Inland water transportation in Bangladesh: Problems and prospects

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List of Acronyms and Abbreviations

Acronym	Abbreviation
CPA	Chittagong Port Authority
MPA	Mongla Port Authority
BIWTA	Bangladesh Inland Water Transport Authority
NCT	New mooring Container Terminal
BWDB	Bangladesh Water Development Board
IWT	Inland Water Transport
NEDECO	Netherlands Engineering Consultants
CEGIS	Centre for Environment and Geographic Information Services.
SSA	Sub Saharan Africa.
BUET	Bangladesh University of Engineering and Technology.
SOP	Sea Operational Preserves.
ADP	Annual Development Programme.

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ABSTRACT

Bangladesh is a riverine country. Seventy percent of its total population live in villages. People use water transport to carry goods and communication from the beginning of the civilization as is cheaper than any other means of it transport. Water transport plays an important role in the inland transportation.

In the post liberation period, the length of waterways in Bangladesh was **30,000 kilometer**. At present there is **24,000 kilometer** of waterways comprising rivers, canals, creeks and marsh. The total length of waterways of the country is about **6,000 kilometer** in the rainy season and **3,824 kilometer** in the dry season, steamers and trollers ply through this way.

Annually 35 lakh tons of goods are carried through inland waterway. 75% of the domes tic trade and passengers of the country mainly depend on water-route transportation. Moreover, this system of transportation is the only way of reaching the remote and interior rural areas. Imported goods are distributed from Chittagong and Mongla port through cargo services and simutaneously, exported goods are transported to those ports after collecting from the producers. So importance of waterways knows no bounds regarding domestic trade and passengers transport.

But now a days the inland water transport is facing various problems. The course of the river is changing due to the excavation of sand from riverbank, growth of industry on both sides of the river, emergence of sandy land in the river, grabbing land by the developers and dumping of industrial waste contribute to narrowing in river-ways. It has very goods prospect from the view point of geographical condition, economic condition and low income of the citizens in Bangladesh. For this reason inland water transport requires a comprehensive study to improve and enhance overall prospect of the inland waterways.

This study has attempted to bring into some objectives which are as under:

(a) Overall objective:

1. **To identify the probable area of development & existing problems in inland waterways and to provide some specific suggestions to improve this sector.**

(b) Specific objective:

1. **To identify the present condition of waterways.**
2. **To asses the importance of waterways for carrying goods and industrial products.**
3. **To evaluate the role of waterways in export and import business.**
4. **To examine the role of waterways in carrying passengers.**
5. **To explore the problems and prospects of inland waterways in Bangladesh.**

In order to achieve above mention objectives this study has chosen the present situation of inland water transportation in Bangladesh. Data has been collected from primary and secondary sources. Methodology is designed will statistical analysis. Respondents of all concerned sources have been conducted to collect necessary information. The thesis has been divided into six chapters, which are:

Introduction.
Review of the literature.
Methodology.
Present condition, importance and role of inland waterways.
Analysis and findings of the study.
Recommendation and conclusion.

Chapter four is the importance one which consists of description and total length of waterways, existing waterways around year, waterways during the rainy season, number of passengers moving the inland waterways and quantity of cargo moving through inland waterways.

This study is purposive survey which is concerned with some problems that can be used to devire information about the nature of problem of inland waterways and how to overcome the problems for the development of this sector. This study worked on a convenient sample of size 7 to reace a decision about the problems and prospects of inland waterways in Bangladesh.

Purposive survey includes the methods like sampling and sampling distribution. various methods of testing hypothesis, correlation, regression, coefficients of variance, factor analysis. This study is designed with hypothesis which is tested by t-test and χ^2 (chi-squire) test.

In spite of these problems and limitations the study has however, fulfilled its objectives. It indicate future trend and recommendation of inland water transportation in Bangladesh. I hope the research work has recommendation all concerned for further study. It is wide sector of prosperity. So adopting policies for multiplying the cheap and environment friendly inland waterways is the present perspective of complicated communication system.

Inland Water Transportation in Bangladesh: Problems and Prospects.

Chapter one: Introduction

1.1 Introduction: Bangladesh is criss-crossed with many rivers. Seventy percent of her total population live in villages. Water-rout is the cheaper way to maintain communication to the cities and towns. Water transport plays an important role in the inland communication. The total length of water-ways of the country is **6000 kilometer**. But its length extends during the rainy season. Water vehicles like small boat, launches, steamers and trollers ply through this way. Annually 35 lakh tons of goods are carried through this way. 75% of the domestic trade and passenger's transport of the country mainly depend of water-rout communication.

Communication in water-ways is developed in many regions comprising Dhaka district. Moreover, this system of communication is the only way of communicating to the remote rural areas. Imported goods are distributed from Chittagong and Mongla port through cargo service and simultaneously exported goods are transported to the those ports after collecting from the producers. So, Importance of waterways knows no bounds regarding domestic trade and passenger's transport. That is to say, inland water rout plays a vital role in the economy of Bangladesh as a whole.

But now a days the inland water transport is facing various problems. Water transport is very much significant in all aspect. It has very good prospect from the view point of geographical aspect, economical conditions, low income of citizen in Bangladesh. This is why this sector requires a comprehensive study to improve and enhance overall prospect of this sector.

1.2 Statement of the problem: Inland water transport plays a vital role in the socioeconomic perspective of rive-rain country, Bangladesh. Eighty percent of her total population live in villages. Inland waterways are the main way of their communication. It has very good prospect for being less risky, cheap in cost and environment friendly in Bangladesh. But now a days the inland water transport is not a suitable way for facing various problems.

There are many problems in the waterways of Bangladesh among which riverbed siltation is highly predominant. Growth of industry on both sides of the river, emergence of sandy land in river, grabbing land by the developers and dumping of industrial waste contribute to narrowing in river-ways. Moreover this phenomenon has had an adverse effect on the existence of the fisher in the river.

According to a survey by the Netherlands Engineering Consultants (NEDECO) Carried out between 1995 and 1967, Bangladesh once had about 310 large and small rivers flowing across its plains. But only 193 have survived till date. Bangladesh water Development Board **and Bangladesh Inland Water Transport Authority (BIWTA)** have estimated that once about **1300** small and large rivers crisscrossed the country.

However, many of them have died due to unplanned construction of embankments and culverts, encroachments, absence of dredging, inadequate flow of water, urbanization, silting, earthquake, climate change and also construction of barrages and dams upstream by India, experts said.

More rivers will die out and the country will have to face a severe ecological impact due to the Indian river-linking project, Dr. Mominul Haque Sarker, deputy executive director of Centre for Environmental and Geographic information Services (CEGIS) said.

Blockage at the mouth of the rivers, narrowness of the river, decrease of the depth of river, cause huge flood. There has been a disruption of the easy movement of water transport due to the decrease of water flow in the water. As a result, the cost of carrying goods has been doubled or more in the last ten years. The navigability of the river is declining for collecting sand from the river.

Inland water ways can play a vital role in our national life sustain its compatibility. But at present the inland water ways of Bangladesh are losing their own traits and causes. But once they main the only means of communication in the country. These significant causes can be included in this study. The objective of this study is to identifying and solve the problems that to smooth functioning of inland waterways.

1.3 Objectives of the study: Bangladesh is criss-crossed with rivers. More than **50 thousand** of different types of vehicles move on the rivers of the country. However, regestered only **8185.** From the time immemorial, Water transport was the only means of carrying goods and passengers. Sealed boats, rope tugging boats were seen on the common phenomenon on the rivers. But with the passage of time, things are changing. In time with the modern world, people are using engine boats, trollers, lunches and steamers for faster communication. No country can be developed trade and commerce without easy and suitable waterways. Inland water transport (IWT), is a major mode of transport of goods and passengers. For this reason, there is a great influence of waterways in the trade and commerce of Bangladesh, a land of rivers. But at present the inland waterways of Bangladesh are facing the threat of their existence. This research work will be done with a view to

suggest to make the inland waterways more effective in future. The objectives can be described in the following ways.

(a) Overall objective:

1. To identify the probable areas of development & existing problems in inland waterways. and to provide some specific suggestions to improve this sector.

(b) Specific objective:

1. To identify the present condition of waterways.
2. To asses the importance of waterways for carrying goods and industrial products.
3. To evaluate the role of waterways in export and import business.
4. To examine the role of waterways in carrying passengers.
5. To explore the problems and prospects of inland waterways in Bangladesh.

1.4 Need for the study: The importance of water transport in the prospective of the economy and environment of Bangladesh needs on elaboration. In the post liberation period the total length of water-ways in Bangladesh was **30,000** kilometer. At present there is **24,000** km. of water ways comprising rivers, canals, creeks and marsh. Out of this total **6000** kilometers are accessible for movement of modern mechanized vessels during the rainy-season and **3824** km. in dry-season.

Country boats in the number of several hundred thousands. are traditional vessels which have been plying inland and coastal waters for hundreds of years and which play key role as a rural mode of transport of goods and passengers. Inland ports and other facilities include 11 major inland ports 23 coastal inland ports, 133 lunch stations and more than **1,000** minor landing points located in rural areas. In comparison, the road network is **2,74,000** km long with **70,000** km of paved roads, **21,000** km of major roads and **2,53,000** km of rural roads. Bangladesh Railways operator network of around **2,800** km. Inland water transport network of the country not only caters to the inland movement of freight and passengers but also plays on important role in the transportation of import and export thought Chittagong and Mongla ports. Inland water transport (IWT) in important for the poor as well as for the competitiveness and growth of the economy as it is the cheapest mode of transport compared to road or rail. In this context inland water transport has become a major research topic in the literature of our economy. This concept is needed to be assessed widely to find out the reasons of accident inland waterways resulting loss of goods and

passengers. To find out the reasons which hamper faster communication specially in dry-season and the effects of setting up mills in the river-banks adjacent to the towns and cities.

I hope the proposed research work on 'Inland Water Transportation in Bangladesh' will extensively help the Bangladesh Inland Water Transportation Authority (BIWTA), Non-government Vehicles owners, Businessman and Industrialist (Garments, Ceramic, Jute, Textile), Importer and Exporter), Government of Bangladesh and Researchers to a great extent.

1.5 Scope of the study: An effective transportation system is essential to facilitate economic growth in Bangladesh. Inland water transport plays a very significant role in the transportation system of Bangladesh. Its low expenses and high accessibility, as compared with other alternatives, amplifies a great demand for carrying goods and passengers within the country.

BIWTC is responsible for operation of passengers both inland water ways and in the costal area and off-shore inlands of the country. These off-shore islands are inhabited by crores of people and are also growing populous day by day. Waterways are the only communication media for the people of the region for carrying out their day-to-day socio-economic activities. But till today no proper passenger service could have been opened in this area by the private sector.

Although inland water transportation sector in Bangladesh posses geographical advantage but there are deficiencies in the safety aspect. This study has been aimed at collecting and analyzing data problems of the carrying goods and passengers transport that caused in the inland water ways of Bangladesh during 2001-2012.

Passenger service unit is mainly engaged in carrying passengers in the inland waterways, coastal areas and off-shore islands. Vessels of this unit are plying in the following routes:

Name of routes/services	
Inland	**Coastal**
Dhaka-Khulna Rocket service	**(a) Chittagong-Barisal steamer service** **(b) Chittagong- Hatiya steamen service** **(c) Kumira-Guptachara LCT service** **(d) Hatiya-CharBata sea-truck service** **(e) Char Changa-Sharbala sea-truck service** **(f) Monpura-Shashiganj sea-truck service** **(g) Barisal-Mazuchowdhuryhat sea-truck service** **(h) Alexander-Mirjaklu sea-truck sevice.** **(i) Teknaf-St.Martin Tourist sea-truck service**

Source: Annual Report-BIWTA, 2005-2008.

This research is mainly based on the Sadarghat terminal of Dhaka. Chandpur terminal and Chittagong Port. Various types of goods are transported from Dhaka through waterways and simultaneously these things are carried in Dhaka. One of the objectives of this research is to represent the problems related to passengers transport and carrying goods.

The research has been designed for 7 selected sample items to identify the problems of inland waterways in Bangladesh. The selected are 10 Executives of BIWTA, **10** Non-government vehicles owners. **10** Businessman, **10** Industrialists, **10** Importer and Exporter, **10** small-traders and **40** Passengers.

1.6 Limitations to the study: This study suffers from certain limitations due to its wide scope of study materials and multiple nature. These limitations were beyond the control of the researcher.

(a) Only three sectors of Inland water ways are covered in the study.

(b) The published secondary data are very limited. Data is not available in publications, Annual report, Statistical yearbook, Ministry of Shipping. Bangladesh inland Water Transportation Authority (BIWTA) etc.

(c) In interviewing period, a significant amount of non-cooperation and avoiding attitude observed from respondents. Some BIWTA officials and vehicles owners avoiding tendency and some other refused to give answers to certain questions on inland water transportation in Bangladesh.

(d) Some of the personnel's of relevant field of selected sampled units were very had nut of crack. However, efforts were made to persuade them though it was troublesome and costly as I conducted with them, in some causes, it took seven items to collect the information.

(e) It has been found that some high executives of Bangladesh Inland Water transportation Authority and senior journalists hole suspicious at attitude to wards this sort of academic research exercise. As a result, they often hesitate to co-operative in providing the needed research information.

In spite of these problems and limitations the study has however, fulfilled its objectives. It indicate future trend and recommendation of inland water transportation in Bangladesh. Utmost emphasis has also been laid in this respect.

1.7. Significance: It is undeniable that this topic is very important in the contest of rural-economy as well as the economy of the country. Its significance can be perceived regarding the following subjects:

1. Availability of cheaper transport: It is impossible to develop trade and industrial products through waterways is cheaper than any other kind of transport.

2. Carrying heavy goods: Heavy industrial machineries and parts, construction materials and fuels can be carried from one place to other places through this way cheaply.

3. Able to mitigate critical situation: There is a probability that the road and railway communication system may be hampered due to flood, tidal wave, cyclone, internal ciaos and confusion and foreign invasion. Waterway is secured enough to face such a critical situation.

4. Waterways is the only communicable transport in many places: Roads and high-ways go under water during the visitation of flood. In these circumstances, water-way is the only means to maintain communication and carrying goods, Moreover, in the costal areas and offshore islands, this is the only means to carry goods and passengers.

5. Agricultural development: This way is the suitable way of carrying seeds, fertilizers, machineries and marketing the products in the agricultural sector. Agricultural development has become caster as there is availability of inland water transport in Bangladesh

6. **Industrial development:** There in an important role of water-ways for the establishment of mills and factories. The raw materials of industries can be collected easily and industrial products can be supplied indifferent market places of the country through this way. So industrial development of the country greatly depends on water-ways.

7. **No cost of construction and repairing:** There is no cost of construction and repairing this way. So it is economically profitable.

1.8 Rationale of the study: Bangladesh lies at the apex of Bay of Bengal and has rivers that come down from the surrounding countries and flow through it. Nearly the total area of the country consists of low and plain lands. **According to Banglapedia (1) about 7% surface of the country is covered by a dense 24000-km long network of inland waterways.** Most of the studies related to inland water transportation accidents and water management in Bangladesh have been carried out in the past few years. Though the importance of water transport has been decreased after the invention of Rail and Motor vehicles, it is still the only cheapest mode of communication.

From a long period of time, inland water-ways are the prime source of trade and commerce within the country and as hinterland for exporting goods abroad. There is no alternative to inland water-ways for importing and exporting heavy industrial equipments and building materials in respects of cheaper means of communication. In a word the importance of carried goods knows no bounds to control the market price and accelerate the wheel of the economy of Bangladesh.

Among the ways of carrying passengers and goods within the country, inland water transport is the most comfortable and secured cheaper as well as environment friendly. One of the most rationale of the study is to develop different polices and recommendations to solve the relevant problems and to accelerate the communication system of inland water-ways in Bangladesh.

Chapter Two: Review of the literature

Review of the literature of inland water transportation in Bangladesh.

2.1 Introduction: An efficient and effective transportation sector will assist Bangladesh in sustaining 7 percent economic growth thus contributing towards its achievement of the Millennium Development Goals.

With some 700 rivers and tributaries crisscrossing the country. Bangladesh has on of the largest inland waterway networks in the world. Chittagong and Mongla ports handle about 40 percent of the nation's foreign trade. The network, which shrinks during the dry season. connects almost all the country's major cities, towns and commercial centers. Moreover, being cheap, safe and environment friendly, inland water transportation is often the only mode that serves the poor, proving especially useful during periods of widespread flooding.

The inland waterways in Bangladesh is both extensive and well-connected with the rest of the transport system. It terms of traffic intensity. the inland waterway network generates about 1.57 million passenger-kilometers per route-kilometer of water-way. The density of inland ports and terminals is much higher on the inland water-ways with approximately 3.7 berthing facilities pen 100 route-kilometers. The density of passenger facilities of the inland waterways is also high at around 40 per 100 route-km.

A large literature on the subject has been developed over the recent year on the various fields of inland waterways as well as the sector.

In this section, an extended analysis of the contents of available literature of different aspects of inland water transportation and other transportation sector have been reviewed. The whole review of literature for the present study has been segmented into three parts which are as follows:

i) Literature available of inland waterways
ii) Literature review of inland water transportation in Bangladesh.
iii) Findings of the review of literature.

2.2 Literature review of inland waterways: A number of studies to inland waterways have been carried out in 2001-2012.

Inland water transportation system in Bangladesh is the oldest mode of transport that carries nearly one third of the country's total passenger and freight. The report revealed that the private operators own more than 90 percent of the water transport plying in the country. Unlike to public sector. the operators do not follow the rules and regulations. This is why their vessels lead to disastrous and fatal accidents in the water-way of the country, Preponderance of private sector in inland water also makes the assessment of operational efficiency difficult. Also, a private operators do

not maintain regular and authentic statistics **(Report of the Task forces on Bangladesh Development Strategies for The 1990's).**

The potential of the sector as well as the various benefits of carrying passenger and goods through waterways are well known in the concerned quarters. The meagre allocation to the sector is also well acknowledge.

(Annual Report BIWTA and World Bank, 2005).

The main industry clusters and effluent 'hotspots\ around Dhaka city includes the tanneries at Hazaribagh which pollute the Buriganga River. the Tejgaon industrial area which drains to the Balu River, The Tongi industrial area which pollutes Tongikhal, The Sayampur and Fatullah industrial clusters in Dhaka South and Narayangonj which dischare to the Burignaga River and the developing heavy industry strip along the Shitalakkhya River. **(World Bank, 2006)**

Bangladesh Transport Sector study have classified the waterway accidents focusing on identification of broad types of inland waterway accident and suggested several remedial measures commensurate with the classification. **(Bangladesh Transport Sector Study, 1994)**

Accident can not be caused by a single factor in inland water-way. Rather it is a complex interaction of mechanical failure, human errors and natural causes. The factors that trigger the water-way accidents are described by Islam. M.R. BIWTA and Chowdhury, A.S. **(Islam, MR. 1999, Seminar Report-BIWTA: 2003, Chowdry, A.S., 2005)**

The risks of accident in the inland waterways of Bangladesh is increasing. It takes a serious tern during the rainy season. Mainly ignoring the marine rules and not applying the unreformed rules and lack of co-ordination among the subordinate officers of the Ministry of shipping are the predominant inland waterways. The river water is flowing with great force due to non-stop raining from 20th June to 26th June, 2011. Storms and tidal surge are frequent now. Nevertheless thousands of launches, Steamers and Cargoes with thousand of passengers and a great deal of goods are continuing there services. Many transport owner and drivers ignore the government rules about when, where and if what situation the water vehicles will move or not. It will increasing the risk of accident. The main causes of accident in the inland waterways are.

i) Violating rules by launch and Steamers.
ii) Out dated marine-laws.
iii) Lack of co-operation among the ministries.
iv) Inadequate rescue functions.

(Kibria Golam Jibon, 2011)

An investigation of accident, damage and cargo losses in inland shipping has been made by Zahangar and Haque who examined the causes of waterway accidents and made recommendations for the prevention of accident (Zahangar S.I.M and
Haque M.E., 1989.)

2.3 Literature review of Inland water transportation in Bangladesh and other Transportation sector. This reading list includes papers reviewing experiences with inland waterways in Bangladesh and other transportation sector. Bangladesh has developed a transport network that includes roads. railways, inland waterways, two maritime ports and civil airports catering to both domestic and international traffic. Road transport has traditionally been the centre of the governments attention in this sector.

It is the fastest growing mode, with an average annual growth of 8% for passenger and 9% for freight since 1990. Roads account for around 80% of passenger and freight movement. The road network consists of four broad categories. National highways connect the national capital with divisional head-quarters. Ports and international regional high-ways form a five-way regional corridor (Dhaka- Chittagong; Dhaka-northwest. Dhaka-Khulna: Dhaka-Sylhet and Khulna-northwest) which represent 3 and 2% of all road length respectively.

Bangladesh today has and extensive road network **(2.4. lac kilometres)** surpassing other **South Asian countries** in total road density. An extensive rural road network has contributed greatly to economic growth and poverty reduction. 80% of the rural road network is composed of narrow reads in poor condition because they are built with poor compaction and without proper structures.

The inland waterway system, which carries large volumes of the nation's freight is not used to its full potential due to sitting waterways, lack of gnat berthing facilities and obstruction caused by low or narrow road bridges and irrigation channel sluice gates. Planned and meaningful dredging should be introduced for navigability of inland waterways. The government has given highest priority dredging, but the money which has already been allocated should be used properly.

Bangladesh Railway has a total of 2,885 route-km railway lines consisting of three different gauges. The Medium Gauge (MG-1000 km) and Broad Gauge (BG-1676 km) systems have been in use since the beginning, but Dual Gauge-a mix of MG and BG-system was introduced in 2001. If rail is to survive as a viable mode, it must significantly improve service quality and operational efficiency. Moreover railway networks need

multimodal integration with road and inland water transport systems as well as improved infrastructure facilities to be able to carry more traffic efficiently.

The priority for the government in the transport sector is to embrace the role of regulator and standard setter. Road safety, improvement of railway service, pollution control and inland waterways are four major areas where needs are most pressing. The highest dividends in terms of growth and poverty reduction will be achieved if the government focuses on maintaining the core network as well as enhancing capacity on major highway corridors expanding railway routes by introducing 110 pound rails and improving the service delivery of BR, bridging river gaps, dredging inland waterways for navigability, replacing ferries with bridges and introducing efficient port management.

(Mohammad Mohiuddin Abdullah, 2011)

According to African transport sector's study is in response to questions regarding perceived unrestrained monopolistic behavior by private sector operators in the port and rail sectors in sub Saharan Africa (SSA). Indeed, prima facie, and for historical reasons, much of SSA.s transport network in organized in multiple port railway corridors that appear to favor potential monopolistic behavior. During the course of the analysis, it because evident that other equally important issues related to financial performance and attractiveness of concessions design needed to be addressed. Since the quantity and availability of data was found to be limited for port concessions, it was decided early in the process to concentrate the analysis on existing planned railway concessions.

(African transport sector, 2006)

The civilization will be endangered unless the rivers are protected. Bearing the slogan-**"The small rivers are not small at all" National rivers fair-1418** has been started from July 23, 2011 at Jahangir Nagar University. This three days long fair has been organized jointly by Geography and environmental science department and Disaster Forum. The fair was inaugurated by renowned freedom fighter PrioVashini. On that occasion. Professor, Dr. Shaif Enamul Kabir Vice chancelor of J.U. white delivering his speech as a chief guest says that rivers play a vital role for the presentation of Biodeversity.

The river Teesta in Lalmonirhat and adjacent districts has reached its low watermark, posing serious threat to irrigation and livelihood of the fishermen. A huge landmass and a number of shoals have emerged turning the river into tapered, petty lanes. Miles after miles on the riverbed are facing threats of desertification and other environmental. Attributing to the unilateral withdrawal of water by India through the Farakka Barrage in the

upstream of Teesta Irrigation Barrage at Daliya of Hatibandha upazila for the abnormal fall of water level, environmentalists in Lalmonirhat, observe the sharp fall would be catastrophic for navigation.

The drastic fall in water level has resulted in total suspension of plying of vessels causing untold sufferings to two lakh people living in char villages under Sadar, Aditmari, Kaligonj and Hatibanda upazilas Scores of fishermen have became jobless and many have already shifted to other profession

(S Dilip Roy, 2011).

About 2 kilometers of river ways of Arialkha river of southernside of the Hazi Shariatullah bridge in Shibchar upazilla of Madaripur district, has been filled with silt. Consequently, the regular transportation of water vehicles is interrupted terribly. A recent survey has found, a rise of a great sandyland of the southern part of the bridge. Water transport can't move through the western side because of the rise of sandylands on the east and west side of the south-north flown river. The trollers have to move carefully in the canal like narrow rivers along the southern sandylands. The big trollers get stuck in the submerged sandy land.

In the last five years the depth and width of the rivers have decreased due to the rise of sand sandylands. Consequenlty, there has been an adverse impact on the commercial activities of village `hat' The water vehicles can not move smoothly due to navigability crisis though the waterways are convinient in carrying goods.

(Imtiaz Ahmed, 2011)

Once upon a time, the 'Alengani' river was very tidy. But now it has turned into a canal. Changing the direction of river flow by building dams in different places, decline of navigability, grabbing the rivers sides and insufficiency of river water are the major causes of its becoming a dead river.

During the dry season, there remains little water in this river. The River, 'Alengani' a branch of the river Jamuna, has been under going the scarcity of water. Starting its course from Jugni and getting united with the Louhagong of Guntia under Mirzapur Upazila, it has submitted itself to the River Buringanga. Once upon a time, the water vehicles like launch, steamer and other vehicles used to move of this river. Rice, Jute and other agro-products were carried by means of these vehicles. With the passage of time, it has lost its past glory. During the rainy season only a few small boats are seen to move on this river.

(Delduar correspondent, 2012)

2.4 Major findings of the review of literature: from the highlighted review of literature it has been observed that inland water transport plays a vital role in the socio-economic perspective of rive rain country, Bangladesh. It has very good prospect for being less risky, cheap in cost and environment friendly in Bangladesh. Research findings may also be used by policy makers for the respective departments of Government to take necessary steps to develop the inland waterways in Bangladesh. But from this review it has come to light the inland transport is not a suitable way for facing various problems.

Some of the reviewed thought about needs of further study are given below:

1. Pragmatic steps and policies should be adopted with a view to making the waterways safe and minimizing the loss of passengers life and property.

2. Changing the direction of river flow of building dams in different places, decline of navigability, grabbing in the rivers and insufficiency of river water are the major causes of 'Alengani' river is becoming a dead river.

Even in the rainy season water vehicles like lunches, steamers and ships except some small boat use the waterways for regular transportation.

3. Bangladesh being a rive rain country, its waterways are the main means of communication which effects of setting up mills on the riverbanks adjacent to the towns and cities. This unavoidable factors creates problems and as a result problems being created to easy movement of water transport shrinking the waterways.

4. The depth and width of Arialkha river have decreased due to the rise of sandy lands. As a result the waterways are shrinking.

5. Inland water transport is a technique to solve the problems which hamper faster communication specially in dry-season.

6. Zahangir and Haque mentioned their study that a little is known about the problems of inland waterways in Bangladesh. So it is needed to be assessed that find-out the problems and solve of the subject.

7. Annual Report of BIWTA and World Bank 2005 shows the potential of the inland water transportation of Bangladesh as well as the various benefits of carrying goods and passengers through waterways the meager allocation to the sector are well known in the concerned quarters.

8. World Bank publication in 2006 shows a report regarding the main industrial areas about the Dhaka city which are responsible for

polluting the main stream surrounding the city. The main culprits to be noted are tanneries at Hazaribagh, Tejgaon industrial area, Tongi industrial area and the Sayampur and Fatullah industrial area.

9. Bangladesh Cargo vessel owners Association reports that they loaded fuel and fertilizers to 16 northern districts from Bangladeshi route and the demand of the employees for taking measures for keeping the river navigable round the year.

Chapter Three: Methodology

This study is purposive survey which is concerned with some problems that can be used to devire information about the nature of problem of inland waterways and how to overcome the problems for the development of this sector. This study worked on a convenient sample of size 7 to reace a decision about the problems and prospects of inland waterways in Bangladesh.

Purposive survey includes the methods like sampling and sampling distribution, various methods of testing hypothesis, correlation, regression, coefficients of variance, factor analysis. This study is designed with hypothesis which is tested by t-test and χ^2 (chi-squire) test.

3.1 Population: Population is the total area of proposed research programme. Population of the study includes-

1. Executives of BIWTA
2. Non Government vehicle owners
3. Businessman
4. Industrialist
5. Importer and Exporter
6. Small traders
7. Passengers

3.2 Sample: A short size of population is called sample. Study will be conducted on a convenient sample and sample size of study will be as follows:

1. Executives of BIWTA	10
2. Non Government vehicle owners	10
3. Businessman	10
4. Industrialist	10
5. Importer and Exporter	10
6. Small traders	10
7. Passengers	40
	Total=100

3.3 Survey area coverage: This study will cover the area as follows:

1. Dhaka
2. Chandpur
3. Chittagong Port
4. BIWTA

Sample selection procedure: Sample shall be selected with purposive method, because number of population are not well defined. The researcher has chosen this method and expect to achieve of objectives of the study.

3.4 Data collection: Data for the purpose of the study would be collected from-both primary and secondary sources. Primary data would be collected through questionnaire and discussion with the sailor, vehicle owner, passenger, businessman, BIWTA (Bangladesh Inland Water Transport Authority) Official etc. A survey of the major activities of the sector will be conducted for the same purpose.

On the other hand the secondary data would be collected from various Journals. Publications, Annual reports, Statistical yearbook, documents from BIWTA (Bangladesh Inland Water Transport Authority) etc.

Both data and information will be analyzed with the aid of computer and relevant statistical methods.

3.5 Test to be used: Statistical method has been applied in this study. Frequency distribution, t-test, χ^2 test are applied to findout various objectives. Inland waterways are very much suitable at present in Bangladesh has been analyzed by χ^2 test.

Hypothesis for χ^2 test are: Hypothesis are some assumptions about the relationship between variables. There are two types of hypothesis which are explained below:

Null Hypothesis (H_0): Passengers and nonpassengers are in unique decision that inland waterways are very much suitable at present in Bangladesh.

Alternative Hypothesis(H_1): They are not in unique decision.

3.6 Data analysis: The collected data has been analyzed manually and with the aid of computer to reach a concrete decision about the problems and prospects of inland waterways in Bangladesh. MS-Word is used for writing the whole documents paper. MS-Excel is used for graphical presentation of the comparison of different respondents. Some statistical methods especially SPSS has also been applied to make sure the final comment more accurate. Different tables such as comparison tables and contingency table have been used as well.

Chapter Four: Present condition, importance and role of inland waterways.

Bangladesh is a land of rivers. A good network of rivers, canals, creeks covers almost all the parts of the country so well that it provides a cheap means of transport and communications and in certain areas, it is the only means of transport.

The topographic, soil and climatic condition in Bangladesh are such that the cost of building and maintenance of roads and railways is very high compared to those of inland water transportation. Water transport is also a stable and reliable means of transport for the country both in times of war and natural calamities like flood, cyclone etc.

Moreover, Inland Water transport is rural in character in that it reaches many outlaying rural populations when it is very impossible and difficult to reach by roads and railway. The present condition of inland water-ways for the present study has been segmented into five parts that are as follows:

4.1 Total length of waterways: In the post liberation period the length of waterways in Bangladesh was **30,000 kilometer.** At Present there is **24,000 km.** of water ways comprising rivers, canals, creeks and marsh. Owing to the deposit of silt on the riverbed, possession of riverside and in adequate dredging system, the waterways shrink into **6,000 kilometers** in the rainy season and **3,824 km.** in dry-season.

4.2 Existing waterways whole the year: Bangladesh has about **24,000 kilometer** water-route. The Marine-SOP under BIWTC Preserves **6,000 Km,** water-route in the rainy season and **3,824 km. in the dry season.** It sets up pontoon at different naval port load and unload passengers and goods from lunches and steamers. It runs several activities through out the country. There are, a Head-Quarter, Seven branches and a Sub-branch of marine preservation and Management department to perform its duties and responsibilities perfectly. The name of the branches are mentioned below:

Branch office:

1. **North-east deltaic branch, BIWTA, SadarGhat, Dhaka.**
2. **Middle deltaic branch, BIWTA, Chandpur.**
3. **East deltaic branch, BIWTA, Chittagong.**
4. **West deltaic branch, BIWTA, Khulna.**
5. **South deltaic branch, BIWTA, Barisal.**
6. **North deltaic branch, BIWTA, Sirajgonj.**
7. **Aricha Branch, BIWTA, Aricha.**

4.3 Waterway during the rainy season: Water transport is the ancient mode of communication of human beings. People use water transport to carry goods and communication, from the beginning to the civilization. Then boat was the main means of communication. But at present the waterways shrink into **6,000 kilometer** in the rainy season.

Source: Annual Report, BIWTA, 2004-05

4.4 Waterways capable for marine route: Though the importance of water transport has been decreased after the invention of Rail and Motor vehicles, it is still the only as the cheapest mode of communication. The total length of navigation waterways in Bangladesh capable for marine route is 6000 km. during dry season which stretches of about 3824 Km. during monsoon. The BIWTA has classified the waterways into class I, II, III, and IV depending upon the minimum water depth to be maintained round the year.

Table 1: Table showing the marine route description.

Class	Length (Km)	Depth maintained (Km.)
I	683	3.66-369
II	1,000	2.1-2.44
III	1,885	1.52-1.85
IV	2,400	less than 1.52

Source: Annual Report BIWTA, 2005

The BIWTA made several affords such as global studies in 1963 and mechanization in 1976 on the country boats fleet but could not answer all calls of need on this fleet. In the process of silting of rivers like the death of tertiaries and tributaries, the country boat sector has been affected the most. The loss of transport links of this fleet is of 6000 km.

Wrecks of sunken vessels due to liberation war and natural accidents in the waterways exaggerated the silting of our alluvial soils and enhanced shrinkage of waterway main network.

Table 2: Table showing the inland water transportation network description:

Year	Monsoon (kms)	Winter (kms)
1970	13,500	8,500
1984	8,400	5,200
2004	6,000	3,800
2008	6,000	3,824

Source: Annual Report BIWTA and World Bank -2005.

4.5. Waterways capable for non-mechanized vehicles: In Bangladesh, being a country with many rivers. Inland water transport is a major mode for the transport of goods and passengers. It is important for the poor as well as the competitiveness and growth of the economy as it is the cheapest mode of transport compared to road or rail.

A large fleet of privately-owned country boats operate all over the country. BIWTA estimates the number country boats at about **7,45,000** of which **4,84,000** are used for passengers and **2,61,000** for cargo. Half of the country boats are non-mechanized vehicles. These boats of our country evolved for low speed non-mechanized propulsion.

4.6 Importance of waterways in Bangladesh: Bangladesh has an extensive inland water network that links with West Bengal on its west and Assam and Northeast India on the east. The importance of water transport in the perspective of the economy and environment of Bangladesh needs no elaboration. Inland water transport network of the country not only caters to the inland movement of freight and passengers but also plays on important role in the transportation of import and export business through Chittagong and Mongla ports.

4.7 Chittagong Port Authority (CPA): Chittagong port the largest sea port of Bangladesh, handles about 92% of country's maritime trade. The growth rate of the volume of imports and exports through Chittagong port is about 10-14%.With the remarkable change in cargo handling in international maritime trade, introduction of open market economy with trade computerizing during the nineties, cargo handling at Chittagong port has increased over time. Consistent with the improvement of modern ports around the world, efforts are continuing to develop CPA as a modern port. With this end in view, a range of development programmes has been undertaken. These include building a container terminal in the New Mooring area, procurement of container handling equipment including granty cranes, capital dredging in Karnaphuli river computerization of the activities of port under the Chittagong port trade facilities project, environment management and building of local roads.

At present, Chittagong Port Authority has been implementing three investment projects. The present status of the projects are as follows:

1 Chittagong Port Trade Facilitation: The objective of the project is to increase the capacity of the Container Terminal In Chittagong Port and upgrade it to international Port security and environmental standards. The project is being executed under five packages; **CPA-1,CPA-2,CPA-3,CPA-4** and **CPA-5**. out of five packages three packages namely oily Waste Collection and Disposal vessel (CPA-2), civil work for waste collection and disposal facilities (CPA-3) and Port service road (CPA-5) has already been completed. CTMS and MIS (CPA-1) and up- gradation of internal road and bridge between CCT and GCB and Gate Control Equipment (CPA)-4) are in progress.

2 New Mooring Container Terminal: The main objective of the project is to ensure efficient and full-fledged operation of container handling at **New Mooring Container Terminal (NCT).** The Govt. approved the DPP of the project with an estimated cost of Tk. 114.48 crore.

3 Capital Dredging and Bank Protection: The objective of the project is to carry out capital dredging in the Karnaphuli Channel from Sadarghat jetty to 3rd Karnaphuli bridge to ensure the navigability to the channel and works of bank protection with jetty facilities to provide berthing facilities for inland coasters and vessels at aforesaid area of the channel. The DPP of the project with an estimated cost of tk.376.34 crore was approved.Statistics of income and expenditure of the CPA during FY 2000-01 to FY 2009-10 are shown below:

Table 3: Income and Expenditure of CPA

(Taka in Crore)

Fiscal Year	Income	Expenditure(Except the contribution in govt. treasury	Surplus
2000-01	477.00	302.28	174.72
2001-02	531.37	396.10	135.28
2002-03	530.66	373.75	156.91
2003-04	557.36	325.60	231.76
2004-05	649.78	379.65	330.13
2005-06	741.13	376.11	365.02
2006-07	830.02	451.26	378.76
2007-08	1057.04	447.16	609.88
2008-09	1133.72	457.51	676.21
2009-10	1150.26	576.78	573.48

Source:Chittagong Port Authority, Ministry Of Shipping

Mongla Port Authority (MPA): Mongla is the second seaport of Bangladesh. About 8 % of country's maritime trade are handled by this port. In FY2009-10, 15 lakh metric tons of goods have been imported and 1.48 lakh metric tons of goods have been exported through this port and at the same time 20,651 TEUS container and 1,44,250 metric tones container cargo have been handled through this port.

The Government has given top priority for developing port facilities up to international standard.

To develop the port 7 development projects have been undertaken at an estimated cost of Tk.467.45 crore. It is expected that after implementation of those projects MPA will be operated efficiently. The broad outline of the projects is as follows:

1 Procurement of Cargo Handling Equipment: For procuring cargo and container handling equipment, the project has been undertaken at a cost of Tk, 22.97 crore. Under the project 2 Straddle Carrier, 2 Terminal Tractor and 2 Container trailer has been procured and to procure 6 nos. Forklift truck project is scheduled to completed by December 2010.

2 Navigational aids to Mongla port : To assist Movement of sea-going vessels in the channel day and night, the project has been undertaken at a cost of Tk. 23 crore. Under this project, 62 buoys, 2 beacons, 6 light towers with lantern and anchors will be procured and installed. The project is scheduled to be completed by June 2011.

3 Dredging at the Outer Bar in the Pussur Channel: The project has been undertaken to increase navigability at the outer bar area of the Pussur Channel to facilitate entrance of more than 9 meter draft ships into Mongla Port area easily. The project at an estimated cost of Tk. 58.46 crore was prepared to dredge about 3.2 million cubic metre silt in the outer bar area.

4 Dredging in the Harbour Channel of Mongla Port: To increase the navigability of the Harbour Channel of the Pussur River the project has been undertaken at a cost of Tk.100 crore. Under the project 4.196 million cubic meter dredging will be done at different places in the Pussur Channel. The project will be implanted over a period of FY 2010-11 To FY 2012-13.

5 Procurement of Cutter Suction Dredger,Pilot and Despatch Boat for Mongla Port: To carry out regular maintenance dredging for smooth functioning of the port, 1 cutter suction dredger,1 pilot boat and 1 pilot dispatch boat will be procured at a cost of Tk 82.93 crore.The project is scheduled to be completed by June2013.

6 Port and Logistics Efficiency Improvement : To prepare Master Plan and short, medium and long term plan for improving efficiency of Mongla Port. This study project has been undertaken at a cost of Tk6.25 crore with the financial assistance of Asian Development Bank. The project is scheduled to be completed by April 2011.

7 **Procurement of Dredgers and Ancillary Crafts:**To procure 6 dredgers for BIWTA, BWDB and MPA this project titled **"Procurement of 6 Dredgers and Ancillary Crafts and Accessories for Ministry of Water Resources and Ministry of Shipping"** (Mongla Port-1 No,BIWTA-3 Nos.BWDB-2 Nos) is being implemented at a cost of Tk.638.94 crore Under this project, 1 dredger with ancillary equipment will be procured for Mongla Port at a cost of Tk. 104.25 crore.The project will the financial assistance of Indian government.

Several steps have been taken to improve MPA management. A project tiled **"Pashur Channel Dredging and Conservation"** is being implemented at an estimated cost of Tk. 548.43 crore. Another project titled **"Suction Dredger Collection"** has also been taken up for implementation at a cost of Tk. 54.79 crore. In addition, there is a

project at Mooring area in Pashur Channel for dredging 13.28 lakh square meters at an estimated cost of Tk.28.89 crore. A project has also been taken up to procure cargo handling equipment in different points of channel at a cost of Tk.24.74 crore.

4.8 Number of passengers moving the inland waterways: Bangladesh inland water transport corporation is responsible for operation passenger services both in inland water routes and in the costal area and off-shore inlands of the country. These off-shore islands are inhabited by crores of people and are also growing populous day by day. Inland waterways are the only communication media for the people of the region for carrying out their day-to-day socio-economic activities. But till to day no proper passenger service could have been opened in this area by the private sector.

Passenger service unit is mainly engaged in carrying passengers in the inland waterways, coaster of this unit are playing in the following routes.

Name of routes or services:

Name of routes	Services
Inland	Dhaka-khulna rocket services
Coastal: i)	Chittagong-Barisal steamer service
ii)	Chittagong-Hatiya stteamer service
iii)	Kumira-Guptachara LCT Sevice
iv)	Hatiya-Char Bata sea-truck service
v)	Charchanga-Char Bata sea-truck service
vi)	Manpura-Shashigonj sea-truck service
vii)	Brisal-Mazuchowdhuryhat sea-truck service
viii)	Alexander-Mirjakaiu sea-truck service
ix)	Teknaf-St. Martin Tourist sea-truck service

During the last 5 Years, the number of passengers and quantity of cargo carried and the fare and freight earned by the passenger service unit are as follows:

Year	Number of passenger	Quantity of cargo	Fare and freight earned
2003-2004	11.15	0.14	864.96
2004-2005	10.80	0.13	790.98
2005-2006	11.14	0.14	836.70
2006-2007	9.40	0.17	728.54
2007-2008	8.86	0.16	834.22

Source: Annual report BIWTA 2003-2008 (Figure in lac).

4.9 Quantity of cargo moving through inland waterways: Bangladesh is a land of rivers. Different categories of vessels such as Coasters, Tankers, self-propelled Barges, Inland and Bay crossing Barges and Tugs are there under cargo service unit. The vessels of this unit carry various types of cargo in the inland and coastal waterways besides imported and exportable cargo in the two sea ports. Cargo service unit also engages its vessels for carrying cargo under inter-country trade protocol between Kolkata in India and Bangladesh. Vessels of this unit are plying in the following routes:

Name of Service:

i) Chittagong-Dhaka
ii) Chittagong-Narayangong
iii) Chittagong-Mongla
iv) Dhaka-Mongla
v) Narayangonj-Mongla
vi) Narayangonj-Ashuganj
vii) Khulna-Mongla
viii) Narayangonj-Kolkata (India)
ix) Khulna-Kolkata (India)
x) Rajshahi-Dhulian (India)

The vessel position under cargo service unit as on 30-06-20008 are as follows:

Type of vessel	Number of commercial vessel	Number of Auxiliary vessel	Total vessels
Coaster	12	-	12
Tanker	12	-	12
Self-Propelled Barge	10	-	10
Bay crossing and inland Barge	19	-	19
Bay crossing and inland	08	-	08
Others	-	17	17
Total=	61	17	78

Source: Annual Report BIWTA 2005-2008

Table 3. Table showing the total vessels of inland waterways in Bangladesh.

Type of service	Number of Commercial vessel	Number of Auxiliary vessel	Total vessel
1) Ferry service: Ferry	35	9	44
Tug	12	0	12
2) Passenger service: Paddle steamer	4	13	17
Other vessel	24	0	24
3) Cargo service	61	17	78
4) Ship repair service	0	14	14
Total=	136	53	189

Source: Annual Report BIWTA, 2008.

Stations and Ghats of BIWTA: Bangladesh inland water transport corporation has **46 stations** and ghats for operation of its services under ferry service unit, passenger service unit and cargo service unit. The names of stations and ghats are as follows:

Stations and Ghats of BIWTA	
1. Paturia	23. Mogla
2. Kazirhat	34. Morrelgonj
3. Daulatdia	25. Bara Masua
4. Mawa	26. Char Khali
5. Char Janajat	27. Hularhat
6. Narayangong Terminal-1and 2	28. Kowkhali
7. Narayangong Terminal-3	29. Jhalakati
8. Dhaka Ghat	30. Barisal
9. Chandpur	31. Shariatpur
10. Chittagong Terminal-1	32. Charchenga
11. Chittagong Teraminal-2	33. Majuchowdhuryhat
12. Sandwip	34. Paterhat
13. Hatiya	35. Ilsha
14. Char Bata	36. Mirjakalu
15. Kumira	37. Mangal Manjhi
16. Guptachara	38. Teknaf
17. Manpura	39. St. Martin
18. Shashiganj	40. Shannashi
19. Char Alexander	41. Chandpur
20. Daulatpur	42. Bhola
21. Khulna Ghat	43. Laxmipur
22. Dulta ghat, Khulna	44. Kathalbari

4.10 Accident type month cross tabulation in inland waterways: Table 4 shows month wise distribution of various types of accidents. As far as total numbers are concerned, it is quite clear from the table that overloading and cyclone type accidents have occurred more in the month May than any other months of the year. Most of the accidents due to overloading and cycione have occurred in the monsoon season, particularly in the months March to July and in October.

Most of the accidents have occurred in the month of October than other months of the year. The affect of excessive current on water transport accidents are comparably less than other type of accidents. Nevertheless, the table suggest that this factors comes into act particularly in the months of June and July.

Table 4: Accident Type-Month Cross-Tabulation

Month	Frequency of occurrence according to accident type				Total
	Overloading & cyclone	Collision	Excessive current	Others	
January	0	6	1	4	11
February	0	3	0	3	6
March	14	7	0	0	21
April	12	6	0	2	20
May	19	4	2	1	26
June	7	3	7	9	26
July	10	3	7	1	21
August	4	5	2	2	13
September	4	4	2	0	10
October	10	11	1	3	25
November	3	2	0	5	10
December	1	3	0	3	8

Source: Department of Accidents, BUET, Dhaka, 2005.

4.11: Different term plans of inland water transportation: For the development of inland water transport BIWTA has taken some policies to implement the initiatives like, development of navigability of inland waterways by dredging, resuscitation of dead and dying river routes, development of inland river ports, providing navigational aids for smooth and save movement of cargo and passenger vessels, improvement of waterways around Dhaka city for making it navigable and wider, providing infrastructure facilities for transportation of container in inland waterways and prepare hydrographic chart in digital system.

Table 5: Table showing the description of income and expenditure of BIWTA:

Financial year	Income	Actual expenditure	Net profit/ Net loss
2003-2004	79.77	106.17	-26.41
2004-2005	92.56	111.58	-19.01
2005-2006	117.15	134.46	-17.31
2006-2007	122.09	142.72	-20.63
2007-2008	120.29	137.93	-17.64
2008-2009	160.15	160.53	-0.38
2009-2010	198.68	205.12(Provisional)	-6.44

Source: Bangladesh Inland Water Transport Authority, Ministry of Shipping(Taka in crore).

Chapter Five: Analysis and findings of the study

This chapter attempts of investigate the views of the problems and prospects in inland waterways in Bangladesh. In particular it examines present and analysis respondent's views of the following broad aspects of inland water transportation.

A) Present condition **B) Carrying goods**
C) Export and import business **D) Carrying passengers and**
E) Problems and prospects.

This study was done will the help of field research, following questionnaire survey method. The findings of the field research method. The findings of the field research are presented below.

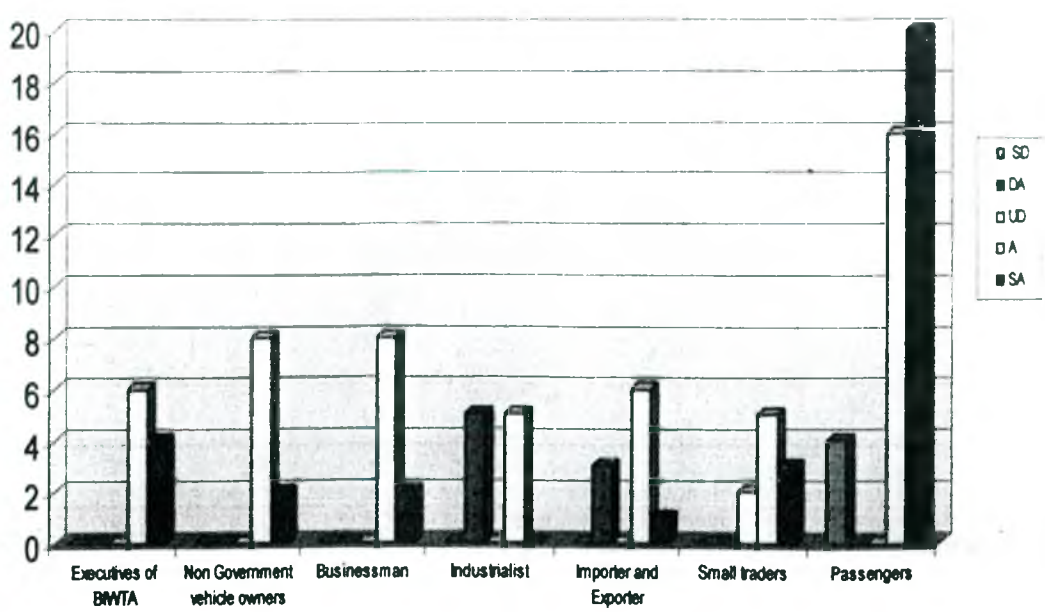
A) Present Condition:

Table No. 1

Inland waterways are very much suitable at present in Bangladesh.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**6**	**4**
Non Government vehicle owners	10	0	0	0	**8**	**2**
Businessman	10	0	0	0	**8**	2
Industrialist	10	0	5	0	**5**	0
Importer and Exporter	10	0	3	0	**6**	1
Small traders	10	0	0	2	**5**	3
Passengers	40	4	0	0	**16**	20

Table No. 1 depicts variation in responses of different categories of respondents. Only **64%** and **32%** of the respondents strongly agree and agree that inland waterways are very much suitable at present in Bangladesh. But **4%** respondents are undecided. No respondents disagree and strongly disagree in this regard.



The respondents were then, inland waterways network covers all over the country. The findings are presented below in table no. 2.

Table No. 2
Waterways network covers all area

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	6	**2**	**2**	**0**
Non Government vehicle owners	10	0	8	2	**0**	**0**
Businessman	10	3	4	2	**1**	0
Industrialist	10	0	6	4	**0**	0
Importer and Exporter	10	0	2	8	**0**	0
Small traders	10	0	6	4	**0**	0
Passengers	40	0	30	4	**6**	0

From the above table it is seen that **48%** and **27%** of the respondents strongly agree and agree that the inland waterways network covers all over the country. But **25%** respondents are disagree in this regard. The findings from the survey that inland waterways network are not covers all over the country.

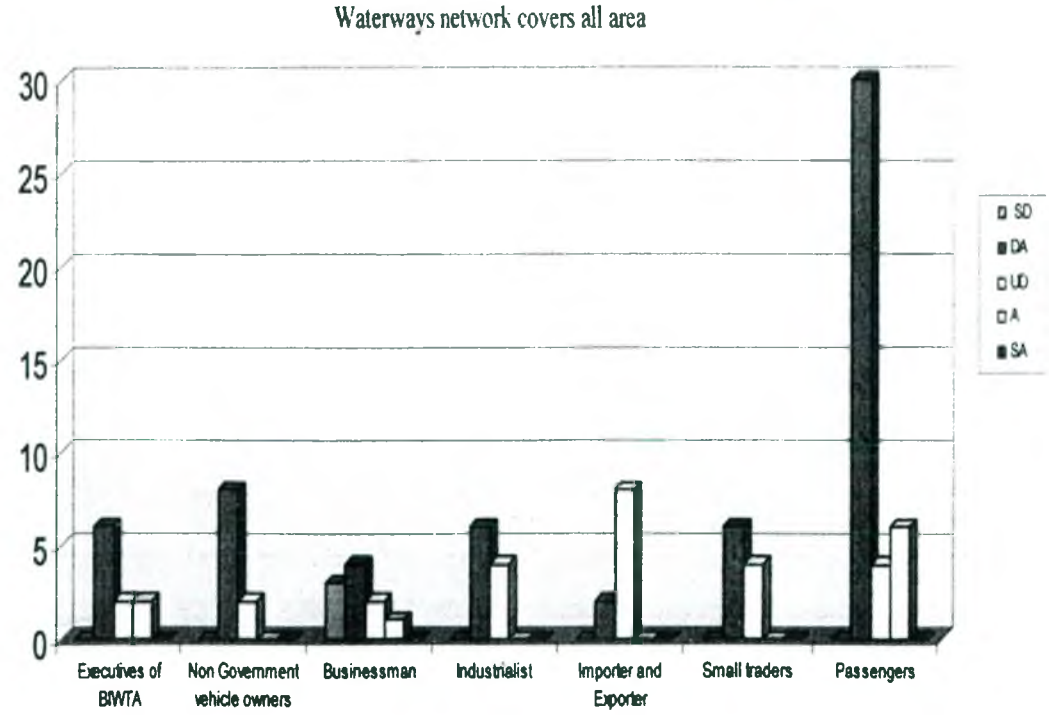


Table No. 3

Waterways is the only communication for riverain area :

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**9**	**1**
Non Government vehicle owners	10	0	0	2	**8**	**0**
Businessman	10	0	0	1	**6**	3
Industrialist	10	0	0	3	**5**	2
Importer and Exporter	10	0	5	2	**3**	0
Small traders	10	0	0	2	**5**	3
Passengers	40	0	6	11	**17**	6

From the above table it is seen that **61%** and **28%** of the respondents strongly agree and agree that the means of communication in rive-rain **villages** is waterway where majority of people live. But **6%** and **5%** respondents disagree and undecided in this regard. No respondents strongly disagree in this regard.

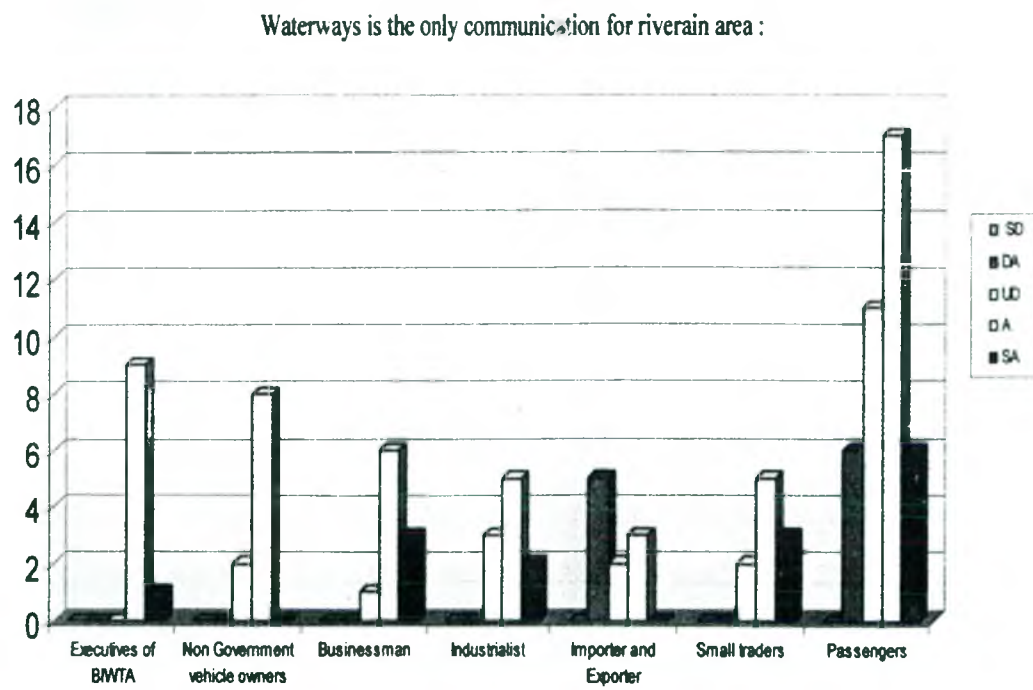


Table No. 4

Inland waterways is playing a significant role in carrying passengers and goods.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**10**	**0**
Non Government vehicle owners	10	0	0	5	**3**	**2**
Businessman	10	0	0	2	**5**	3
Industrialist	10	0	0	0	**5**	5
Importer and Exporter	10	0	0	0	**8**	2
Small traders	10	0	0	2	**5**	3
Passengers	40	0	6	0	**16**	18

From the above table it is seen that **68%** and **28%** of the respondents strongly agree and agree that inland waterways is playing a significant role in carrying passengers and goods at present in Bangladesh. Only **4%** of the respondents disagree on this regard.

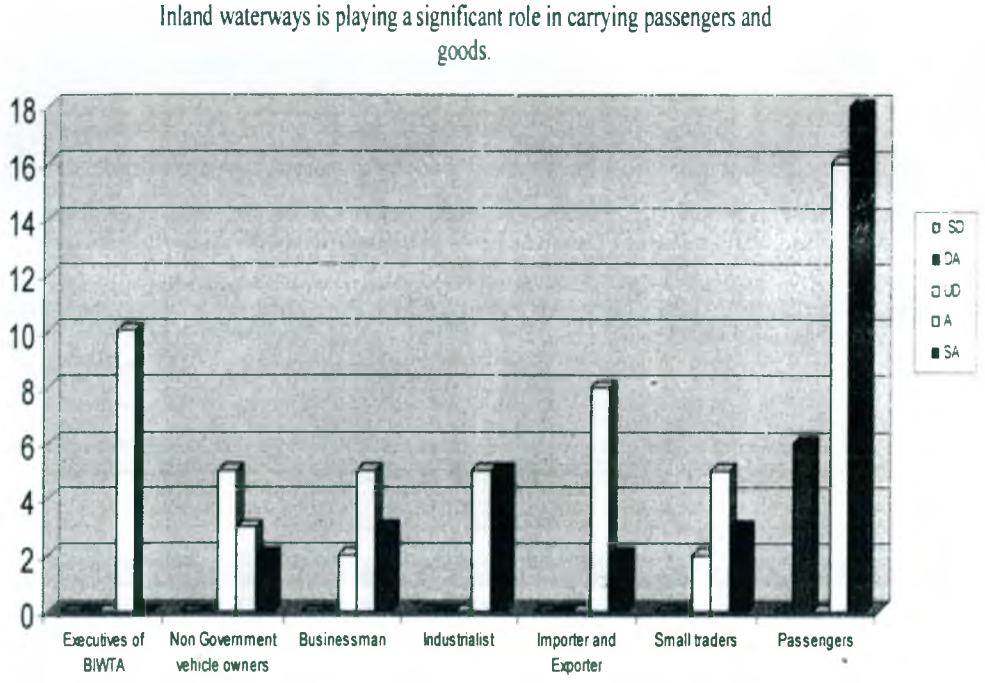


Table No. 5

Waterways are safer as per accidental ratio.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**5**	**5**
Non Government vehicle owners	10	0	6	0	**2**	**2**
Businessman	10	1	5	2	**1**	1
Industrialist	10	0	5	0	**5**	0
Importer and Exporter	10	0	8	1	**1**	0
Small traders	10	0	5	0	**5**	0
Passengers	40	4	5	0	**25**	6

From the above table it is seen that **30%** and **56%** of the respondents strongly agree and agree that waterways are safer as pen accidental ratio. Only **10%** and **4%** of the respondents disagree and undecided on this regard.

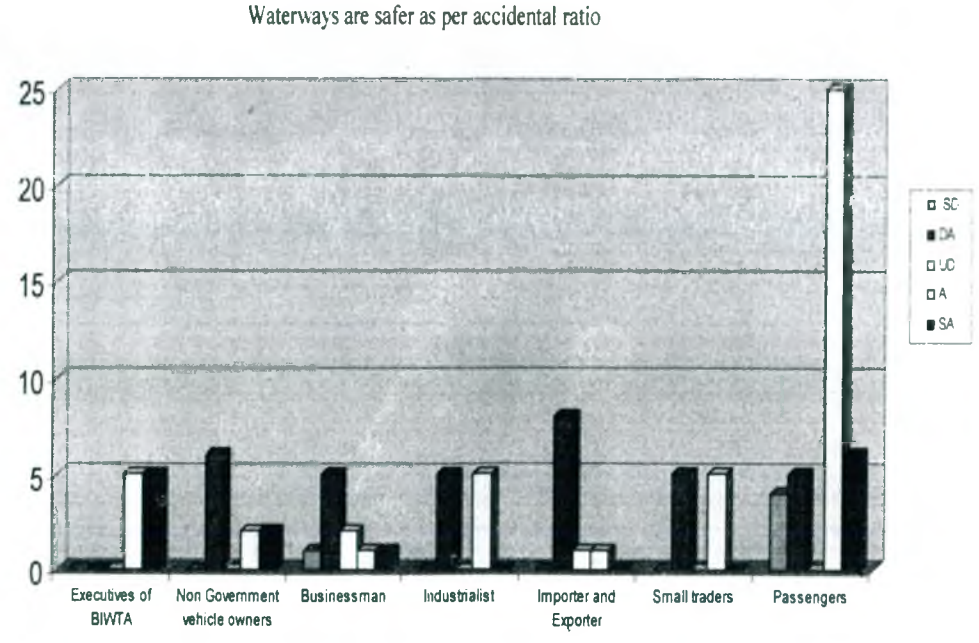


Table No. 6

Inland waterways are easier to carry goods from remote area of the country .

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**6**	**4**
Non Government vehicle owners	10	0	2	1	7	**0**
Businessman	10	0	0	2	**7**	1
Industrialist	10	0	0	3	**5**	2
Importer and Exporter	10	0	0	0	**8**	2
Small traders	10	0	4	2	**0**	4
Passengers	40	0	2	1	**14**	23

From the above table it is seen that **36%** and **47%** of the respondents strongly agree and agree that inland waterways are easier to carry goods from remote area of the country. Only **8%** and **9%** of the respondents disagree and undecided in this regard.

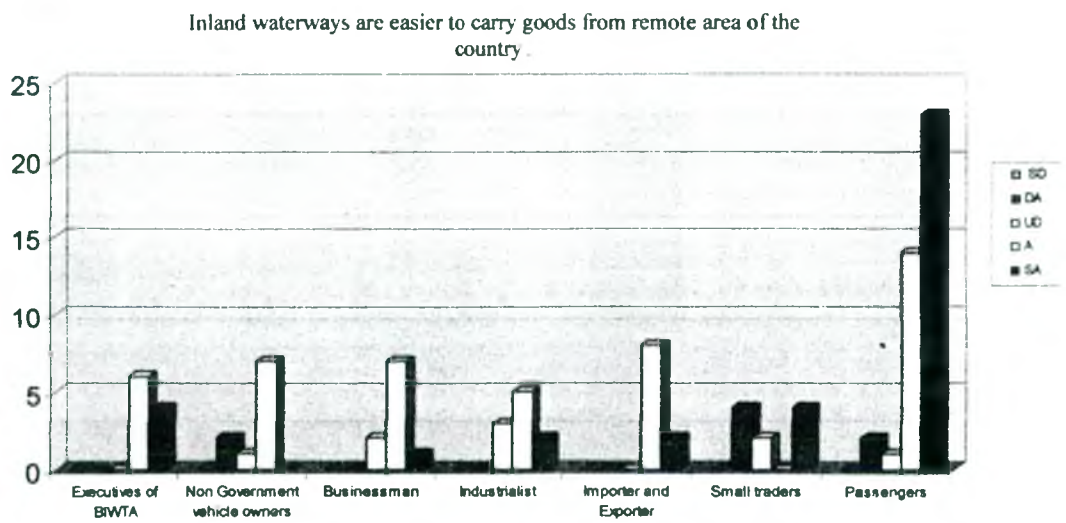


Table-7

Waterways is very much significant in rural areas specially in agriculture based country.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**8**	**2**
Non Government vehicle owners	10	0	0	1	**6**	**3**
Businessman	10	0	1	1	**5**	3
Industrialist	10	0	5	0	**5**	0
Importer and Exporter	10	0	2	4	**4**	0
Small traders	10	0	0	2	**4**	4
Passengers	40	0	0	10	**14**	16

From the above table it is seen that **28%** and **46%** of the respondents strongly agree and agree that importance of waterways is very much significant in rural areas specially in agriculture based country. Only **8%** and **18%** of the respondents disagree and undecided in this regard.

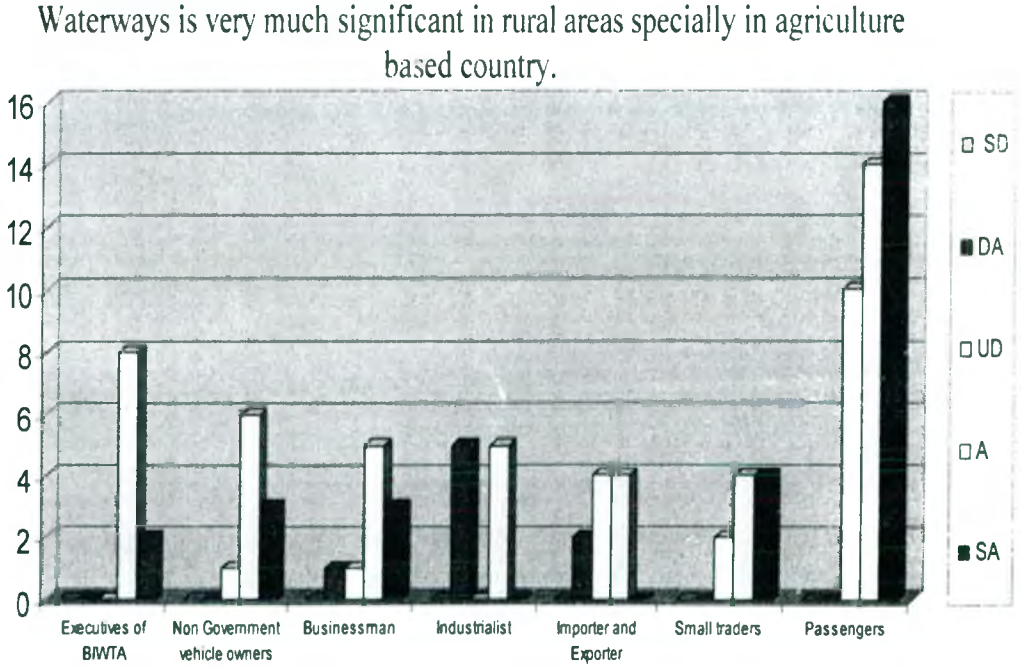


Table-8

Effective communication to delivery industrial goods in rural area.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	4	3	**1**	**2**	**0**
Non Government vehicle owners	10	0	8	2	**0**	**0**
Businessman	10	0	7	0	**3**	0
Industrialist	10	0	7	0	**3**	0
Importer and Exporter	10	0	4	1	**5**	0
Small traders	10	0	5	3	**2**	0
Passengers	40	5	14	7	**14**	0

From the above table it is seen that **29%** of the respondents agree that inland waterways are more effective to delivery industrial goods in rural area. Only **9%, 48%** and **14%** of the respondents strongly disagree. disagree and undecided in this regard

Effective communication to delivery industrial goods in rural area.

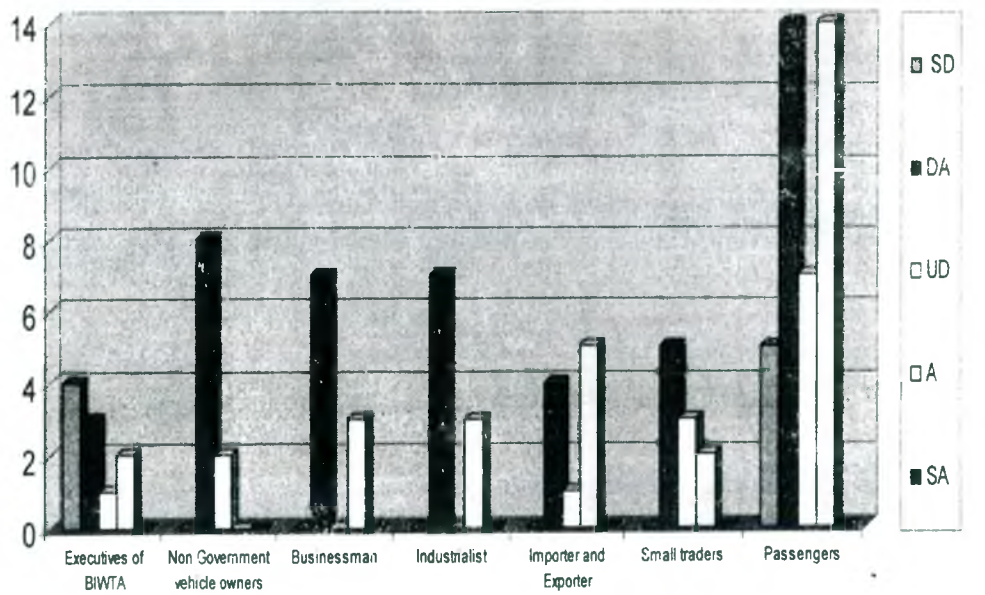


Table-9

Agricultural product delivered smoothly to the market.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	2	0	5	3
Non Government vehicle owners	10	0	0	0	6	4
Businessman	10	0	2	3	5	0
Industrialist	10	0	4	0	6	0
Importer and Exporter	10	0	4	0	4	2
Small traders	10	0	0	2	5	3
Passengers	40	0	0	5	10	25

The above table shows that **37%** and **41%** of the respondents strongly agree and agree that agricultural product can be delivered to the markets smoothly by means of inland waterways. Only **12%** and 10% of the respondents disagree and undecided in this regard.

Agricultural product delivered smoothly to the market.

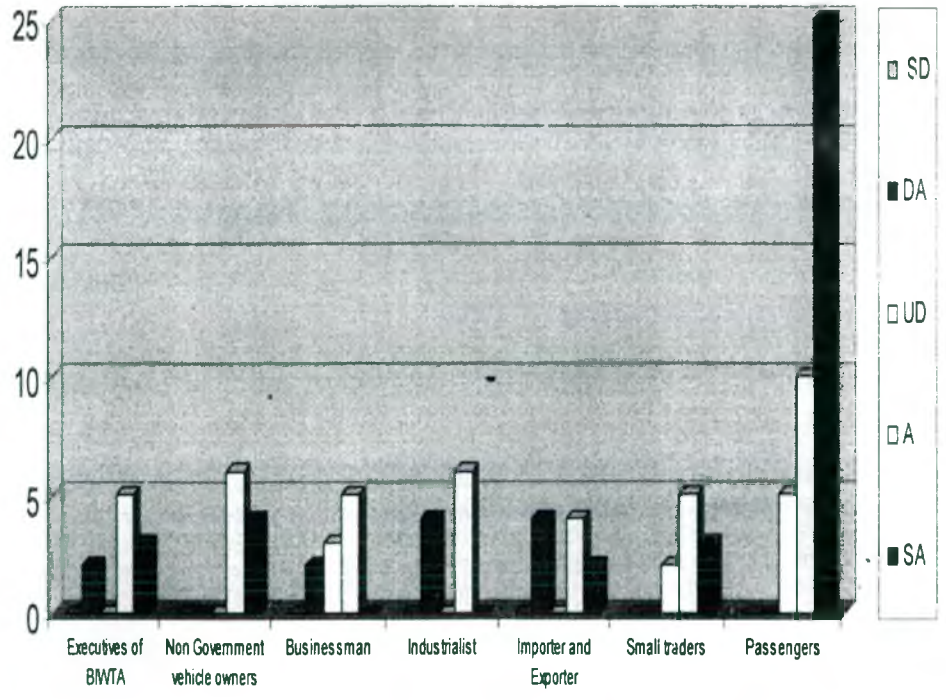


Table-10

Waterway is cheaper than other mode of transport

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**4**	**6**
Non Government vehicle owners	10	0	0	2	**5**	**3**
Businessman	10	0	2	0	**6**	2
Industrialist	10	0	0	2	**5**	3
Importer and Exporter	10	0	0	2	**6**	2
Small traders	10	0	2	0	**5**	3
Passengers	40	0	6	6	**8**	20

From the above table, it is seen that **39%** and **39%** of the respondents strongly agree and agree that waterway is cheaper than other mode of transport. Only 10% and 12% respondents disagree and undecided in this regard.

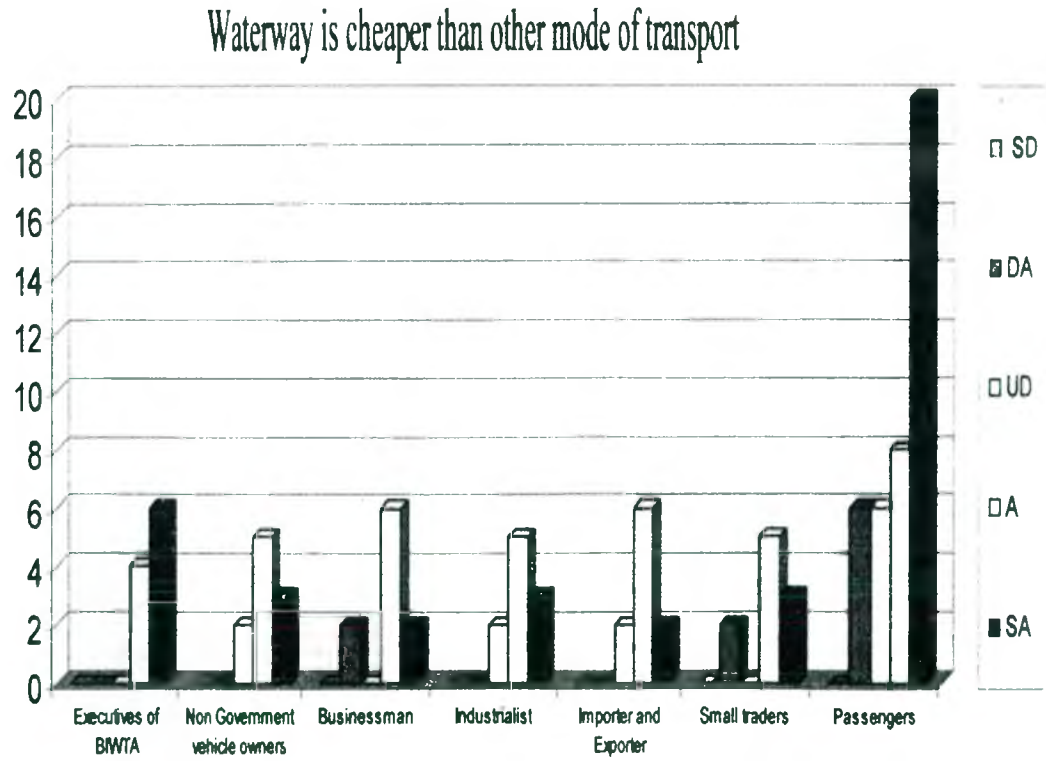


Table-11

Reduce cost while exporting Jute, tobacco, shrimps and handicrafts.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	4	**4**	**2**	**0**
Non Government vehicle owners	10	0	7	1	**2**	**0**
Businessman	10	0	5	5	**0**	0
Industrialist	10	0	5	4	**0**	1
Importer and Exporter	10	0	8	1	**1**	0
Small traders	10	0	4	3	**3**	0
Passengers	40	0	9	4	**18**	9

The above table shows that **31%** and **56%** of the respondents strongly agree and agree that there is no alternative to using inland waterways in reducing the cost while exporting Jute, tobacco, shrimps and handicrafts. Only **6%** and **7%** of the respondents disagree and undecided in this regard.

Reduce cost while exporting Jute, tobacco, shrimps and handicrafts.

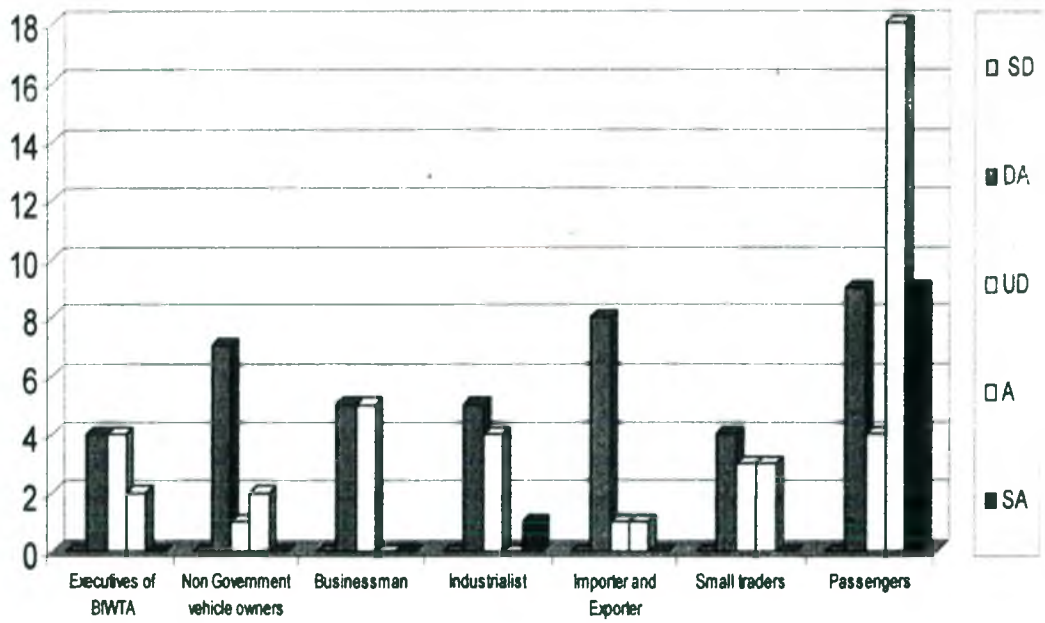


Table-12

Inland waterways are risky due to storms and cyclones .

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	2	**0**	**8**	**0**
Non Government vehicle owners	10	0	0	1	7	**2**
Businessman	10	0	1	1	**5**	3
Industrialist	10	0	0	0	**5**	5
Importer and Exporter	10	0	1	0	**5**	4
Small traders	10	0	0	1	**4**	5
Passengers	40	0	2	4	**22**	12

The above table shows that **55%** and **42%** of the respondents strongly agree and agree that Inland waterways are risky due to storms and cyclones. Only **3%** respondents are undecided in this regard.

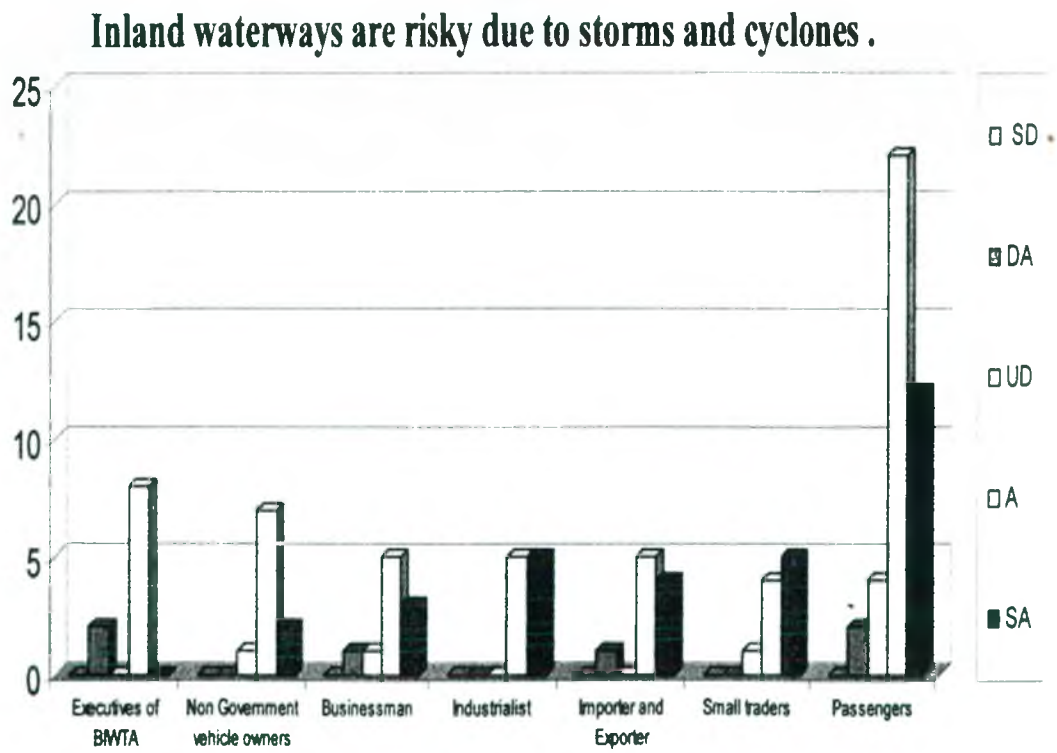


Table-13

Waterways is cheap and easy for carrying heavy industrial and construction material.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	5	**0**	**2**	**3**
Non Government vehicle owners	10	0	2	3	**4**	**1**
Businessman	10	0	6	2	**2**	0
Industrialist	10	0	5	0	**5**	0
Importer and Exporter	10	0	4	0	**6**	0
Small traders	10	0	5	0	**5**	0
Passengers	40	0	9	7	**14**	10

The above table shows that **14%** and **38%** of the respondents strongly agree and agree that heavy industrial machineries and parts, construction materials and fuels can be carried from one place to others places through waterways cheaply and easily. Only **36%and 12%** respondents disagree and undecided in this regard.

Waterways is cheap and easy for carrying heavy industrial and construction material.

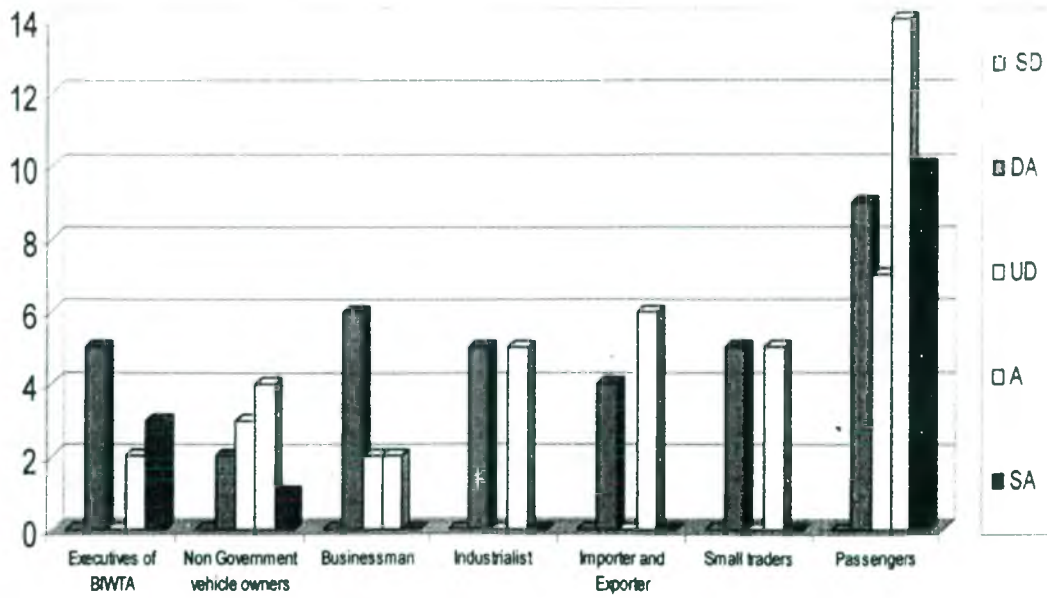


Table-14

A lunch carry 1200 tons goods instead of 2000 tons for want of dredging.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	7	**3**
Non Government vehicle owners	10	0	0	2	**8**	**0**
Businessman	10	0	0	1	**8**	1
Industrialist	10	0	2	4	**4**	0
Importer and Exporter	10	0	2	0	7	1
Small traders	10	0	0	2	**5**	3
Passengers	40	0	4	2	**8**	28

The above table shows that **36%** and **47%** of the respondents strongly agree and agree that a lunch carries 1200 tons of goods for want of dredging where as it has the capacity to carry around 2000 tons of goods . Only **8%and 11%** respondents disagree and undecided in this regard.

A lunch carry 1200 tons goods instead of 2000 tons for want of dredging.

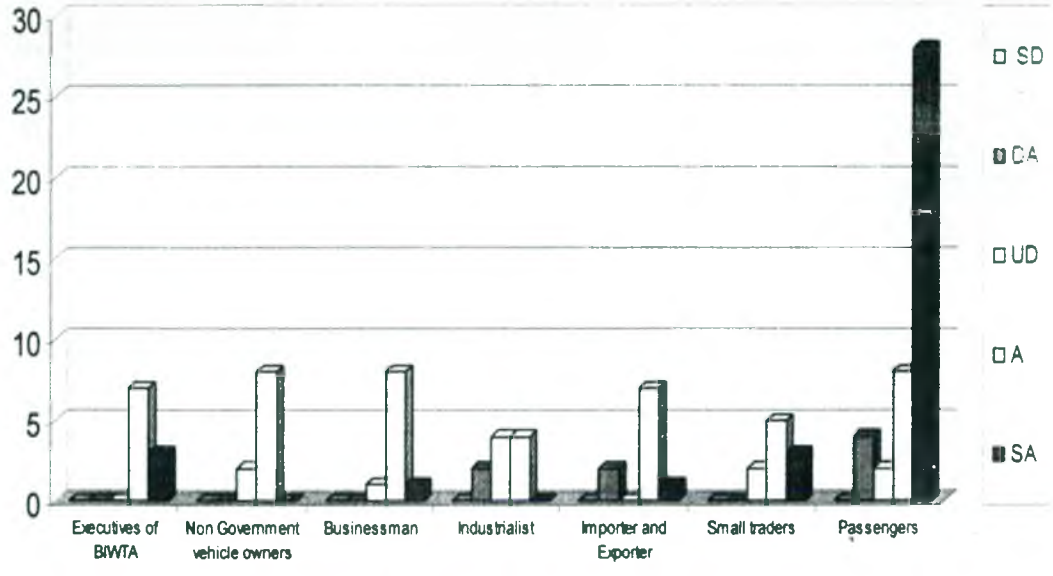


Table-15

The coordination among Ministry of land, Ministry of water resources, Ministry of Environment, Ministry of home and Ministry of shipping should be strengthened.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**5**	**5**
Non Government vehicle owners	10	0	0	0	**4**	**6**
Businessman	10	0	0	1	**2**	7
Industrialist	10	0	0	0	**5**	5
Importer and Exporter	10	0	0	0	**2**	8
Small traders	10	0	0	2	**5**	3
Passengers	40	0	0	6	**18**	16

The above table shows that **50%** and **41%** of the respondents strongly agree and agree that the coordination among Ministry of land, Ministry of water resources, Ministry of home and Ministry of shipping should be strengthened. But **9%** of the respondents undecided in this regard.

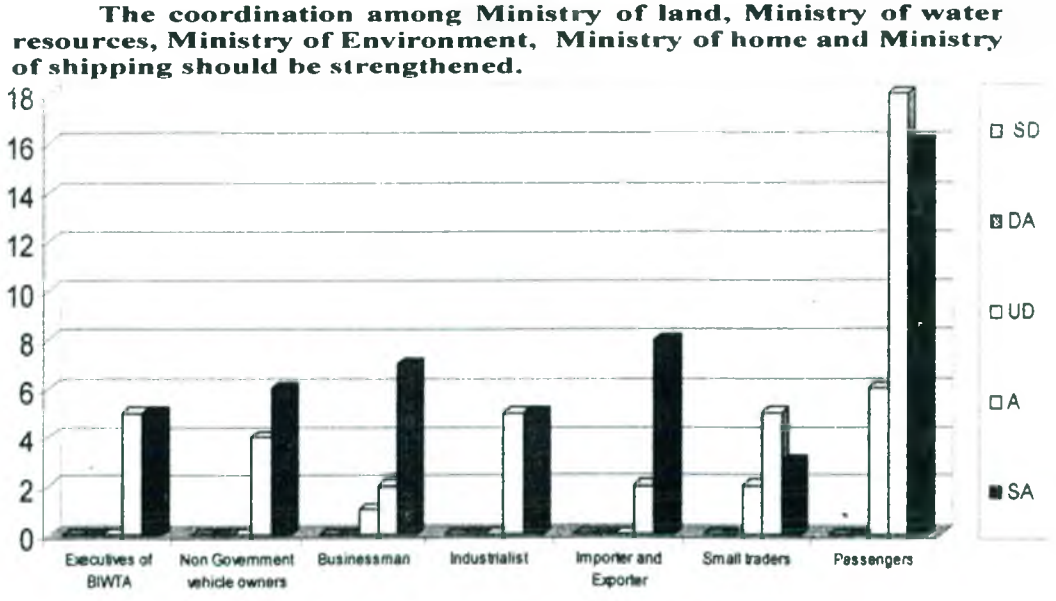


Table 16

There is necessity of using local made dredger for improving navigability.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	2	**2**	**6**	**0**
Non Government vehicle owners	10	2	6	0	**2**	**0**
Businessman	10	1	9	0	**0**	0
Industrialist	10	0	5	3	**2**	0
Importer and Exporter	10	0	7	2	**1**	0
Small traders	10	0	6	4	**0**	0
Passengers	40	0	27	4	**3**	6

The above table shows that **6%** and **14%** of the respondents strongly agree and agree that there is necessity of using local made dredger for improving navigability. But **62%, 3%** and **15%** of the respondents disagree, strongly disagree and undecided in this regard.

There is necessity of using local made dredger for improving navigability.

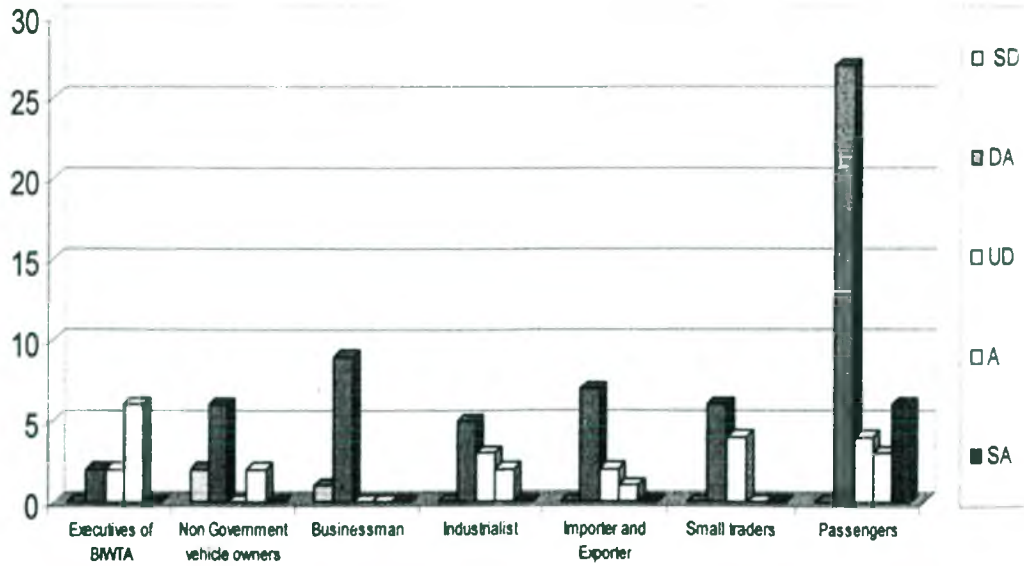


Table-17

The transport cost of passengers in the waterways is cheaper.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	0	2	8
Non Government vehicle owners	10	0	2	0	8	0
Businessman	10	0	1	0	8	1
Industrialist	10	0	0	2	3	5
Importer and Exporter	10	0	2	0	6	2
Small traders	10	0	0	0	6	4
Passengers	40	0	0	6	18	16

The above table shows that **36%** and **51%** of the respondents strongly agree and agree that the transport cost of passengers in the waterways is cheaper. Only **5% and 8%** of the respondents are disagree and undecided in this regard.

The transport cost of passengers in the waterways is cheaper.

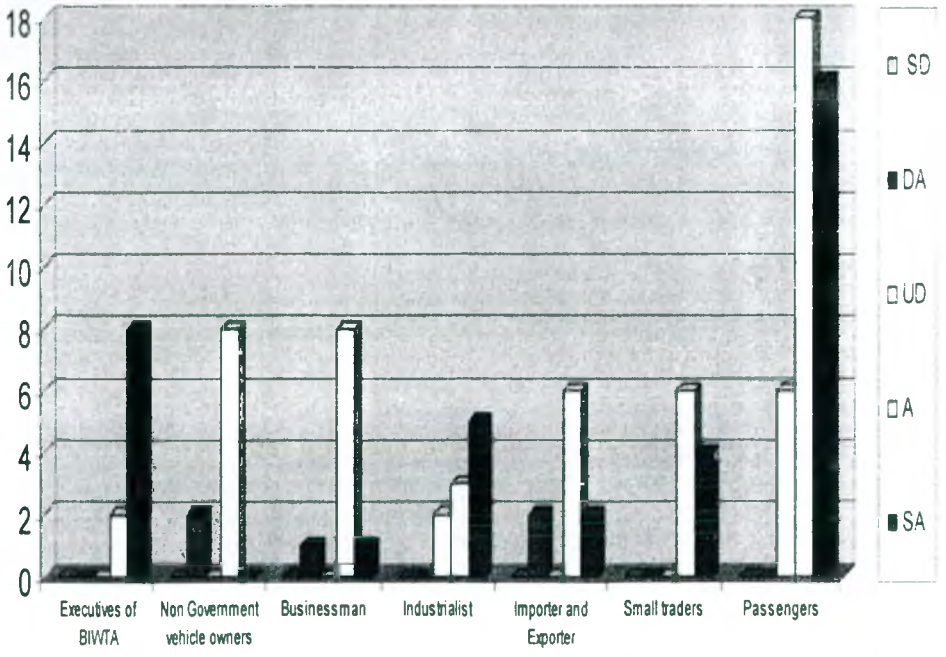


Table-18

Overloading the lunches with goods and passengers and the prime cause of mishap in waterways.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	3	2	5	0
Non Government vehicle owners	10	0	2	1	5	2
Businessman	10	0	3	1	3	3
Industrialist	10	0	3	0	5	2
Importer and Exporter	10	0	6	0	2	2
Small traders	10	0	0	2	5	3
Passengers	40	0	6	4	16	14

The above table shows that **26%** and **41%** of the respondents strongly agree and agree that the transport cost of passengers in the waterways is cheaper. Only **23% and 10%** of the respondents are disagree and undecided in this regard.

Overloading the lunches with goods and passengers and the prime cause of mishap in waterways.

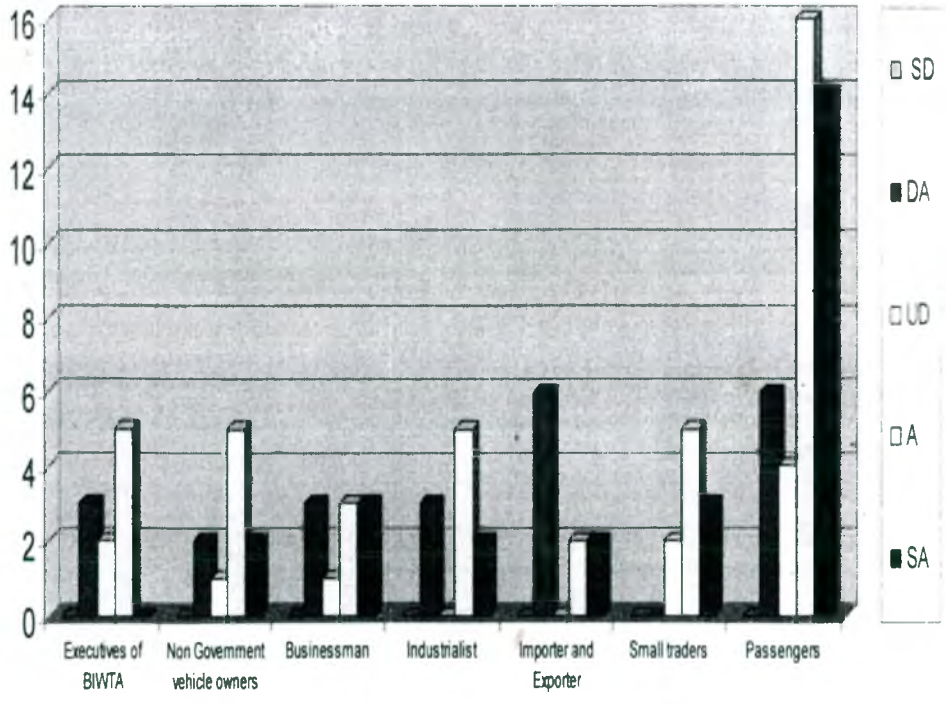


Table-19

Passengers are getting better service in waterways.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	3	7	0
Non Government vehicle owners	10	0	0	2	8	0
Businessman	10	0	5	3	2	0
Industrialist	10	3	4	0	3	0
Importer and Exporter	10	3	4	0	3	0
Small traders	10	0	3	1	6	0
Passengers	40	9	18	3	10	0

The above table shows that **39%** of the respondents agree that passengers are getting better service in waterways. Only **15%, 34%** and **12%** of the respondents are strongly disagree, disagree and undecided in this regard.

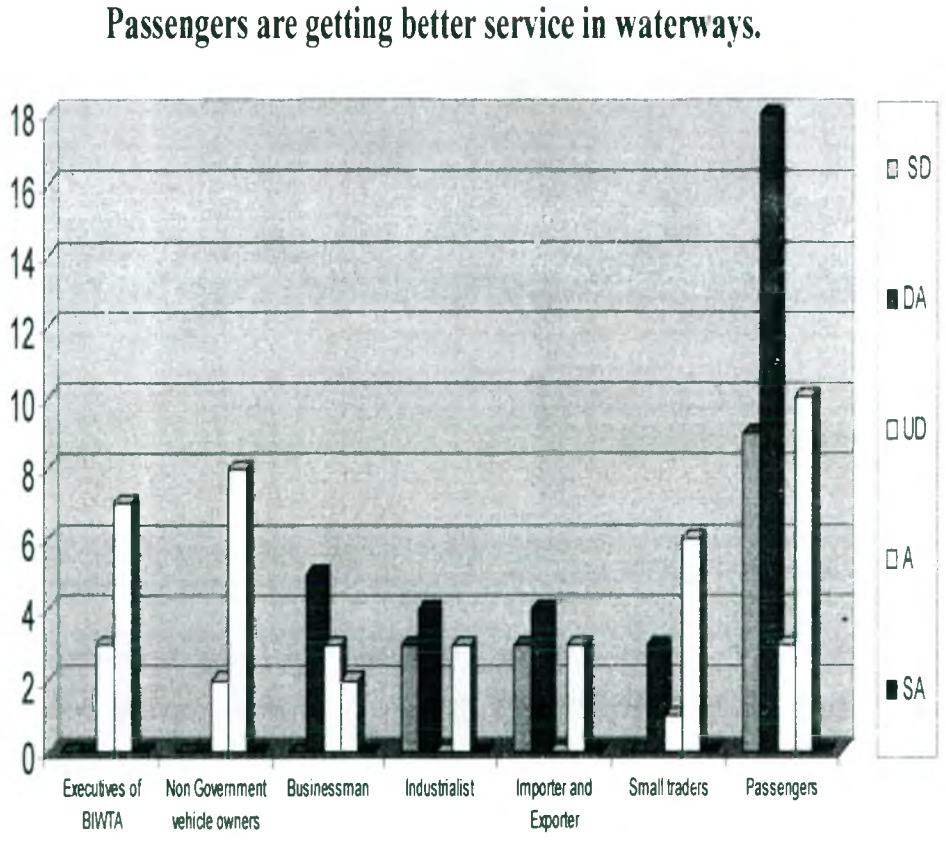


Table-20

There is a lack of skilled and trained crew workers in the inland waterways.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	2	**0**	**6**	**2**
Non Government vehicle owners	10	0	3	0	**5**	**2**
Businessman	10	0	2	2	**6**	0
Industrialist	10	0	2	0	**2**	6
Importer and Exporter	10	0	1	3	**6**	0
Small traders	10	0	0	2	**5**	3
Passengers	40	0	2	4	**12**	22

The above table shows that 35% and 42% of the respondents strongly agree and agree that there is a lock of skilled and trained crew workers in the inland waterways. Only 12% and 11% of the respondents disagree and undecided on this regard.

There is a lack of skilled and trained crew workers in the inland waterways.

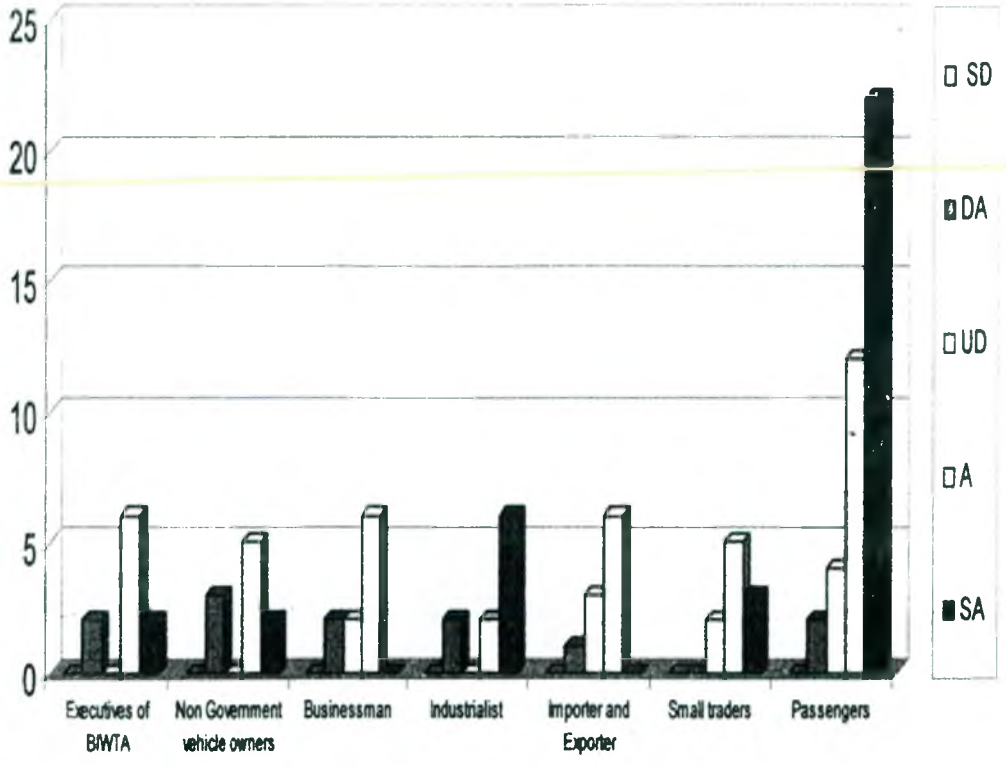


Table-21
Inland waterway is less risky than other mode of transport.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**2**	**8**	**0**
Non Government vehicle owners	10	0	2	2	**6**	**0**
Businessman	10	0	6	0	**4**	0
Industrialist	10	4	3	0	**3**	0
Importer and Exporter	10	2	2	0	**6**	0
Small traders	10	0	4	0	**6**	0
Passengers	40	0	11	5	**24**	0

The above table shows that **57%** and **62%** of the respondents agree that inland waterway is less risky than other mode of transport. But **6%, 28%** and **9%** of the respondents undecided, disagree and strongly disagree in this regard.

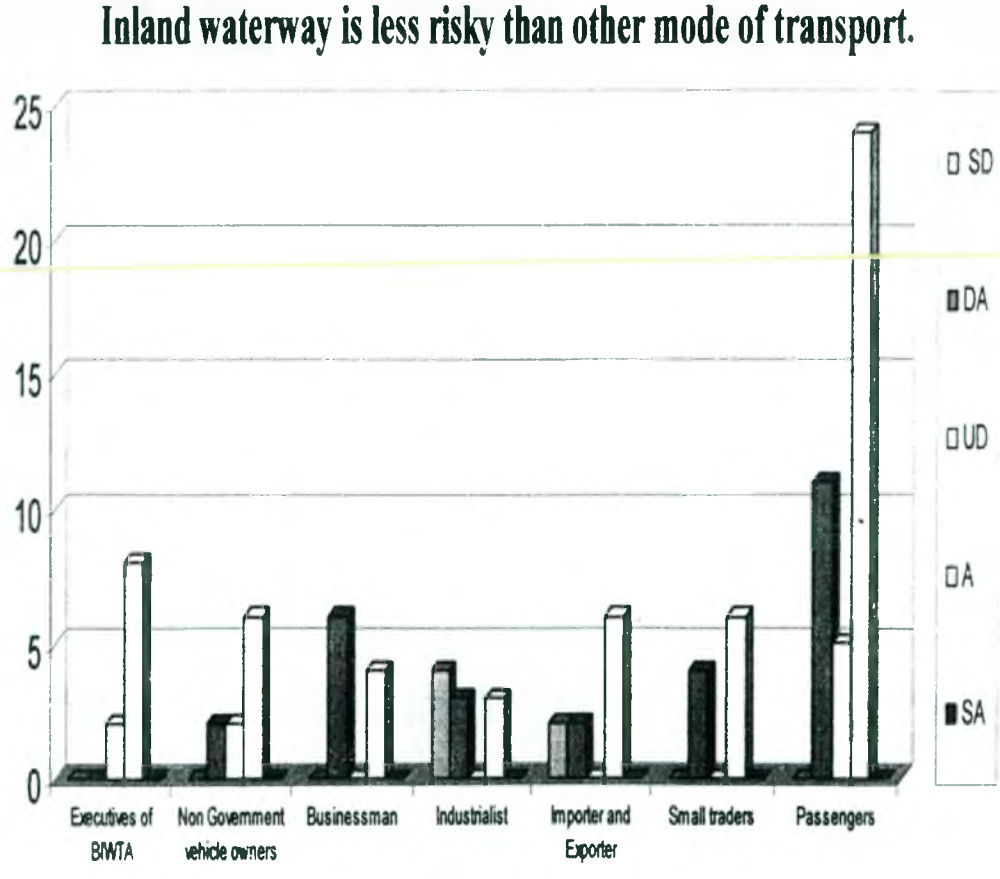


Table-22

The course of the river is changing due to the excavation of sand from riverbank.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**1**	**7**	**2**
Non Government vehicle owners	10	0	0	2	**8**	**0**
Businessman	10	0	0	1	**8**	1
Industrialist	10	0	4	3	**3**	0
Importer and Exporter	10	0	0	1	**7**	2
Small traders	10	0	2	3	**5**	0
Passengers	40	0	2	2	**28**	8

The above table shows that **13%** and **66%** of the respondents strongly agree and agree that the course of the river is changing due to the excavation of sand from riverbank. Only **13%,** and **8%** of the respondents undecided and disagree in this regard

The course of the river is changing due to the excavation of sand from riverbank.

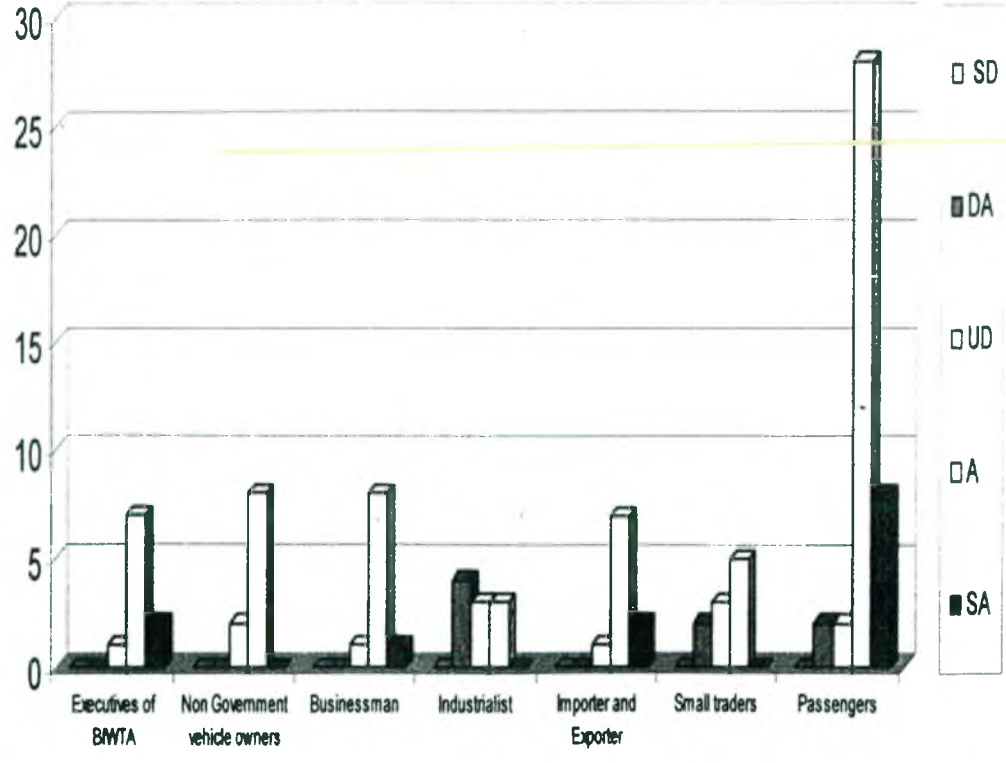


Table-23

The network of inland waterways is widespread and its importance in socio-economic perspective is great.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**5**	**5**
Non Government vehicle owners	10	0	1	3	**3**	**3**
Businessman	10	0	2	2	**6**	0
Industrialist	10	0	4	0	**4**	2
Importer and Exporter	10	0	0	1	**9**	0
Small traders	10	3	0	2	**5**	0
Passengers	40	0	4	6	**20**	10

The above table shows that **20%** and **52%** of the respondents strongly agree and agree that the network of inland waterways is widespread and its importance in socio-economic perspective is great. Only **3%, 11% and 14%** of the respondents are strongly disagree, disagree and undecided in this regard.

The network of inland waterways is widespread and its importance in socio-economic perspective is great.

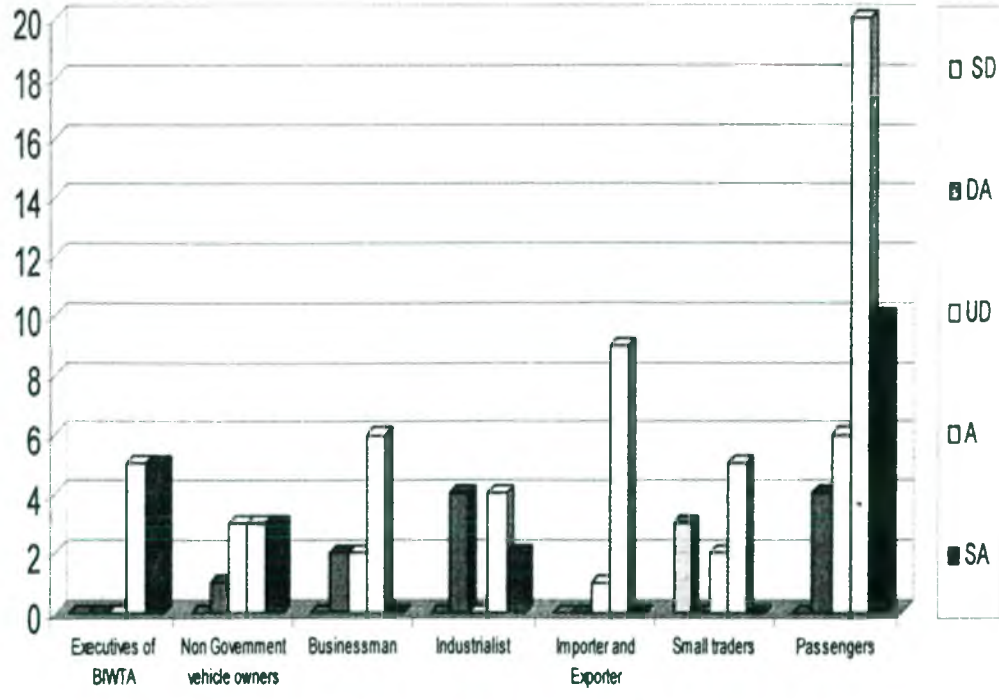


Table-24

Inland waterways are natural environment friendly, free from traffic congestion as well as comfortable and healthy for the passengers.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**2**	**8**
Non Government vehicle owners	10	0	0	0	**3**	7
Businessman	10	0	2	0	**1**	7
Industrialist	10	0	3	0	**5**	2
Importer and Exporter	10	0	2	0	**3**	5
Small traders	10	0	0	0	**5**	5
Passengers	40	0	5	0	**12**	23

The above table shows that **57%** and **31%** of the respondents strongly agree and agree that inland waterways are natural environment friendly, free from traffic congestion as well as comfortable and healthy for the passengers but 12% of the respondents disagree in this regard.

Inland waterways are natural environment friendly, free from traffic congestion as well as comfortable and healthy for the passengers

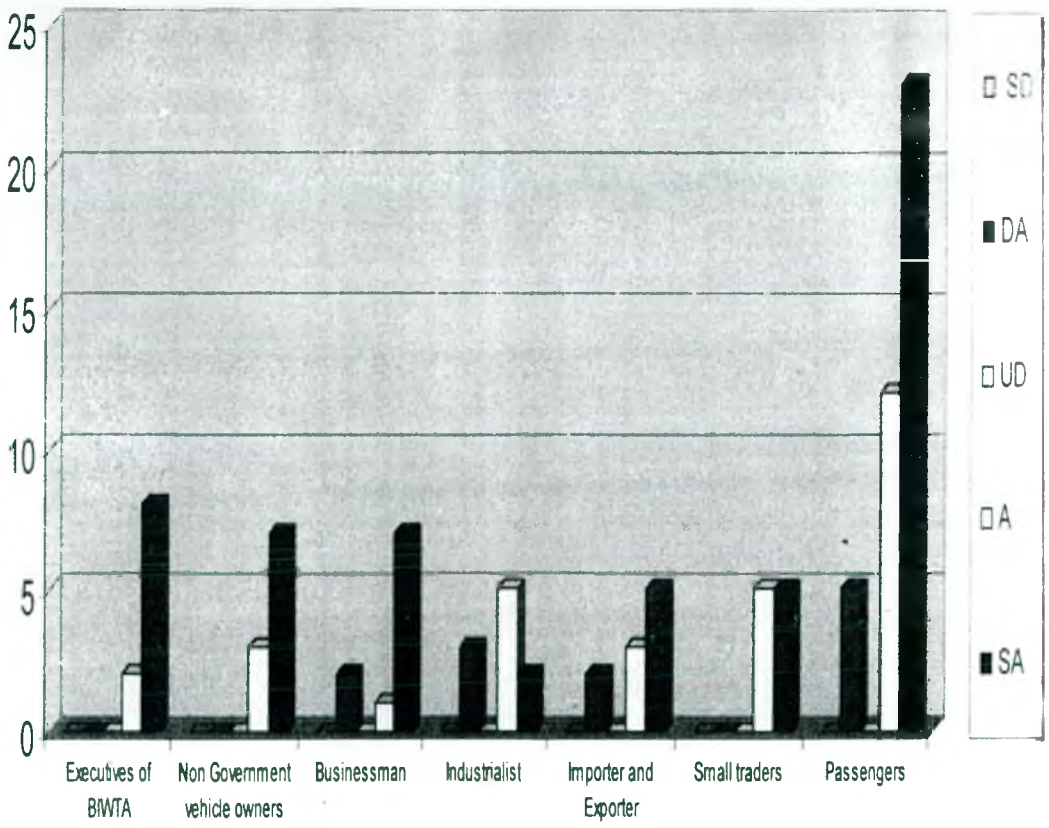


Table-25

Demarcation of the area of the rivers and eviction of unauthorized establishment on both sides are mandatory.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	**0**	**3**	7
Non Government vehicle owners	10	0	0	2	7	**1**
Businessman	10	0	0	0	**8**	2
Industrialist	10	0	0	3	**4**	3
Importer and Exporter	10	0	0	0	**8**	2
Small traders	10	0	0	3	**5**	2
Passengers	40	0	4	4	**20**	12

The above table shows that **29%** and **55%** of the respondents strongly agree and agree that demarcation of the area of the rivers and eviction of unauthorized establishment on both sides are mandatory. But **4% and 12%** of the respondents are disagree and undecided in this regard.

Demarcation of the area of the rivers and eviction of unauthorized establishment on both sides are mandatory.

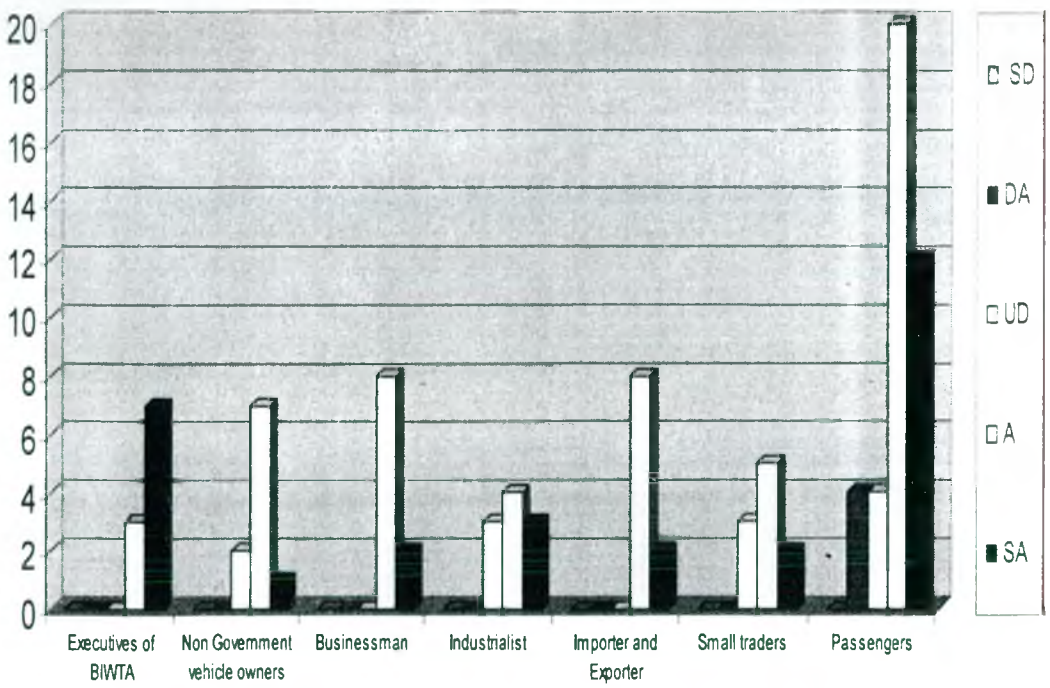


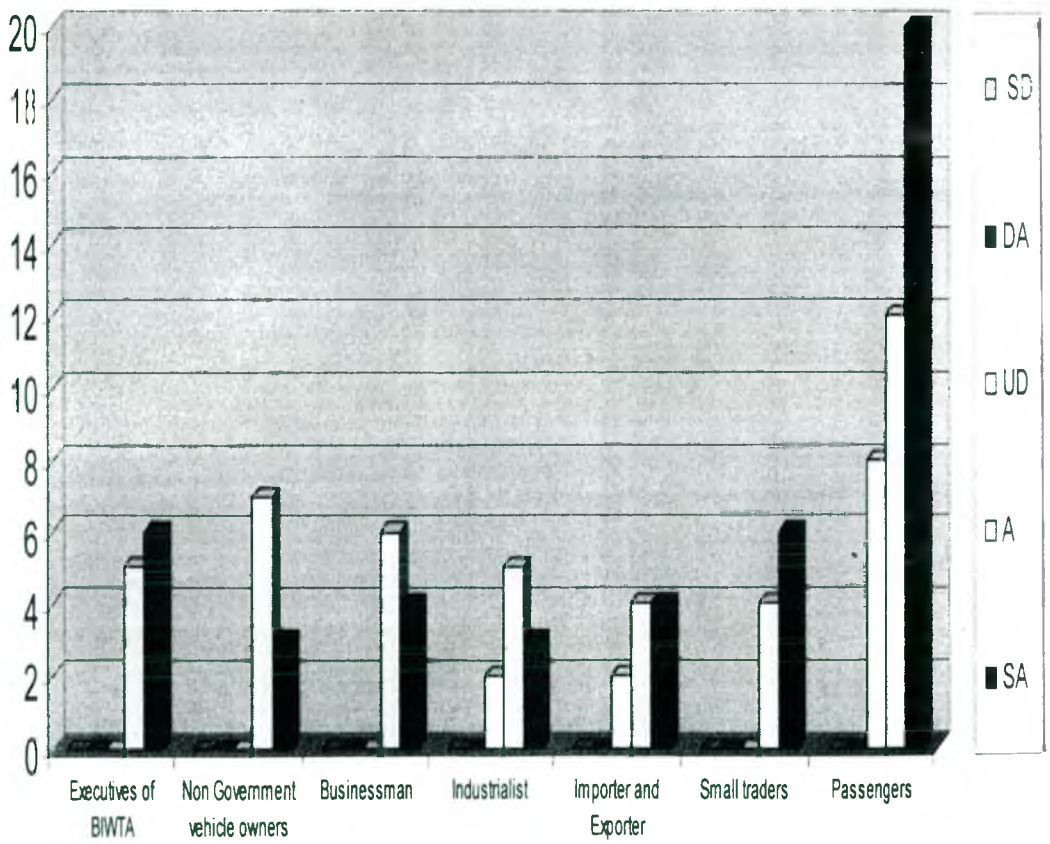
Table 26

Dredging is inevitable for the development and conservation of navigability.

Category of respondents	Number of sample	Responses				
		Strongly disagree (SD)	Disagree (DA)	Undecided (UD)	Agree (A)	Strongly agree (SA)
Executives of BIWTA	10	0	0	0	5	6
Non Government vehicle owners	10	0	0	0	7	3
Businessman	10	0	0	0	6	4
Industrialist	10	0	0	2	5	3
Importer and Exporter	10	0	0	2	4	4
Small traders	10	0	0	0	4	6
Passengers	40	0	0	8	12	20

The above table shows that **46%** and **43%** of the respondents strongly agree and agree that dredging is inevitable for the development and conservation of navigability. But **12%** of the respondents are undecided in this regard.

Dredging is inevitable for the development and conservation of navigability.



Secondary data can be used to make a rational decision. That means, collected data need to apply some statistical methods (Correlation, regression, coefficient of variation, t-test) in order to make sure that collected data are representing the whole population. For doing this task, SPSS (Statistical Package for Social Sciences) has been applied in secondary data.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Income from passengers	807.5740	5	50.05899	22.38706
	Income from ferry	10902.2660	5	1555.00397	695.41891

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Income from passengers & Income from ferry	5	-.449	.449

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Income from passengers - Income from ferry	-10094.69200	1578.09389	705.74504	-12054.15437	-8135.22963	-14.304	4	.000

Comments : Since P value is less than 0.05. So null hypothesis is rejected. That is, there s significant difference between mean income from passengers and mean income from ferry.

Chi-square test has been used to find association between the opinion of passengers and non – passengers group about the fact (Table no. 1) that inland waterways are very much suitable at present in Bangladesh.2X2 contingency table for the number of opinion of passengers and nonpassengers.

Table No.1

Type of respondents	Status of opinion		
	Overall agree	Overall disagree	Total
Passengers	O_{11}=36 E_{11}=34.4	O_{12}=4 E_{12}=5.6	40
Nonpassengers	O_{21}=50 E_{21}=51.6	O_{22}=10 E_{22}=8.4	60
Total	86	14	100

Null Hypothesis(H_0) : Passengers and non passengers are in unique decision that inland waterways are very much suitable at present in Bangladesh.
Vs. Alternative Hypothesis (H_1) : They are not in unique decision .

$$E_{ij} = \frac{RowtotalxColumn}{Grand\_Total}$$

$$E_{11} = \frac{40X86}{100} = 34.4$$

$$E_{12} = \frac{40X14}{100} = 5.6$$

$$E_{21} = \frac{60X86}{100} = 51.6$$

$$E_{22} = \frac{60X14}{100} = 8.4$$

Test Statistic,

$$\chi^2 = \sum \left(\frac{O_{ij}^2}{E_{ij}} \right) - N$$

$$Now \quad , \chi^2 = \sum \left(\frac{O_{ij}^2}{E_{ij}} \right) - N \sim \chi^2 with \quad (2-1)X(2-1)$$

$$= 1X1$$

$$= 1 d.f.$$

$$= \frac{36^2}{34.4} + \frac{4^2}{5.6} + \frac{50^2}{51.6} + \frac{10^2}{8.4} - N$$

$$= 37.67 + 2.86 + 48.45 + 11.9 - N$$

$$= 100.88 - 100$$

$$= 0.88$$

Tabulated value of (chi-square) at 5% level of significance and 1 degrees of freedom is =3.84.

Comments: Since calculated value is less than tabulated value. So we accept the null hypothesis. That is passengers and non passengers are in unique decision that inland waterways are very much suitable at present in Bangladesh.

Table No: 2

Inland waterways is playing a significant role in carrying passengers and goods. 2X2 contingency table for the number of opinion of passengers and nonpassengers.

Type of respondents	Status of opinion		
	Overall agree	Overall disagree	Total
Passengers	O_{11}=34 E_{11}=34	O_{12}=6 E_{12}=6	40
Nonpassengers	O_{21}=51 E_{21}=51	O_{22}=9 E_{22}=9	60
Total	85	15	100

Null Hypothesis(H_0) : Passengers and non passengers are in unique decision that inland waterways is playing important role in carrying passengers and goods.

Vs. Alternative Hypothesis (H_1) : There is no similarity.

$$E_{ij} = \frac{RowtotalxColumn}{Grand\_Total}$$

$$E_{11} = \frac{40X85}{100} = 34$$

$$E_{12} = \frac{40X15}{100} = 6$$

$$E_{21} = \frac{60X85}{100} = 51$$

$$E_{22} = \frac{60X15}{100} = 9$$

Test Statistic,

$$\chi^2 = \sum \left(\frac{O_{ij}^2}{E_{ij}} \right) - N$$

$$Now \quad , \chi^2 = \sum \left(\frac{O_{ij}^2}{E_{ij}} \right) - N \sim \chi^2 \; with \quad (2-1)X(2-1)$$

$$= 1 X 1$$

$$= 1 \; d.f.$$

$$= \frac{34^2}{34} + \frac{6^2}{6} + \frac{51^2}{51} + \frac{9^2}{9} - N$$

$$= 34 + 6 + 51 + 9 - N$$

$$= 100 - 100$$

$$= 0$$

Tabulated value of χ^2 (chi-square) at 5% level of significance and 1 degrees of freedom is =3.84.

Comments: Since calculated value is less than tabulated value. So we accept the null hypothesis. That is passengers and non passengers are in unique decision that inland waterways is playing a significant role in carrying passengers and goods.

Table No: 3

Waterways is cheaper than other mode of transport. 2X2 contingency table for the number of opinion of passengers and non -passengers.

Type of respondents	Status of opinion		
	Overall agree	Overall disagree	Total
Passengers	O_{11}=34 E_{11}=34.8	O_{12}=6 E_{12}=5.2	40
Nonpassengers	O_{21}=53 E_{21}=52.5	O_{22}=7 E_{22}=7.8	60
Total	87	13	100

Null Hypothesis(H_0) : Passengers and non passengers are in unique decision that inland waterways is playing important role in carrying passengers and goods.

Vs. Alternative Hypothesis (H_1) : There is no similarity is the opinion of passengers and nonpassengers in this context.

$$E_{ij} = \frac{RowtotalxColumn}{Grand\_Total}$$

$$E_{11} = \frac{40X87}{100} = 34.8$$

$$E_{12} = \frac{40X13}{100} = 5.2$$

$$E_{21} = \frac{60X87}{100} = 52.5$$

$$E_{22} = \frac{60X13}{100} = 7.8$$

Test Statistic,

$$\chi^2 = \sum \left(\frac{O_{ij}^2}{E_{ij}} \right) - N$$

$$Now \quad , \chi^2 = \sum \left(\frac{O_{ij}^2}{E_{ij}} \right) - N \sim \chi^2 with \quad (2-1)X(2-1)$$

$$= 1X1$$

$$= 1 d.f.$$

$$= \frac{34^2}{34.8} + \frac{6^2}{5.2} + \frac{53^2}{52.5} + \frac{7^2}{7.8} - N$$

$$= 33.22 + 6.92 + 53.5 + 6.28 - N$$

$$= 99.92 - 100$$

$$= -0.08$$

Tabulated value of χ^2 (chi-square) at 5% level of significance and 1 degrees of freedom is =3.84.

Comments: Since calculated value is less than tabulated value. So we accept the null hypothesis. That is passengers and non passengers are in unique decision that Waterways is cheaper than other mode of transport

Correlations

		Profit	Number of vehicles
Profit	Pearson correlation	1	.837(**)
	Sig. (2-tailed)		.005
	N	9	9
Number of vehicles	Pearson correlation	.837(**)	1
	Sig. (2-tailed)	.005	
	N	9	9

Here, r = .837, there is a highly positive linear relationship.

** Correlation is significant at the 0.01 level (2-tailed).

From the analysis I have found that there remains highly significant correlation between number of vehicles and profit

Regression

Variables Entered/Removed (b)

Model	Variables Entered	Variables Removed	Method
1	Number of vehicles, Number of Passengers(a)		Enter

a. All requested variables entered.

b. Dependent variable: Profit .

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.914 (a)	.835	.780	566.6326230

a. Predictors: (Constant), No. of vehicles, No. of passengers.

ANOVA (b)

Model	Sum of Squares	df.	Mean Square	F	Sig.
1 Regression	9750334	2	4875167.009	15.184	.0048
Residual	1926435	6	321072.529		
Total	11676769	8			

a. Predictors : (Constant), No. of Vehicles, No. of passengers.

b. Dependent Variable : Profit.

Coefficients(a)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	6363.486	2978.297		2.137	.077
Number of Passengers	30.514	13.831	1.074	2.206	.070
Number of Vehicles	-135.547	382.774	-.172	-.354	.735

a. Dependent Variable: Profit.

From the analysis I found that number of passengers has positive impact on profit. That is, profit increases with the increase of passengers. But number of vehicles has no positive impact on profit. It has slightly negative impact on profit.

Findings of the study: This study has emphasized on explorate and inductive statistical search for findings an acceptable decision. Despite having so many obstacles and problems, this study tries its best to overcome existing impediments. Among the result of the study and some of the important findings are specified as follows:

1. In this study it is observed that Bangladesh has about **24,000 kilometer** of waterways comprising rivers, canals creeks and marsh. The marine SOP under BIWTC preserves **6,000 kilometer** water-route in the rainy season and **3,824 kilometer** in the dry season.. Annually about **35 lakh** tons of goods are carried through this way.**75%** of the domestic trade and passengers transport of the country mainly depend on water-route communication..
2. A huge number of mills, factories and industries are established on the bank of rivers by encourse the river which result the shortage of river area.
3. In this study it has been identified that the rivers of Bangladesh become dry in winter season which create problem in smooth navigation.
4. In the study it has been observed that Chittagong port, the largest sea-port of Bangladesh, handles about **92%** of countrys maritime trade. The growth rate of the volume of imports and exports through Chittagong port is about **10-14%.** One of the biggest container terminal of the country has been established at Pangaon under Keranigong upazilla. The products related to fisheries and jute industry and other important goods are carried through this terminal. The products are reached from the various corners of the country.
5. This study puts emphasis on the importance of water transport in carrying goods and industrial products. Most of the industries are set on the banks of the river due to in convenience of using water transport. Jute and textile and salt industries are at Narayangong..There has been a growth of cement industry in Munshigong. Moreover fertilizer industry is situated at Ashugonj. The products of the above mentioned industries and factories can comfortably be carried through inland waterways.
6. About 10000 (ten thousand) inland and coastal ships and around 4000 (four thousands) mechanized country boats have been playing all over the country, which carry more than 90% of oil product, 70% of cargo and 35% of passengers in total.
7. In this study it has been recognize that the government allocation and Annual Development Programme (ADP) for waterways and water transport is below **4%,** whereas for road is above **70%.**

8. The predominant causes of accidents in inland water ways of Bangladesh are cyclone, overloading and collision of vessels. Accidents are more frequent in the monsoon season, particularly in the months March to July and in October. Most of the cyclones and overloading accidents have occurred in these months.

9 In this study it is observed that the main industry clusters and effluent hotspots around Dhaka city includes the tanneries at Hazaribagh which pollute the Buriganga river. The Tejgaon industrial area drains to the Balu river, the Tongi industrial area pollutes Turag (Tongikha), the Sayampur and Fatullah industrial clusters in Dhaka south and Narayangonj discharge industrial waste to the Buriganga river. A committee coordinated by the Ministry of Environment, BIWTA, and Ministry of Laws should be formed as it can take necessary measures to save rivers from the disposal and dumping industrial garbage.

10 After analyzing the chi-square method, it is revealed that the stakeholders and the passengers of inland water transport, favour the utilization of waterways. With a view to decreasing and minimizing road accident, traffic congestion and expenditure, there should be substantial reform in inland waterways.

11 A statistical method named coorelation test has been applied to find out economic viability of the water transportation in Bangladesh which has shown a positive result. On the basis of correlation method, it appears that there remains highly significant correlation between number of vehicles and profit.

12 The study examined that profit increases with the increase of passengers of inland water transportation. From the analysis of coefficients the study found that increasing number of passengers has positive impact on profit. That is profit increases with the increase of passengers. So that the vehicles are not overloaded up to the utilized of capacity of the vehicles. But number of vehicles has no positive impact on profit. It has slightly negative impact on profit.

Finally it can be said that BIWTA has been taken some policies to implement the initiatives like, development of navigability of inland waterways by dredging, resuscitation of dead and dying rivers routes. development of inland river ports, providing navigational aids for smooth and safe movement of cargo and passengers vessels so that Bangladesh Inland Water Transport Authority can be benefited financially and passengers can get better services.

Chapter Six: Recommendation and conclusions

6.1 Recommendation: This study has been purposive survey which is concerned with some problems that can be used to devire information about the nature of problem of inland waterways and how to overcome the problems for the development of this sector. Some of the recommendations have been observed at present study. These recommendations may be mentioned as follows:

1. Blockage at the mouth of rivers, narrowness of the river and decrease of the depth of river, cause huge flood in Bangladesh. Illigal and unauthorized establishment should be evicted from the both sides of the rivers of Dhaka,Gazipur,Munshigong and Narayangong districts

2. Riverbed siltation is highly predominant. These has been a disruption of the easy movement of water transport due to the decrease water flow in the water. So dredging in inevitable for the development and conservation of navigability.

3. About 80% of the respondent gave positive answer in favour of the service improvement under BIWTA . The elements of service are seat arrangement and condition, sanitation facilities (toilet, water supply), lights, clean environment etc.

4. Inland waterways, water transport and shipbuilding sector should get its due share from ADP and export shipbuilding should get special attention like RGM.

5. Extensive dredging is required for major rivers of Bangladesh to maintain navigability in inland waterways. Bridges and overhead structure over the major rivers must maintain a standard height (at least 25 meter air draft clearance from the monsoon water level.)

6. Dumping of industrial waste contribute to narrowing in riverways . Moreover this phenomenon has had an adverse effect on existence of the fisher in the Shitalakkhya and Buriganga river. A committee may be formed by the government to save rivers from the disposal and dumping industrial garbage.

7. Availability of adequate amount of life saving equipments should be ensured. Crews should be trained in this regard and public awareness should also be increased.

8. Government administration may have to be responsibility to repair the inland ports, jetty, etc and to beauty the connectivity and surrounding of

export shipyards as well. The access inland of the shipyards may be organized which makes it easier for foreign customer to visit the yards.

9. Inland waterways should be developed comprising the prevailing road connectively . Besides BIWTA, nongovernment vehicle owners should introduce modern and sophisticate steamer, troller and cargo services.

10. Technical maintenance work of BIWTA should be performed in due time. Proper maintenance is the important precondition for smooth operation of the launch.

11. For economical, environment friendly and secured water transport, marine unit, marine guard and coast guard should be included in the adjacent police station.

12. The internal river ports and ferry terminal should be moderanized is an urgent basis. To desire of the passengers the number of modern v

ehicles are increasing of inland waterways in Bangladesh.

13. An initiative should be taken as a satellite channel telecast a 30 minutes for documentary programme related to inland water transport.

14. Loading condition of all the passenger vessel may be checked before any voyage. Legislation regarding overloading can be revised if necessary. Inspection and enforcements may also be enhanced. Load certificate may be issued.

15. The stability of a vehicle is very important criterion to operate it in different operating and loading conditions. From the beginning of the construction BIWTA may employe naval architects to supervise the dimensions of the vehicle and quality of the materials used.

16. The government should adopt necessary measures to lessen marine accident. Workshop and seminars should be organized with a view to motivation the employees and workers of the inland water transports.

This study has recommended all concerned for further study. It is wide setor of prosperity. So adopting policies for multiplying the cheap and environment friendly inland waterways is the present perspective of complicated communication system.

6.2 Conclusion: Bangladesh is a land of rivers. 70% of its total population live in villages. People use inland water transport to carry goods and communication from the beginning of the civilization as is cheaper than any other means of transport.

Inland water transport plays a very significant role in the transportation system of Bangladesh. Its low expenses and high accessibility, amplifies a great demand for carrying goods and passengers with the country. It has very good prospect for being less risky, cheap in cost and environment friendly in Bangladesh. But now a days the inland water transport is not a suitable way for facing various problems.

There are many problems in the inland water ways of Bangladesh among which riverbed siltation is highly predominant. Growth of industry on both sides of the river, emergence of sandy land in river, grabbing land by the developers and dumping of industrial waste contribute to narrowing in river ways. Moreover this phenomenon has had an adverse effect on the existence of the fisher in the river.

Illegal and unauthorized establishment should be evicted from the both sides of the rivers of Dhaka, Gazipur, Munshigong and Narayangong districts. Extensive dredging is required for major rivers of Bangladesh to maintain navigability in inland waterways. Loading condition of all the passenger vessel may be checked before any voyage. Legislation regarding overloading can be revised if necessary. The internal river ports and ferry terminal should be moderanized is an urgent basis. To desire of the passengers the number of modern vehicles are increasing of inland waterways in Bangladesh.

In spite of these problems and limitations the study has however, fulfilled its objectives. It indicate future trend and recommendation of inland water transportation in Bangladesh. Utmost emphasis has also been laid in this respect

I hope the research work has recommended all concerned for further study. It is wide sector of prosperity. So adopting policies for multiplying the cheap and environment friendly inland waterways is the present perspective of complicated communication system.

Apprendix

Questionnaire for Executives of BIWTA

Inland Water Transportation in Bangladesh Problems and prospects.

Name of the respondent.....
Address.....
This study is for academic purpose only.
(Information will be preserved strictly confidential)

1. Do you think that inland waterways are very much suitable at present in Bangladesh?

   Agree **Disagree** **No comment**

2. Do you support inland waterways network covers all over the country?
   Strongly disagree **Disagree** **Undecided** **Agree** **Strongly agree**

3. Do you feel that inland waterways is playing a significant role in carrying passengers and goods at present in Bangladesh?

   Disagree **Undecided** **Agree**

4. Do you support the idea that only means of communication in riverain village is waterway where majority the people live?

   Disagree **Agree**

5. Do you think waterways are safer as per accidental ratio?

   Strongly disagree **Disagree** **Undecided** **Agree** **Strongly agree**

6. What is your final comment about the problems of inland water transportation in Bangladesh?

Questionnaire for Exporter and Importer

Inland Water Transportation in Bangladesh:Problems and prospects.

Name of the respondent.....
Address.....
This study is for academic purpose only.
(Information will be preserved strictly confidential)

1. Do you think inland waterways are easier to carry goods from remote area of the country?

Yes **No** **Don't know** **Not sure** **Not applicable**

2. Do you think agricultural product can be delivered to the markets smoothly by means of inland waterway?

Agree **Disagree** **Undecided**

3. Do you think that waterway is cheaper that other mode of transport?

Agree **Disagree**

4.Do you think a lunch carries 1200 tons of goods for want of dredging where as it has the capacity to carry around 2000 tons of goods?

Agree **Disagree** **Undecided**

5.. Do you think that coordination among Ministry of land, Ministry of Water resources, Ministry of Home and Ministry of Shipping should be strengthened?

Strongly agree **Agree** **Undecided** **Disagree** **Strongly disagree**

6. Do you feel inland waterways network covers the import business all over the country ?

Agree **Disagree**

Questionnaire for Non Government vehicle owners

Inland Water Transportation in Bangladesh:Problems and prospects.

Name of the respondent.....
Address.....
This study is for academic purpose only.
(Information will be preserved strictly confidential)

1. Do you think the course of the river is changing due to the excavation of sand from riverbank?

   Agree **Disagree**

2. Do you support the inland waterways are risky due to storms and cyclones?

   Agree **Disagree** **Undecided**

3. Do you think the number of accident in the inland waterways is comparatively less ?

   Strongly agree **Agree** **Undecided** **Disagree** **Strongly disagree**

4. Do you think dredging is inevitable for the development and conservation of navigability?

   Agree **Disagree** **Undecided**

5. Do you support the idea that heavy industrial machineries and parts, construction materials and fuels can be carried from one place to other places through waterways cheaply and easily ?

   Strongly agree **Agree** **Undecided** **Disagree** **Strongly disagree**

6. Have any special comment ?

Questionnaire for Passengers

Inland Water Transportation in Bangladesh:Problems and prospects.

Name of the respondent.....
Address.....
This study is for academic purpose only.
(Information will be preserved strictly confidential)

1. Do you think whether there is necessity of using local made dredger for improving navigability ?

   Strongly agree **Agree** **Undecided** **Disagree** **Strongly disagree**

2. Do you think passengers are getting better service in waterways ?

   Agree **Disagree**

3. Do you think the transport cost of passengers in the waterways is cheaper ?

   Disagree **Undecided** **Agree**

4. Do you support the idea there is a lack of skilled and trained crew workers in the inland waterways ?

   Disagree **Agree**

5. Do you think overloading the lunches with goods and passengers are the prime cause of mishap in waterways ?

   Strongly agree **Agree** **Undecided** **Disagree** **Strongly disagree**

6. Do you think the inland waterways are natural environment friendly, free from traffic congestion as well as comfortable and healthy for the passengers ?

Agree **Disagree**

7. Do you think demarcation of the area of the rivers and eviction of unauthorized establishment on their both sides are mandatory ?

Agree **Undecided** **Disagree**

8. Do you think the maintenance condition of vehicle has been improved by Bangladesh Inland Water Transportation Authority ?

Agree **Disagree**

9. What is your comment about working standard inland water vehicles ?

Extra Ordinary **High Standard** **Standard** **Below the Standard**

10. Is there any problems ?

11. What is your final comment?

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