

# Analysis of Mitigating Challenges of Training and Maintenance of Pontoon Ferry and Safety Operations Based in Water Transportation in Tanzania

Captain Joel Michael Ojode  
Department of Navigation, Navy Flotilla Unity  
Kigamboni, Dar es Salaam, Tanzania

**Abstract:-** This study aimed to analysis of causes of challenges of pontoons ferry operation Training and maintenance to the safety of water transportation. The studies conducted in Tanzania and investigate factors that obstruct efficiency of training of crew, maintenance and safety operations of pontoon ferries Moreover, and the measures required to take for maintain the challenge analysed. The study involves different mariners and stakeholders dealing with Maritime transportation in Tanzania. Such as TEMESA, and TPDF NAVY, The study employs non-probability sampling method to get these respondents. Furthermore, the study employed two methods of data collection including, interviews and observations. The study analyses data qualitatively and descriptively. Tables, charts, and graphs made to analyse the collected data. Some of finding of study are deterioration of pontoons is become of overdue rehabilitation, which causes unpredictable breakdown of machinery in that case leading to inefficiently operations. There are lack of professional of maritime industry specifically management and poor safety operations of pontoons ferry.

**Keywords:-** Mitigating challenges, Training, Maintenance, pontoon ferry, Safety Operation, Water transportation.

## I. INTRODUCTION

The geographical location of United Republic of Tanzania, influencing water transportation because of large body of water surrounding the country, in which mean many part of the country separated with these water bodies. In order to achieve communication between two parts, it requires water transportation. Water Transportations is the most convenient means of handling the movement of people's goods between two parts of the land separated by water. This type of transport used from earliest time. Water transport in Tanzania divided into two subdivisions that are

inland water transport (lakes and rivers) and Ocean (Indian Ocean). The means of transportation in Tanzania based in Ships, boat, ferries, pontoon ferry and canoes, in this paper direct based on the operation of pontoon ferry in Tanzania.

Pontoon ferry focuses on the process of monitoring and controlling the movement of a people or vehicle from one place to another, in the field of water transportation. In recent years, there has been a rapid growth in the navigation technology that is the one of the oldest human science and technology. Navigation system is the system that used to guide a pontoon to its destination. Navigation equipment offer position, speed, heading, desired course, desired speed, and control Pontoon ferry sailing along desired direction. In order to achieve Transportation system we must have navigation equipment across a diverse range of application of Pontoon ferry. However, coupled with this expansion has been in awareness that water transportation equipment is potentially vulnerable to sources of maneuvering, this has caused particular concern in the domain of marine transportation.

In adding pontoon ferry form a part of public transportation systems of many waterside village, town, cities and islands. Allowing direct transit between points just known (floating Bridge), uses to carry vehicles and passengers a cross the great lakes region, rivers and (ocean such as part of Magogoni to kigambonia at Dar es Salaam and Msanga mkuu to Mtwara ferry at Mtwara region in Tanzania). The use of pontoon in the country is main means of transportation in lake were there many island which located far away from each other, in lakes where construction of bridge can be impossible. Despite of these of global development economic the government of Tanzania managed to construct many bridges in different water Transportation to cater the challenge of operation of pontoon ferry as described in table 1 below show the top six bridges in Tanzania.

Bridge	Length	location	Navigable Water	Region
Magufuli bridge	3200metres	Busisi	Lake Victoria	Mwanza
Mkapa bridge	970metres	Ikwiriri	River rufiji	Pwani
Unity bridge	720	Mtambaa swala	River Ruvuma	Mtwara
Nyerere bridge	680metres	Kurasini	Indian Ocean	Dar-es Salaam
Kilombero bridge	384meters	Ifakara	River Kilombelo	Morogoro
Kikwete Bridge	275metres	Uvinza	River Malagarasi	Kigoma

Table 1:- Top six bridge in Tanzania



Fig 1:- Nyerere bridge in Day Time



Fig 2:- Nyerere bridge in night time

The importance of Nyerere bridge, landscaped, historical, traditional has made the bridge to become tourist’s influence people of Tanzania are much enjoyed their lives when closing from one side to another and other social activities such as welding. The importance of protect the bridge promote tourism resources, which can help the country to earn revenue for the development. The paper advised the Tanzania’s government through ministry of tourism and environment sector how to create attractive city for tourism and how to promote local tourism in the country, by maintaining a bridge despite of being a permanent solution of Challenges of water transportation in the country. Nevertheless, because to the country economic depends over 25% in Tourism. The bridge is impossible in some area will take long time to constrict bridges especial between islands in lakes and sea. That mean the uses of pontoon ferry will still dominant water transport, for short-term plan the government should invest much in modern pontoons ferry and long term plan should for toll bridge.

In Sweden, for example the pontoon ferries considered as a full-integrated port of the highway system thus no fares charged. On Norwegian ferries are uniform system of fares is being used through the country most of the pontoons ferries are uniform are being subsidized by the state. In

considerably lower than on comparable coastal shipping services.

- *Key services of pontoon ferry analysis*
  - Purely considered as a part of the road system
  - Connect various communities to a large local centre
  - Taken over the functions of the typical country services of thus connecting smaller communities of a system of island
  - Crossing including road connection

➤ *Pontoons Ferries in Tanzania*

The geographical area of Tanzania surrounded with large water bodies, such as are Lake Victoria, Lake Nyasa, Lake Tanganyika, Indian Ocean (as seen in **figure 7**) and big Rivers. That support operation of pontoon ferries. In addition, the water transportation are occupied with the transportation of pontoon ferries see **table 2** mention some few pontoon in different water bodies in the county. All pontoon in the country is under the supervision of government agency (TEMESA). The below pontoon provide services for a very negligible cost that means 200Tsh per each personnel regarded the how the distance is. The pontoon ferry is very important component of the public transport in Tanzania.

Pontoon Ferries	Tonnes	Operation areas	Navigable water
M.V Magogoni	500	Magogoni to Kigamboni	
M V Kigamboni	170	Magogoni to Kigamboni	Indian Ocean
M.V. Sengerema	170	Kigongo- Busisi	Lake Victoria
M V. saba saba	85	Kisonga Bunda	Lake Victoria
M. V .Pangani	35	Ilagala village	River Maragarasi

Table 2:- List some of pontoon operating different water in Tanzania



Fig 3:- Mkapa Bridge in Rufiji river



Fig 4:- M. V Magogoni

Figure 4 is the Mkapa Bridge is the currently second longest bridge in Tanzania across the Rufiji River, it was amongst the longest road bridges in east and southern Africa. This is because the age-old communication problem linking it with Dar es Salaam solved with the on-going construction of the Kibiti-Lindi road and the completion of the Mkapa Bridge across the Rufiji River. This is on top of the existing access by air and by sea. Figure 5 MV Magogoni operating is costly due to its long neglected regular services and could endangered passengers. According to TEMESA is responsible for supervising the operations of ferries but noted that there are several challenges. Tanzania Electrical, Mechanical and Electronics Services Agency (TEMESA) is a public entity established by the government of the United Republic of Tanzania (URT) by the government notice number 254 published on 26th August, 2005 to take over the functions which were previously undertaken by the then Electrical and Mechanical (E&M) Division of the Ministry of Works. The Agency created in the spirit of Act of No 30 of 1997, which was to improve senders and increase both effectiveness and efficiency of operations. The overall objective of the Agency is to provide efficient and effective electrical, mechanical and electronics' sendees as well as reliable and safe ferry sendees to the public. The Agency has failed to provide quality and reliable services related to the hiring of equipment to government institutions and the public.

## II. RESEARCH METHODOLOGY

The study involves interview and observation in different mariners and stakeholders dealing with Maritime transportation in Tanzania particularly based pontoon ferry operation. Such as TEMESA, and TPDF NAVY, The study employs non-probability sampling method to get these

respondents. Furthermore, the study employed two methods of data collection including, interviews and observation. The study was able to make inferences to ascertain the values and attitudes of the respondents and the information gathered through other methods. In addition, information gathered from secondary sources synthesized using the same guide by referring to important refrains. Making preceded conclusions by a detailed description of the data in connection to other people writings on the same subject.

### ➤ *Finding of challenge of pontoon ferries in Tanzania*

On the contrary, some new problems exposed, such as

- Unreliable operation of equipment
- Incorrect handling of pontoon ferry operations
- Use of less experienced skill personnel,
- Unskilled operation of personnel
- Shortage of training methods
- Inadequate maintenance of spare parts support
- Spare parts, tools and so on are difficult enough to meet the daily maintenance needs.
- Lack of training materials, training models, training equipment, for Crew on board etc

In addition to the operations of pontoon challenges in Tanzania are existing problems, which causing risks of the life to crew, passengers and their properties. These problems continues up date and become courser of pontoon accidents such as the MV Nyerere, named for the first former president who led the East African nation to independence, was traveling between the islands of Ukara and Ukerewe. The MV Nyerere a ferry operating on Lake Victoria capsized on September 20. The study finding grouped the challenges, based in staffing, responsibility and operational as describe with figure (5&6).

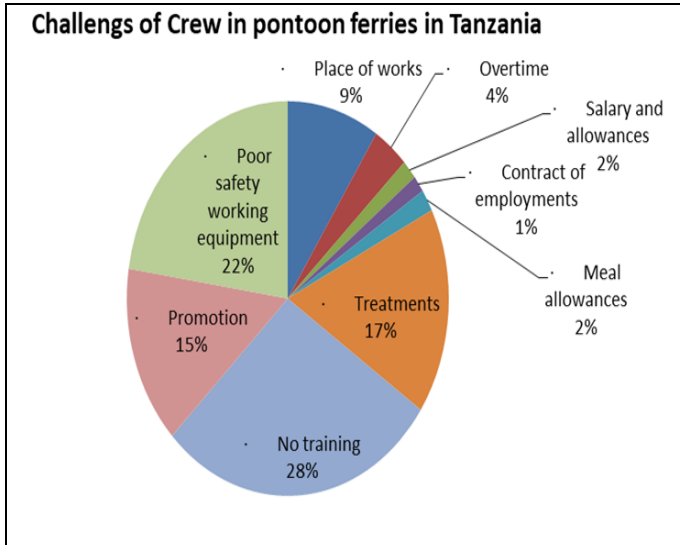


Fig 5:- Workers challenges

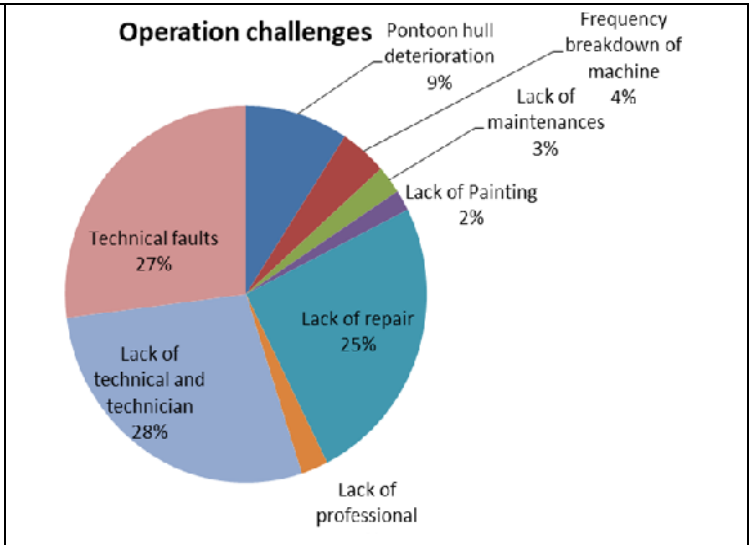


Fig 6:- Pontoon operational challenges

According to officials of the Tanzania electrical mechanical and electronic services agency (TEMESA), that deal with the maintenance of pontoon ferry including engine, Turbines and running of generator, but should be kept in mind that the precaution and maintenance of failures, the efforts must be comprehensive and cover all areas from which failures may arise. Such as personnel error, maintenance practices systems. These groupings are most useful when solving cause/effect failures of the equipment in Pontoon ferry. However, they may also use to keep a mariner focused on all aspects of maintenance.

Tanzania depends on marine transport to compete globally and to help revive a sluggish domestic economy, and help individual to transport their goods and them self to move from mainland to island and back. In waterways, more than 120000 pontoon and 45000 land craft move 295 billion ton annually on 25,000 miles of navigable waters of the Inland waterway system. However, that pontoon ferries during navigation facing varies equipment failure and lack of maintenance.



Fig 7:- Tanzania water bodies



Fig 8:- MV Nyerere sank in Victoria

Figure 7 show the water bodies of Tanzania and figure 8 describe MV Nyerere a small ferry bringing passengers and cargo from nearby Bugolola Island, The reasons why pontoon and Land craft ferries sink and people die in Lake Victoria are analyses in table

Sources	Percentages
natural disasters	16%
human error	29.9%
bad weather	13.2%
high wind	14.9%
Poor seamanship	5%
Overloading of cargo and passengers	8%
Lack of Navigational professional	13%

Table 3:- The common sources of pontoons accidents in Tanzania

**Table 3** in other cases, human errors is the main cause by 29.9%. **Figure 8** is examples of maritime disasters attributed to human error rather than purely natural causes. In some pontoon's crew expressing some Challenge of steering system failure is due to the broken of rams, Seal, damaged nuts, corrosive, leakage of oils in the systems, mixture of sea water and hydraulic oil, to form cologne in steering system material this make pontoon ferry maneuvering failure. If lever weakened, it is difficult to get the speed of the engine and the response of engine. Failures in charging system (alternator), if the charging system fails it will cause the fall down of battery charge and hence causes the navigation systems to fail to work e.g. Radar, GPS, Gyro, etc. and it may cause fire due to the difficulties of start. In addition, sometimes cause bust.

Marine navigation equipment in Pontoon based, on the international standards and regulations of IMO, which require that the pontoon ferry to be installation and fitted properly. All the pontoon ferries of the installation need maintenance system. Marine navigation equipment are currently the only practical way of judging, monitoring and controlling of pontoon.

All pontoons navigation equipment depends on electricity, and is susceptible to shorting of electricity current by seawater or fast assaults. Even with the elaborate backup systems and rigorous insulation, there is a risk of water to cause electricity short. Back up the navigation, capability with manual marine navigation tools such as a chart, magnetic compass, pencil and ruler as there is little that affects their functionality. The sextant considered as an essential marine navigation instrument on sailing long passages but has now relegated to standby status, this precision instrument took centuries to develop but is now displaced by the GPS receiver, which is more accurate and easier to use. The following marine navigation equipment is essential when cruising at sea and. basically; GPS is usable everywhere except where it is difficult to receive the signal, such as inside most buildings, in caves, subterranean locations, and underwater.

Maintenance depends to the failure of the equipment, in order to upsurge the pontoon running efficiently with few disruptions, but unless you translate that general goal into variable sub goals, you will experience challenges. Otherwise, having no goals or only general ones will magnify those challenges of failure. With a means challenge tried to decide what and how to achieve Maintenance.

Problems include how to reduce excessive challenges, how to decrease running costs while maintaining good quality, how to increase the endurance life span of pontoon ferries, how to improve safety, and how to change the government of Tanzania mindset through TEMESA to prevent mode. Overcoming challenge should involve findings and an expert. The purposes will determine the challenges experienced. Just as there are different levels of purposes and its sophistication in challenge solving. These purposes achieved by TEMESA it self-plan or our Tanzania government through TASAC regulation.

### III. TRAINING PROGRAM ANALYSIS IN TANZANIA

Should be able to consider the following below listed points ultimately, maintaining of pontoon is not easy it on going to require of theoretical knowledge, reading of manuals, practical study of maintenances equipment and practical safety awareness.

- Knowledge how to use the program and filling in and follow the maintenance program
- Execute a dally round which will give you history data of equipment in the order be able to make preventive maintenance instead of break down maintenance
- Execute all necessary maintenance and perform repairs on-board pontoon ferry
- Learning how to read each and every pontoon drawing to be able to find related components electrical draw
- Knowledge how to read an electrical drawing and being able to find related components and being able to execute fault finding
- Execute all necessary maintenance and perform repairs on-board during sailing
- Knowledge how to read manuals and able to find related spare parts and the maintenance of equipment
- Learning how to work safety on board pontoon ferry
- Conducting safety Training on board pontoon

On board pontoon ferry the has the following hazards are like to happen and the precautions should be minimised by wear PPEs, seen in the table 4 below explain the hazards and causes.

Hazard	Causes
Slipping falling	Outstanding to slippery surfaces as the result of oil, grease, garbage, water or obstructions
Head injuries	Outstanding to overhead loads, low door way entrances, falling equipment/objects
Drowning	Man overboard
Burns	Due to hot steam pipes, hot machinery, welding spark
Eye injuries	Due to Chipping, welding
Clothing or fingers	Being coughing by moving machinery
Enclosed (confined)	Lack of Oxygen

Table 4:- Safety working on board pontoon analysis

#### IV. ENTRY OF ENCLOSED SPACES

More seafarers die or are injured in enclosed spaces than by any other on board work activity. In spite of all the guidelines, safety procedures, manuals, and training, accidents in enclosed spaces continue to take place on ships. Data from the UK Marine Accident Investigators Bureau (MAIB) show there were 101 enclosed space incidents in an eleven-year period between 1998 and 2009. Ninety-three of them were fatal and another 96 of them were serious injury accidents. (Source: Lloyd’s Register)

The number of accidents happening because of seafarers entering confined spaces is unacceptable and that although safety procedures developed for people to follow, it is clear from the numbers of fatalities and injuries that

these procedures are failing. Working procedures in enclosed spaces, information provided on practical safety procedures and risk assessments that needs to take before making entry into confined spaces on pontoon ferry. The practical guide includes the following topics:

- Confined space hazards
- Risk assessment
- Duties of responsible officer
- Atmospheric testing and confined space inspection
- Defining the criteria for confined space entry
- Procedures for safe entering
- Emergency response arrangements

In most pontoon operator has observed entry in enclosed space without for the procedure. Enclosed (confined) spaces are spaces that do not have a 24 hours oxygen ventilated example of enclosed spaces are cofferdams, chain lockers, pump rooms, oil cargo tanks, ballast tanks, peak tank, bunker tanks and duct keels etc. Hazards in enclosed spaces include; Oxygen deficiency due to rusting, paint drying burning, flooding with welding of gas cutting (without proper ventilation) decay of organic matters e.g. fruits. And also there presence of flammable of toxic gasses’

Precautions on entering the enclosed space is as follow

- Ventilate the spaces thoroughly and test for oxygen content to reach 21%
- Make sure there no flammable and toxic gases
- Use enclosed space entry permit system

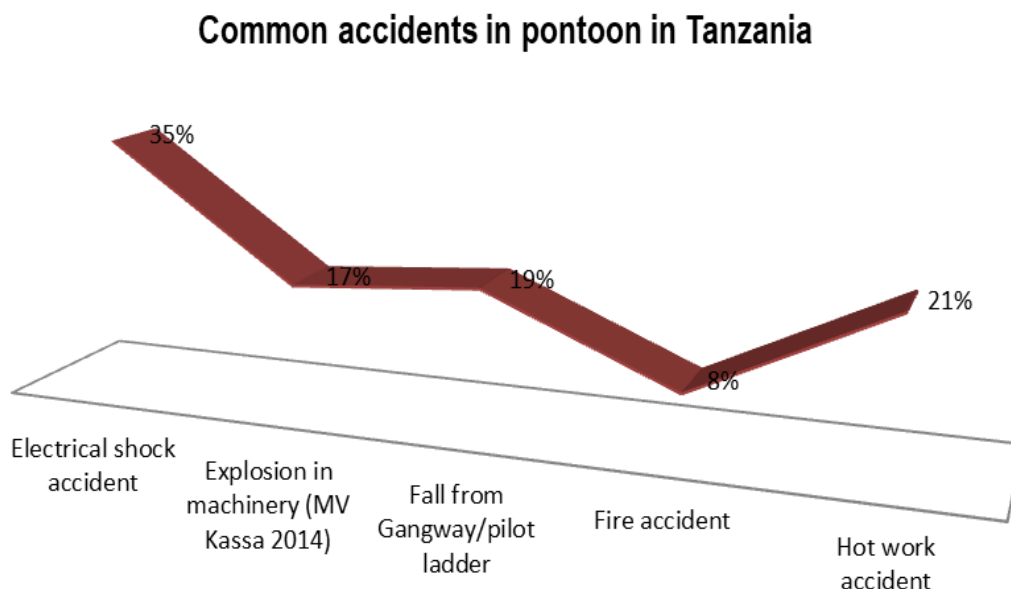


Fig 9:- major accidents in most pontoon in URT

The figure 9 above describe the high percentage about accidents on pontoon ferry are an electrical shock by 35% is the worst of all kinds. Electrical wires and connections are present everywhere on pontoon ferry and it is important to ensure you protect yourself and others from getting any kind

of electrical shock. Moreover, it said that a crew on board a pontoon gets an electrical shock mainly due to its negligence and unawareness, which though true, addressed by proper awareness.

The main issues faced on board pontoon ferry related to electrical systems:

- Electrical problem due to equipment failure - leading to indirect contact
- Electrical problem - leading to direct contact
- Explosion
- Fire, flare up etc.

Table 5 analyses the few important points and precautionary measures to understand how you can save yourself and others from an electrical shock on ships by considering the priority of in ranking from minimum 1 to maximum 5 point. 5 point mean high precaution while work on electrical system.

Precautionary	Ranking
Check all electrical motors, wiring, and switches, for abnormal sounds, variation in temperatures, and loose connections	5
Ensure that all electrical connections are inside the panel box so that no one can touch them accidentally	4
In accommodation area multiple socket plugs shouldn't be used	2
Turn off the breaker before starting any work on an electrical system	1
Use ply card and notice board as much as possible to inform others about the on-going work to avoid accidental starts	3
Double check the electrical tools like portable drills for any loose wires before attempting any job	4
Always wear protective clothing, rubber gloves, rubber knee pads and safety shoes to avoid risk of shock	5
Treat all wires as live wires. That mean if someone see are bare wire, he/she should check voltage with a meter before touching it	5
For Breaker off, take out the fuse and lock the breaker. Tag "Man On Work" on the breaker, check the terminal you want to work with good meter to make sure the right breaker is switched off.	2

Table 5:- Reduce the Danger of an Electrical Shock On pontoon ferry

Due to the importance of efficient electrical maintenance and troubleshooting in pontoon, ferry the Government of Tanzania through TEMESA should establish the training centre specifically for a pontoon ferries and the components content of electrical subject should be as following below.

- Essentials for electrical safety
- Generic guidelines for equipment
- Maintenance of low voltage equipment
- Maintenance of high voltage equipment
- Test equipment and component testing
- Earth fault monitor
- Guidelines for troubleshooting
- Troubleshooting of specific equipment

## V. OPERATION AND MAINTENANCE OF MAIN ENGINE

Most of pontoon ferry challenge is breakdown of machinery, as the main engine is the source of the propulsion that call for speed of action, it is essential for the personnel concerned to have a thorough knowledge of its efficient operation and defects removal to guarantee the full combative power of the pontoon ferry. Collect operation of the engine ensured by strictly observing the rules and regulations given. In addition, remedy of defect in time will prolong the service life of engine and promise fuel and oil economy. Proper preparations before starting are the sole assurance for a successful starting of the engine. **Table 6** below show the checks and preparations should be worried

Procedure	Explanations
Pre-heating	To avoid the fail to start or start with difficulty when the room temperature is below 15 degree centigrade.
Barring round	The engine should be barred round hand several turns and the condition of the moving parts checked by feel.
Pre- circulating the lubricating oil	Use the priming pump to circulate oil in the system of the main engine to ease starting and minimize wear of the engine parts
Prevention of Over speed or starting under load	The reverse control handle should rest on the neutral position. Since this can only be done with the speed handle in idling position ,prevention of over speed of starting under load is thus assured
Checking all the auxiliary system	Check to see that all the passages in systems are free and the low pressure safety mechanisms must be in working order

Table 6:- Starting of engine

## VI. CONCLUSION

Existing of water transport in Tanzania is due to geographical surrounding of water body. Despite pontoon, ferry is not a government business but its government services and all operation problems set up by paper is within government control for the area. Pontoon ferry operational privatized costs are very high fear for passengers, such as Kamanga ferry at Sengerema in Mwanza. It is responsibility of government of Tanzania to provide reliability, convenience, conformability, frequency timely, regularly and safety services similar to bridge and working hour in 24 hrs for each pontoon ferry. The government should facilitate training material by support to payment training for maritime industrial profession or crewing producer agency e.g. Dar es Salaam maritime institute Mbegani Fisheries Colleges to strengthen the experience, skill and knowledge capability to pontoon's crew. Based on the technical details of the existing problem of operation of pontoon ferry, this paper puts forward effective training methods, practical maintenance equipment and usage methods, combined application methods of special navigation and management

of TEMESA. At the same time, the future technology of modern development of application of modern pontoon ferry in Tanzania, to promote the water transportation in the country.

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