the dry season to occupy large quantities of goods for high shipping capacity resulting in adverse effects on regular good flows. In addition, some vessels are required to carry the cargo using full capacity for lower cargo and may result in high operating costs resulting in high cargo transport charges. As a result there was challenge for shippers, agents and owners, which is not having a regular flow of cargo between the ports of Yangon and the ports of Mandalay.

According to the survey results, there were some good view of the ship owners concerning vessel registration and obtaining service license as well as local building and repairing of the inland water vessels. These findings suggest there are not much barriers to be registered the vessels at the Department of Marine Administration. The ship owners are able to easily register their vessels and easy to get services licenses from the department.

In conclusion, their feedback on the service quality of the private sector in the inland water transport was quite good despite there were some weaknesses of the private inland water cargo transport. The cargo transport with private vessels was cost effective consequently they chose private shipment over public shipment of IWT. Although there are some weaknesses in the services of the private sector, most of users are more likely to use their services. The vessels operated by the private sector were better than those of other operators.

In their view, the vessels run by private sector and their services were fairly good. However, there were a few other things which need to be improved for the facilities of ports such as inadequacy of jetty for loading and unloading goods, lack of machine cargo handling system, insufficient warehouse, lack of door to door transport service, and insufficient draught for maximum load capacity of the vessels during the dry season in the Ayeyarwaddy River.

These finding were more or less similar for the groups of respondents and they are consistent with each other despite there were 3 categories of the respondents in this study.

5.2 Recommendations

Based on the survey results, the following are recommended for this analysis. Waterways are an essential mode of transport for both passengers and freight. It is the cheapest mode of transport, the most suitable to carrying heavy and bulky material and also a mode of transport that is fuel-efficient and environmentally friendly. In order to improve the waterway transport, the government and focal department should maintain to improve the Ayeyarwaddy River channel and the navigation conditions between Yangon and Mandalay. Furthermore, the ports' infrastructure between Yangon and Mandalay should be developed.

Scaled-up efforts by the Directorate of Water Resources and Improvement of River Systems (DWIR) to develop the channel and publicize its location should be

maintained by channelization by river training, dredging and river bank stabilization. Since waterway management is very inefficient, river training, including dredging, mapping of the river and providing navigational support, and the requirements for navigation which are channel markings, night navigational aids, including the possible deployment of GPS and river maps and charts for navigation should be provided. A minimum navigation depth of 1.5 m should be targeted. Modern navigation aids should be provided to allow long-term night navigation. It is proposed to dredge Ayeyarwaddy which is the country's main river and could be outsourced and even develop into a lucrative operation. River training works and the improvement of channels for the Ayeyarwaddy are recommended, as they are vital for transport efficiency and safe navigation.

In relation to the infrastructure development of IWT, the ports 'facilities should be improved for their capacity and capability. Moreover, to develop basic river port terminals, the services of cargo handling at the various ports gradually enabling mechanized operations, the government should provide these facilities or permitting to be invested by private sector. Because of the nature of the river, mechanization can only be gradually introduced, low cost options for river ports such as floating docks, should be installed before considering costlier permanent structures. Increased government infrastructure spending on the inland water transport is typically expected to result in higher short-term economic performance by improving demand and increasing overall efficiency over the long term.

This study could emphasize only on the private sector service of cargo transport along the Ayeyarwaddy River (Yangon-Mandalay) by evaluating services provided by private sector, as well as challenges encountered by these key stakeholders. This study cannot cope with the development of river port system and the development of the infrastructure of waterway transport. Therefore, it is recommend that the future study would focus on the private sector service in the inland water cargo transportation of other cities and development of river port system along the rivers of Myanmar.

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Name:

Questionnaires on Private Cargo Transport in Inland Water Transport to be answered by agents

Section (A) Demographic Factors of Respondents

1. Gender

- Male Female

2. Age

- Between 20years and 30 years
 Between 31 years to 40 years
 Between 41 years to 50 years
 Above 51 years

3. Education

- High School
 Bachelor/diploma
 Post-graduate

4. Duration of Service for Inland Water Transport

- Under 3 years
 Between 3 years and 6 years
 Between 6 years and 9 years
 Above 9 years

Please choose one which is adaptable with you.

Section (B) Characteristic of service on private cargo transport

1. What type of cargo are maximum shipment in private cargo transport?

- General Cargo (Rice, cooking oil, salt) Fuel (coal, gasoline and diesel fuel)
 Construction materials Others

Section (C) Port System of Services on Private Cargo Transport in IWT

2. Is there cleanliness in the environment of the ports?

- Yes No

3. Is there adequacy of space at the ports for the service users, service provides and the goods?

- Yes No

4. Are the ports convenient for loading and unloading goods?

- Yes No

5. Is there machine cargo handling system at the ports?

- Yes No

6. Is there adequacy of warehouses for storage goods at the ports?

- Yes No

Section (D) Quality of Services Provided by Private Cargo Transport in IWT

7. Are the freight charges fairness for service providers and users?

- Strongly agree Agree Disagree Strongly disagree

8. Can the private cargo transport give timely service?

- Strongly agree Agree Disagree Strongly Disagree

9. Did the service providers timely inform for the service delay of cargo transport?

- Strongly agree Agree Disagree Strongly Disagree

10. Is there any incidence of loss or damage of the goods in inland private cargo transport?

- Yes No

11. Is there timely action to be taken by the service providers for the loss and damage of the goods?

- Strongly agree Agree Disagree Strongly Disagree

12. Do you take any insurance for shipment of the goods?

- Yes No

13. Can door to door service be provided by ship owners in private cargo transport?

- Yes No

Section (E) Challenges of operating encountered by the respondents

14. Is there regular flow of commodities in inland water cargo transport for every season?

- Yes No

15. Are there any changes of freight charges based on the seasons?

- Yes No

16. Are private owned vessels of inland water cargo transport convenient?

- Yes No

17. Is there any requirements for the development of port infrastructure in Inland Water Transport?

- Yes No

Name:

Questionnaires on Private Cargo Transport in Inland Water Transport to be answered by ship owners

Section (A) Demographic Factors of Respondents

1. Gender

- Male Female

2. Age

- Between 20years and 30 years
 Between 31 years to 40 years
 Between 41 years to 50 years
 Above 51 years

3. Education

- High School
 Bachelor/diploma
 Post-graduate

4. Duration of Service for Inland Water Transport

- Under 3 years
 Between 3 years and 6 years
 Between 6 years and 9 years
 Above 9 years

Please choose one which is adaptable with you.

Section (B) Characteristic of service on private cargo transport

1. What type of cargo are maximum shipment in private cargo transport?

- General Cargo (Rice, cooking oil, salt) Fuel (coal, gasoline and diesel fuel)
 Construction materials Others

Section (C) Ports System of Private Cargo Transport in IWT

2. Is there cleanliness in the environment of the ports?

- Yes No

3. Is there adequacy of space at the ports for the service users, service provides and the goods?

Yes No

4. Are the ports convenient for loading and unloading goods?

Yes No

5. Is there machine cargo handling system at the ports?

Yes No

6. Is there adequacy of warehouses for storage goods at the ports?

Yes No

Section (D) Quality of Services Provided by Private Cargo Transport in IWT

7. Are the freight charges fairness for service providers and users?

Strongly agree Agree Disagree Strongly disagree

8. Can the private cargo transport give timely service?

Strongly agree Agree Disagree Strongly Disagree

9. Did the service providers timely inform for the service delay of cargo transport?

Strongly agree Agree Disagree Strongly Disagree

10. Is there any incidence of loss or damage of the goods in inland private cargo transport?

Yes No

11. Is there timely action to be taken by the service providers for the loss and damage of the goods?

Strongly agree Agree Disagree Strongly Disagree

12. Do you take any insurance for shipment of the goods?

Yes No

13. Can door to door service be provided by ship owners in private cargo transport?

Yes No

Section (E) Perception on Port System

14. Do modernized machineries have the ports that is easily utilized for loading and unloading goods?

Strongly agree Agree Disagree Strongly Disagree

15. Should container system be used in private cargo transport?

Strongly agree Agree Disagree Strongly Disagree

Section (F) Challenges encountered by the respondents

16. Is there easiness of registration/license for construction/operation of vessels in private cargo transport of IWT?
 Yes No
17. Is there usability of Ayeyarwaddy River waterway for every season?
 Yes No
18. Is there regular flow of commodities for every season?
 Yes No
19. Are there any change of freight charges based on the seasons?
 Yes No
20. Is there easiness of constructing/repairing for the private owned vessels locally?
 Yes No
21. Are the private owned vessels of inland water cargo transport convenient for the operation?
 Yes No
22. Is there any vessels 'requirements to be transported specific cargo?
 Yes No
23. Is there adequacy of vessels to be transported fuel?
 Yes No
24. Is there any requirements of modernized vessels for private cargo transport?
 Yes No

Name:

Questionnaires on Private Cargo Transport in Inland Water Transport to be answered by shippers

Section (A) Demographic Factors of Respondents

1. Gender

- Male Female

2. Age

- Between 20years and 30 years
 Between 31 years to 40 years
 Between 41 years to 50 years
 Above 51 years

3. Education

- High School
 Bachelor/diploma
 Post-graduate

4. Duration of Service for Inland Water Transport

- Under 3 years
 Between 3 years and 6 years
 Between 6 years and 9 years
 Above 9 years

Please choose one which is adaptable with you.

Section (B) Characteristic of service on private cargo transport

1. Do you have any experience on using other mode of transport for cargo transported?
 Yes No
2. Why do you choose the private cargo shipment of Inland Water Transport?
 Speedy Cheap Easy Others
3. What type of cargo are maximum shipment in private cargo transport?
 General Cargo (Rice, cooking oil, salt) Fuel (coal, gasoline and diesel fuel)
 Construction materials Others

Section (C) Port System of Services on Private Cargo Transport in IWT

4. Is there cleanliness in the environment of the ports?
 Yes No
5. Is there adequacy of space at the ports for the service users, service provides and the goods?
 Yes No
6. Are the ports convenient for loading and unloading goods?
 Yes No
7. Is there machine cargo handling system at the ports?
 Yes No
8. Is there adequacy of warehouses for storage goods at the ports?
 Yes No

Section (D) Quality of Services Provided by Private Cargo Transport in IWT

9. Are the freight charges fairness for service providers and users?
 Strongly agree Agree Disagree Strongly disagree
10. Can the private cargo transport give timely service?
 Strongly agree Agree Disagree Strongly Disagree

11. Did the service providers timely inform for the service delay of cargo transport?
 Strongly agree Agree Disagree Strongly Disagree
12. Is there any incidence of loss or damage of the goods in inland private cargo transport?
 Yes No
13. Is there timely action to be taken by the service providers for the loss and damage of the goods?
 Strongly agree Agree Disagree Strongly Disagree
14. Do you take any insurance for shipment of the goods?
 Yes No
15. Can door to door service be provided by ship owners in private cargo transport?
 Yes No

Section (E) Challenges of operating encountered by the respondents

16. Is there regular flow of commodities in inland water cargo transport for every season?
 Yes No
17. Are there any changes of freight charges based on the seasons?
 Yes No
18. Are private owned vessels of inland water cargo transport convenient?
 Yes No
19. Is there any requirements for the development of port infrastructure in Inland Water Transport?
 Yes No