



United Nations  
Economic Commission for Africa

# Enhancing Capacities in Logistics and Transportation for Inland Waterways and Lakes in Eastern Africa

## Comparative Analysis Report





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United Nations  
Economic Commission for Africa

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## Acronyms

<b>AfCFTA</b>	African Continental Free Trade Area
<b>AI</b>	Artificial Intelligence
<b>AU</b>	African Union
<b>AUDA</b>	African Union Development Agency
<b>CCTFA</b>	Central Corridor Transit Transport Facilitation Agency
<b>CNT</b>	National Transport Confederation
<b>COMESA</b>	Common Market for Eastern and Southern Africa
<b>DMN</b>	Digital Multimodal Nodes
<b>DRC</b>	Democratic Republic of the Congo
<b>EAC</b>	East African Community
<b>ECA</b>	Economic Commission for Africa
<b>EDINNA</b>	Educational Network of Inland Waterway Navigation Schools and Training Institutes
<b>EU</b>	European Union
<b>GDP</b>	Gross Domestic Product
<b>GHG</b>	Greenhouse Gas
<b>GIS</b>	Geographic Information System
<b>ICT</b>	Information and Communications Technology
<b>IoT</b>	Internet of Things
<b>IWAI</b>	Inland Waterways Authority of India
<b>IWT</b>	Inland Waterway Transport
<b>JMV</b>	Jal Marg Vikas
<b>LNG</b>	Liquefied Natural Gas
<b>LTA</b>	Lake Tanganyika Authority
<b>MGR</b>	Meter Gauge Railway
<b>ML</b>	Machine Learning
<b>MOU</b>	Memorandum of Understanding
<b>NAIADES</b>	Navigation and Inland Waterway Action and Development in Europe
<b>NbS</b>	Nature-Based Solutions
<b>NCTTA</b>	Northern Corridor Transit and Transport Agreement
<b>NCTTCA</b>	Northern Corridor Transit and Transport Coordination Authority
<b>NEPAD</b>	New Partnership Africa's Development

<b>ODA</b>	Official Development Assistance
<b>PICI</b>	Presidential Infrastructure Championing Initiative
<b>PIDA</b>	Programme for Infrastructure Development in Africa
<b>PIDA-PAP</b>	Programme for Infrastructure Development in Africa – Priority Action Plan
<b>PPP</b>	Public-Private Partnership
<b>REC</b>	Regional Economic Community
<b>RIS</b>	River Information Systems
<b>SADC</b>	Southern African Development Community
<b>SAGCOT</b>	Southern Agricultural Growth Corridor of Tanzania
<b>SAPL</b>	Summit Alliance Limited
<b>SME</b>	Small- and Medium-Sized Enterprise
<b>SRO-EA</b>	Subregional Office for East Africa
<b>TFA</b>	Trade Facilitation Agreement
<b>UNECA</b>	United Nations Economic Commission for Africa
<b>UNECE</b>	United Nations Economic Commission for Europe
<b>VICMED</b>	Victoria to the Mediterranean Sea via the River Nile
<b>WTO</b>	World Trade Organisation

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## Trademarks and Disclaimers

Economic Commission for Africa (ECA) believes the information in this publication is accurate as of its publication date; such information is subject to change without notice. ECA is not responsible for any inadvertent errors.



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## Executive Summary

The lakes and waterways of East Africa that provide the greatest expanse of inland water in the tropics represent untapped potential for transport and logistics. Countries in East Africa have recognised this potential and have been reviving the Inland Waterway Transport (IWT) sector to meet the rising demand for transport and logistics and support the implementation of the African Continental Free Trade Area (AfCFTA). Through best practices from international experience and transport development trends, East Africa has embraced an integrated multimodal corridor approach and leapfrogged IWT development. The subregion has two main multimodal corridors – the Northern Corridor and the Central Corridor.

However, for East Africa to progress further, an emphasis on holistic and integrated thinking is vital to developing and providing sustainable solutions to IWT and its incorporation in multimodal corridors. This means not only ensuring transport modes are integrated at various points in the network, but also ensuring that transport is responsive to the needs of the productive sectors such as agriculture, tourism, mining and manufacturing. This requires the commitment and involvement of government, the private sector, Civil Society Organisations and academia in tackling economic, social, political and environmental issues in a holistic manner. It also means ensuring that the entire value chain is resilient and inclusive.

A global study that conducted a comparative analysis of the policies and programmes in four countries – Brazil, China, Egypt and India – and in the European region offers valuable insights into the strategic areas that East African countries should prioritise to accelerate IWT development. The four countries and Europe have been selected for analysis because of their demonstrated leadership in promoting IWT in their respective region or subregion. Like in East Africa, these countries/regions have extensive networks of inland waterways, yet, they have experienced a decline in the IWT sector, and have been making significant efforts to revive the IWT sector through various policies and strategies.

Based on the insights drawn from the comparative analysis of best practices and lessons learned from African and international case studies, recommendations for enhancing the operational capabilities for logistics and transportation for inland waterways and lakes in Eastern Africa are provided in the following 12 categories:

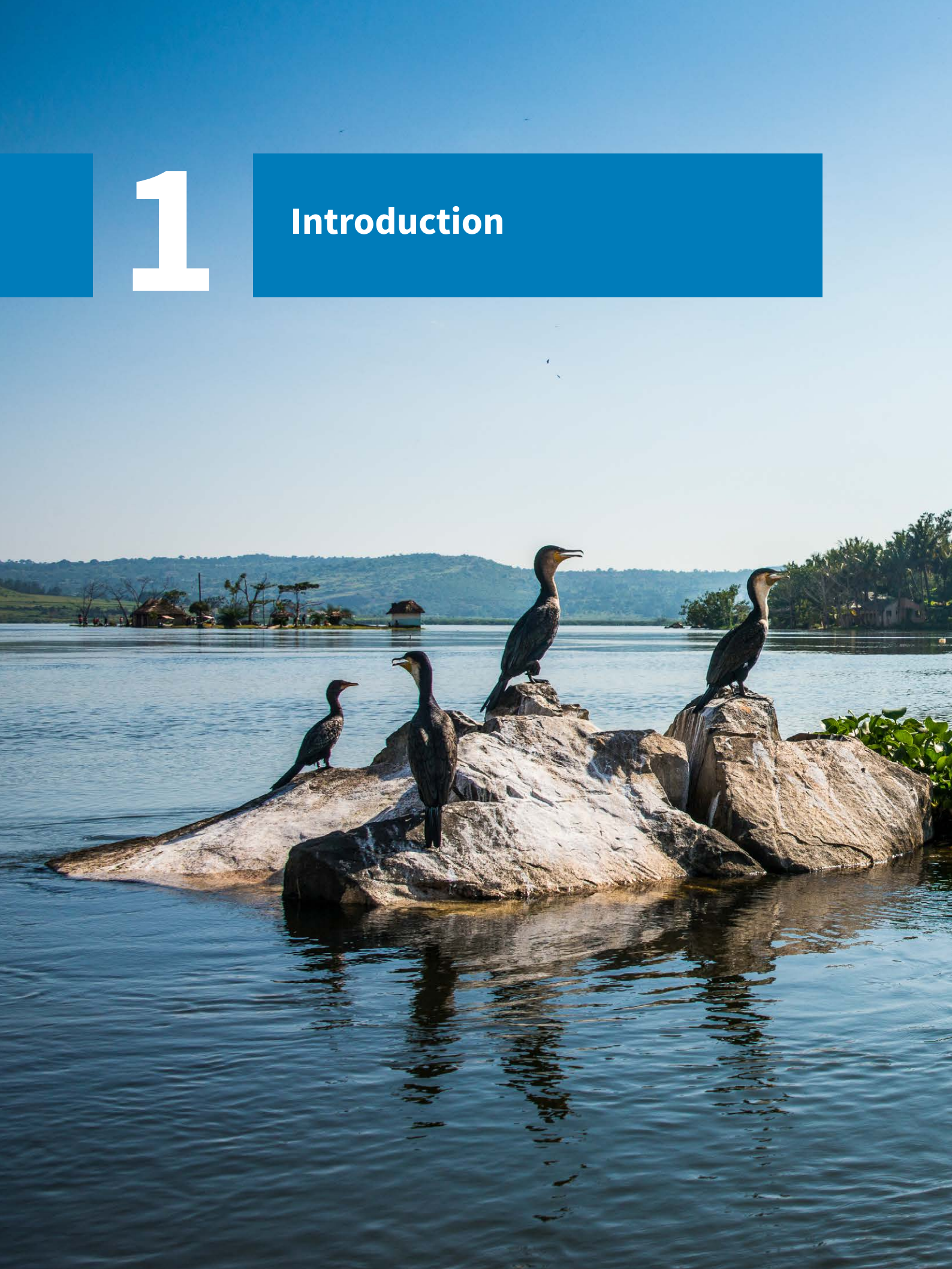
-  Infrastructure, Facility and Cold Chain Modernisation
-  Policy and Regulatory Reform
-  Collaboration, Cooperation and Partnership
-  Financing
-  Digitalisation and Leveraging of Advanced Technologies
-  Job Creation, Start-Up Ecosystem and Capacity Building
-  Inclusion
-  Climate Resilience

-  Crisis Resilience
-  Safety and Security
-  Food Security
-  Integrated Water Resources Management and Nature-Based Solutions

Through a roundtable policy discussion conducted in Kigali, Rwanda, with key regional stakeholders in November 2022, the top three priorities for each category were identified by consensus.

# 1

## Introduction







*Uganda, Jinja, white-breasted cormorants, Phalacrocorax carbo lucidus, sitting on a rock on a little island at the source of the Nile.  
Photo Credit: Westend61/Getty Images*



# 1. Introduction

## 1.1 Background and Geographical Scope

Historically, inland waterways that include lakes, rivers and canals, both natural and artificial, played a vital role in logistics and transportation, and contributed significantly to economic growth. Over time, however, many governments shifted their focus to developing rail and road networks, resulting in the underinvestment and neglect of waterways infrastructure.

As road networks become increasingly congested, polluted and accident-prone, and as world leaders call for sustainable transportation that considers the health and well-being of people and the environment, inland waterway transport (IWT) has received renewed attention. This is because it is considered a low-cost, low-pollution and low-carbon transport mode, and its advantages increase with transport distance and cargo volume, particularly when well-integrated in multimodal supply chains. Studies have found IWT to be 30-60% less costly than road or railway transport and consumes three to six times less energy than road transport.

The lakes and waterways of Eastern Africa provide the greatest expanse of inland water in the tropics and include both the world's second-largest lake, Lake Victoria, and the second-deepest lake, Lake Tanganyika. These are the two main navigable lakes in East Africa, in addition to the River Nile and River Congo that have been used for millennia as a means of transporting goods and people. There are other potential inland waterways that have been identified for transportation and logistics, but investments and resources will be needed before they can be widely used commercially. They include Lake Albert and Lake Edward (both shared by the Democratic Republic of the Congo (DRC) and Uganda), and the Akagera River (which crosses Burundi, Rwanda, Uganda and Tanzania). Figure 1.0 highlights the geographical position of major lakes and rivers in Eastern Africa.

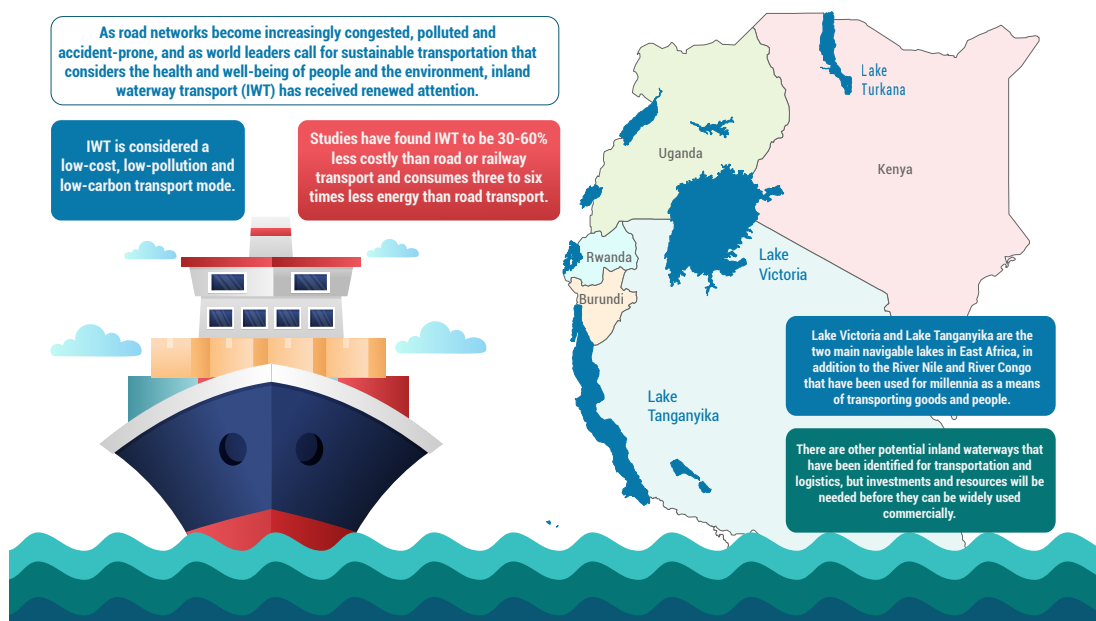




Figure 1.0: Major Lakes and Rivers in Eastern Africa



Source : <https://africageographic.com/stories/great-lakes-solo-man-powered-expedition/>

Table 1.0 provides some key information about the main lakes and inland waterways in East Africa based on the limited data available.

**Table 1.0: Information about the Main Lakes and Inland Waterways in East Africa**

Lake	Physical Dimension	Countries that Share Lake/River	Main Ports	Regulation / Agreement	Connection with Other Transport Modes	Commercial Centres Served by Lake/River
Lake Victoria	Surface area: 68,800km  Mean depth: 40m	Kenya	Kisumu	Lake Victoria Transport Act 2008	There are rail-ferry terminals at Kisumu, Mwanza and Jinja with rail connection to maritime ports.	Kisumu and Migori in Kenya.
		Tanzania	Mwanza, Musoma, Bukoba, Kemonondo Bay, Nansio			Mwanza, Musoma and Bukoba in Tanzania.
		Uganda	Port Bell (serving Kampala), Jinja			Kampala, Jinja and Entebbe in Uganda.  The lake also serves the centres along the Central Corridor (in Burundi, DRC, Rwanda, Uganda and Tanzania and Northern Corridor (in Burundi, DRC, Kenya, Rwanda, South Sudan and Uganda).
Lake Tanganyika	Surface area: 32,900km  Mean depth: 570m	Burundi	Bujumbura	Convention on the Sustainable Management of Lake Tanganyika	A rail line connects Kigoma with Mpulungu.  In DRC, the railway port of Kileleshwa maintains links with Kigoma, Bujumbura and Kalundu. Kileleshwa is also connected to Lubumbashi by rail and road, and to Bukavu by road.  In Tanzania, a road project connects Sumbawanga via Matai to Kasanga Port.	Bujumbura in Burundi.
		DRC	Kileleshwa, Kalundu (near Uvira)			Kileleshwa and Uvira in DRC.
		Tanzania	Kigoma, Kasanga			Kigoma, Kasanga and the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) in Tanzania.
		Zambia	Mpulungu			Mpulungu and the Northern Province in Zambia.  The lake also serves the centres along the Central Corridor (in Burundi, DRC, Rwanda, Uganda and Tanzania and Northern Corridor (in Burundi, DRC, Kenya, Rwanda, South Sudan and Uganda).
Lake Malawi (Nyasa)	Surface area : 29,600km <sup>2</sup>  Mean depth: 292m	Malawi	Chilumba, Chipoka, Monkey Bay, Nkhata Bay, Nkhatakota	Malawi-Tanzania Agreement on Lake Shipping Services 1995 for transport and trading on Lake Malawi	Malawi's railway system provides services on Lake Malawi and has rail connections with Beira and Nacala on the coast of Mozambique. Chipoka Port has rail and road connection for Blantyre up to Indian Ocean and Lilongwe Road connection up to Zambia. Nkhata Bay port has road connection to Mzuzu, Zambia and Tanzania. Chilumba port has road connection to Tanzania and Zambia.	Most part of Malawi through rail and road.
		Mozambique	Metangula			In Tanzania, the Southern Highlands, including the Njombe and Ruvuma regions.
		Tanzania	Itungi, Kiwira, Mbaba Bay, Ndumbi			

Lake	Physical Dimension	Countries that Share Lake/River	Main Ports	Regulation / Agreement	Connection with Other Transport Modes	Commercial Centres Served by Lake/River
Lake Kivu	Surface area: 2,693km	DRC	Goma	N/A	There is a rail network on Lake Kivu linking Bukavu to Goma (106 km), and a Kalundu-Bukavu road network (128 km).	In the DRC, Bukavu, Goma, North Kivu and South Kivu.
	Mean depth: 220m	Rwanda	Karongi, Rubavu, Rusizi, Rutsiro (Nkora)			In Rwanda, Karongi, Rubavu, Rusizi, and Rutsiro (Nkora).
Nile River	Length: 6,650km Navigable network: 1,545km Mean depth: 8-11m	Burundi, DRC, Egypt, Kenya, Rwanda, South Sudan, Sudan, Tanzania, Uganda	Burundi, DRC, Egypt, Kenya, Rwanda, South Sudan, Sudan, Tanzania, Uganda	Nile Basin Initiative	There are road and rail networks running parallel along the Nile River.	Commercial centres along the Nile River in Burundi, DRC, Egypt, Kenya, Rwanda, South Sudan, Sudan, Tanzania, Uganda.  The river serves the centres along the Northern Corridor.
Congo River	Length: 4,700km Navigable network: 3,000km (especially between Kinshasa and Kisangani) Mean depth: 10-80m	DRC	Banana Port, Boma, Matadi	N/A	There are roads and rail networks running parallel along the Congo River. For example, rail line links Banana Port, Boma and Kinshasa.	Commercial centres along the River Congo such as Kinshasa, Kisangani and Ilebo.

Sources: All Africa, “Tanzania: Delays in Kasanga Port, Road Project Rile Govt,” 3 January 2021, <https://allafrica.com/stories/202101040167.html>; Africa Press, “Lake Nyasa ports to get facelift,” 26 December 2019, <https://www.africa-press.net/tanzania/economy/lake-nyasa-ports-to-get-facelift>; Bernard Lugongo, “Tanzania: Tpa Enlivens Economic Activities Around Lake Nyasa,” All Africa, 14 January 2021, <https://allafrica.com/stories/202101140058.html>; Britannica, “Congo River: The people and the economy,” <https://www.britannica.com/place/Congo-River/The-people-and-the-economy>; Britannica, “East African Lakes,” <https://www.britannica.com/place/East-African-lakes>; Britannica, “Lake Nyasa,” <https://www.britannica.com/place/Lake-Nyasa>; Fortune of Africa, “List of Top 10 Rivers in Africa,” <https://fortuneofafrica.com/top-10-rivers-in-africa/>; and TradeMark East Africa, “Lake Kivu Harbour Transport Project,” <https://www.trademarka.com/project/lake-kivu-harbour-transport-project/>.

Although Eastern Africa, according to classification by the United Nations Economic Commission for Africa (ECA), covers 14 countries, the focus of this paper are those countries listed above with major lakes and waterways. They include: Burundi, DRC, Kenya, Rwanda, South Sudan, Tanzania and Uganda.

The lakes and waterways of Eastern Africa represent untapped potential for logistics and transportation. They are also home to some of the largest and most ecologically diverse freshwater systems in the world, supporting millions of people with drinking water, food and livelihoods. Thus, the protection, conservation and sustainable management of blue assets, and development for logistics and transportation must go hand in hand.

## 1.2. Strategic Importance of AfCFTA for Sustainable Development of Eastern Africa

East Africa has been the fastest growing and most integrated subregion in Africa since 2013, and is currently expanding at more than double the continental average. The East African Community (EAC), a regional intergovernmental organisation, plays an important role in facilitating regional integration and growth, and enabling infrastructure development and trade.

Despite significant growth and development, the economies of Eastern Africa are faced with many challenges such as low levels of investment and intraregional trade. For example, the two largest economies in the subregion – Kenya and Ethiopia – barely trade with each other, and their annual bilateral trade is worth less than USD 100 million, accounting for less than 1% of Kenya and Ethiopia's exports.

A significant proportion of domestic demand is being met by imports rather than regional production, resulting in large trade deficits ranging from 10% to 20% Of Gross Domestic Product (GDP). These deficits need to be financed, yet official development assistance (ODA) to the subregion is declining and other sources of development finance are often difficult to access. Ultimately, it is a pattern of growth that cannot be sustained.

The implementation of the African Continental Free Trade Area (AfCFTA) in Eastern Africa is a key driver for the integration of Eastern African countries to overcome the constraints of marginalisation in the global marketplace and boost intra-African trade. The implementation stage of AfCFTA began on 1 January 2021, with countries starting the tariff reduction process, leading to the elimination of tariffs on intra-regional imports over a period of five to ten years. Alongside the removal of tariff barriers, AfCFTA will focus attention on outstanding non-tariff barriers. Eastern Africa has already made some progress in this area by, for example, installing 25 one-stop border posts, significantly reducing the time taken for goods to pass through customs.

According to a 2022 ECA study, the establishment of AfCFTA could increase intra-African freight demand by around 28% compared with the non-AfCFTA scenario. Reliable, affordable and sustainable transport networks are a prerequisite for the successful implementation of AfCFTA. Yet, transport costs in Eastern Africa are high compared to global standards – contributing up to 40% of the cost of goods traded in the subregion. Often, exports from an African country pass through Europe before reaching another African country because of convoluted transit routes and high shipping costs. The regulatory rules and frequent checkpoints by trade officials and police along transport corridors add to shipping costs.

Although only 28% of Africa's road network is paved, most countries rely on the road network for transport and logistics, because other transport modes such as air, rail and water are even more poorly developed. Generally, the inland waterways infrastructure in Eastern Africa has been poorly maintained and underutilised since the collapse of the rail wagon system in 2004 and the investment in the road network has been prioritised over the rail and inland waterway networks.

In order to support the implementation of AfCFTA, planning and investment in transport and logistics are needed to address the bottlenecks that have hindered trade across countries in the region. A holistic and integrated approach needs to be adopted that ensures multimodal linkages between inland waterways, road, rail and air transport, and cooperation with multi-sector stakeholders to address economic, social, political and environmental issues, including those related to energy, Information and Communications Technology (ICT), and water resources management.

### 1.2.1 The Importance of IWT in the Implementation of AfCFTA

IWT plays an important role in improving domestic connectivity and regional integration, particularly since the lakes and waterways of Eastern Africa provide the greatest expanse of inland water in the tropics, yet their potential remains largely underutilised. IWT can create a common transport route across several countries that share the same lake or river. This is demonstrated by how Europe has utilised rivers such as the Danube and the Rhine to foster trade across the continent.

Moreover, IWT is generally acknowledged as a cleaner, safer and most energy-efficient mode of transport when compared to road-based systems that are often confronted with congestion, pollution and safety issues, and the advantages of IWT increase with transport distance and cargo volume. For example, one litre of fuel will move 24 tonnes over one kilometre on the road, 85 tonnes over the rail per kilometre, and 105 tonnes per kilometre over IWT, making it very fuel-efficient. Another study noted that IWT is one of the most Carbon Dioxide (CO<sub>2</sub>)-efficient transport modes per tonne of goods carried, using only 17% of the energy needed by often-congested road transport and 50% of rail transport. IWT can therefore contribute to meeting countries' green ambitions and climate targets.

Traditionally, IWT provided port-to-port transport of mainly commodities carried in bulk over long distances. They include non-perishable agrifood products such as grain, sugar, salt, coffee and fertilizers, construction materials such as cement, sand and stones, mining extracts such as coal, copper and iron ore, petroleum products, and industrial products that are stored or processed at the port.

Current challenges faced by the IWT sector include lack of funds allocated for the upgrading and maintenance of waterways, outdated hydrographic capability, poor navigation aid system and very limited night time aids, poor safety culture, including outdated rules and regulations concerning the design, licensing, construction, operation and maintenance of IWT vessels, lack of facilities for search and rescue operations, and insufficient and dilapidated port facilities.

However, if strategically developed through the incorporation of innovation and technology, IWT could play a vital role in unlocking the economic potential, and increasing competitiveness and integration of countries that share waterways. IWT also has the potential to diversify its services beyond the delivery of bulk products over long distances, to serve smaller-scale freight transport in urban centres as demonstrated in Europe.

### 1.3. Overview of Global Transportation Innovations

According to ECA, “the ability of countries to engage in sustainable free trade across Eastern Africa and the African continent depends on their technological performance, particularly in creating new products and services, diffusing old and new technologies, and developing human capital.” Technology and innovation are vital to the realisation of AfCFTA. Attaining the objectives of AfCFTA will require leadership and investments in multiple forms of technological development and innovation. The ECA report goes on to argue that the missing link for Africa is research and development investment to establish and strengthen centres of excellence for human capital development, including in logistics and transport.

Globally, the transport sector is increasingly structured around online and automated systems. Innovations and modern technologies are being leveraged to enhance efficiency and reduce the cost of transport and logistics, coordinate end-to-end transport and logistics with different players along the value chain, improve safety, as well as minimise environmental impact and combat climate change.

Countries around the world, including in Africa, have been adopting an integrated multimodal corridor approach that links different infrastructure sectors together. It refers to the process of spatially organising two or more infrastructure assets into corridors to enhance the social and economic development of the corridor countries. This approach implies a deliberate focus on regional integration in which all infrastructures and facilities, such as ports, roads, rail, pipeline, inland waterways, border post facilities, and other logistics services complement one another.

Intermodal transport can reduce the cost of logistics and transport, particularly for bulk products across long distances, and it is also generally more environmentally friendly. However, intermodal transport is typically slower and not suitable for the delivery of urgent or perishable products. For less developed intermodal systems, there may be lower levels of traceability and a higher risk of damage, especially in the transition to different transport modes. But with the digitalisation and use of technology, intermodal transport has become more reliable, efficient and safe. The intermodal transport system also requires significant capital investment in handling infrastructure and equipment, like warehouses and cranes, which are important parts of intermodal transportation.

For the developing regions with large numbers of landlocked developing countries, like Eastern Africa, the United Nations underscores the importance of transport corridors. United Nations agencies and development banks have promoted infrastructure projects preparation, funding and maintenance based on a corridor approach to optimise access to landlocked developing countries. In Africa, the Programme for Infrastructure Development in Africa (PIDA), which is a flagship programme of the African Union (AU) to develop the infrastructure in transport, energy, ICT and transboundary water resources, has mainstreamed all projects along designated corridors.

In the implementation of the multimodal corridor approach, current trend points to the application of synchronomodality, which is the synchronisation of multimodal services with different speeds and lead times, and the alignment of equipment and services on corridors and hubs with the multimodal networks. For synchronomodality, real-time information is needed for decision-making. The development of smart infrastructure and intelligent



transportation systems using sensors, Internet of Things (IoT) networks, cloud technologies, Artificial Intelligence (AI) and Machine Learning (ML) has enabled real-time monitoring and the application of synchromodality. In addition, these technologies that allow real-time monitoring have helped to optimise transport and logistics operations, reduce the cost of infrastructure and equipment maintenance, enhance safety, and minimise carbon emissions.

Relatedly, the emergence of autonomous vessels could increase safety, improve environmental performance and accelerate decarbonisation. Various countries are moving ahead fast with this technology and currently have commercial projects at the stage of advanced testing and trialling.

With the data collected and analysed through these intelligent systems, they can be used to improve the design and planning of vessels, ports, warehouses, and entire transport corridors and networks using various modelling applications, remote sensing, satellite and Geographic Information System (GIS) technologies, as well as digital twins for simulation and creation of 3D models to test out different models and scenarios.

Blockchain is another technology that is becoming more widely used in transport and logistics to improve accountability and traceability of cargo, fleet and transactions across the value chain.

There is also increasing automation of recurrent operations to reduce time and cost, such as roll-on/roll-off where loaded road vehicles are driven on a vessel, and off at the port of destination. It involves using sensors to detect obstacles and AI to dynamically learn the required operations including lane following, obstacle avoidance and rolling cargo placement.

While these technologies have gained widespread support, scalability is a challenge as they remain expensive. The COVID-19 pandemic has prompted the acceleration of innovation and digitalised transport and logistics processes. However, implementing these systems requires fast and reliable broadband technologies that are still costly in many low- and middle-income countries due to inadequate digital infrastructure and capacity.

Another key challenge is the lack of capacity to address cyber risks. Online platforms and information systems have many advantages, but they also expose transport and logistics to new and unforeseen threats and vulnerabilities, notably the risk of cyberattacks. It is vital to build capacities in identifying and addressing cybersecurity risks and vulnerabilities and strengthen the resilience of information systems of organisations, ships, ports, warehouses and other facilities along value chains.

# 2

## Approach and Methodology







*MV Uhuru, a refurbished cargo ship carrying fuel loaded wagons, docked at the newly-inaugurated Kisumu port with an oil loading jetty at Lake Victoria in Kisumu, Kenya.  
Photo Credit: BRIAN ONGORO /Getty Images*

## 2.0 Approach and Methodology

This section introduces the goals and objective of the study, and explains the research methodology and analysis techniques, including the desktop research and literature review undertaken.

### 2.1 Goals and Objective of Study

This study aims to introduce the breadth of issues that need to be considered in a holistic and integrated manner, focusing on the infrastructural, economic, social, political and environmental aspects when enhancing the capacity of lakes and waterways for logistics and transportation in Eastern Africa.

### 2.2 Desktop Research and Literature Review

This study draws on the knowledge and experience of IWT and multimodal transport and logistics in Africa, Asia, Europe and Latin America.

Based on the inception report and report outline agreed with ECA, indicating the purpose of research and broad focus areas, the research team undertook an online search of relevant literature on IWT from reliable sources, including from government policies, regulations and programmes, as well as from United Nations agencies, development banks, academic journals, development organisations, think tanks and reliable media agencies across the globe. The types of literature accepted for review include government policies, regulations, trade agreements, open-source research publications, and official reports and articles. The year of their publication was not restricted in order to assess IWT trends over time. The search was limited to English-language publications.

The search yielded over 100 relevant and reliable online resources that were reviewed and analysed, and key insights and lessons distilled from these resources contributed to the richness of this study.

### 2.3 Research Methodology and Analysis Techniques

The study adopted two types of analysis techniques – a comparative analysis of policies and programmes in five selected countries/regions, and the analysis of case studies that allows in-depth, multi-faceted exploration of complex issues in their real-life settings over time in order to draw out best practices and learnings.

Four countries were selected for analysis – Brazil, China, Egypt and India – plus the European region. Brazil, China, Egypt and India are recognised leaders of IWT development in their region/subregion. Europe has a long and well-established history of developing its IWT, and insights from their experience will be valuable for developing regional IWT strategies for Eastern Africa as a whole, including effective ways to incentivise cooperation among countries in developing IWT, harmonisation of policies and regulations, and IWT integration in multimodal transport and logistics chains.

The study intended to include a representative mix of countries by region, and the countries were selected based on their demonstrated leadership in promoting IWT in their respective region or subregion. In all cases, the countries/region have extensive networks of inland waterways, yet, they have experienced a decline in the IWT sector. In the selected countries/region, the respective government leaders have recognised the potential of IWT and have been making significant efforts to revive the IWT sector through various policies, regulations and strategies.

In order to obtain a better understanding of the types of policies, regulations and strategies these selected countries/regions have adopted to promote IWT, a comparative analysis was conducted using a key word and key phrase search methodology to draw out key trends, following which an analysis of country/regional case studies was undertaken for more in-depth study of the best practices and learnings that can be applied to the Eastern Africa context.

The list of key words and key phrases for comparative analysis were compiled from the extensive desktop research and literature review of over 100 IWT-related online resources. These key words and key phrases were then shortlisted and categorised to represent the breadth of current issues related to IWT that need to be considered in a holistic and integrated manner when enhancing the capacity of lakes and waterways for logistics and transportation in Eastern Africa (Table 2.0).

Also, from the extensive desktop research and literature review, five key resources – one from each country/region – were selected to conduct the comparative analysis. Preference was given to the latest regional and national policy documents related to transport or IWT. However, in the case of China and Egypt, their transport and IWT policy documents were not available in English, therefore, alternative resources had to be used for the comparative analysis. The most recent and comprehensive resources on transport and IWT publicly available online were selected. The documents selected for comparative analysis are listed in Annex 2.

**Table 2.0: Shortlist of Key Words and Key Phrases**

Key Word/Key Phrase					
<b>Sustainable Development</b>					
Sustainable Development	Climate Change / Carbon	Environment	Economic	Trade	Social
Job (Creation)	Gender / Equality / Women	Resilience	Agriculture / Food	Industry / Manufacturing	Waste
Energy Efficiency / Renewable Energy	Nature-Based Solution / Work with Nature	Water Resources Management			
<b>Transport and Logistics Infrastructure and Approach</b>					
Corridor	Multimodal / Intermodal (Linkage)	Regional (Development / Connectivity / Trade)	(Logistics) Hub / Cluster	Port	Vessel / Barge / Fleet
Warehouse / Storage	Cold Storage				
<b>Development and Operations</b>					
Standards / Regulations	Governance	Financing / Investment	Maintenance	Monitoring / Inspection	
<b>Workforce</b>					
Skills	Training / Capacity Building	Certification	Safety / Security	Health / Well-Being	
<b>Digitalisation</b>					
Digital	Innovation	Start-Up	Data	Information System / Platform	Cyber Risk / Cyberattack / Cybersecurity
<b>Collaboration, Cooperation and Partnership</b>					
Collaboration / Cooperation / Partnership	Private / Private Sector / Private Investment	Civil Society / Local Community Participation			



# 3

## Global Comparative Analysis







*Engineers travel by boat to the gas extraction barge during a shift change on March 09, 2023 in Kibuye, Rwanda. The KivuWatt power plant, built through international cooperation with the Rwandan government, is located in the middle of one of the great Rift lakes, between Rwanda and DR Congo, and produces electricity from the immense quantities of gas trapped in the depths of Lake Kivu.*

*Photo Credit: Luke Dray /Getty Images*

## 3.0 Global Comparative Analysis

A global comparative analysis was conducted of five leading IWT countries/regions to identify the extent to which key issues are being pursued in an attempt to revive the IWT. The detailed analysis is provided in Annex 1.

The analysis highlights key areas that Eastern Africa may need to pay particular attention to when developing policies and solutions to enhance the capacity of IWT for improved transport, logistics and intra-regional trade. These areas are elaborated in Section 3.1.

### 3.1 Policies and Regulatory Trends and Gaps

Based on the comparative analysis, Table 3.0 gives a summary of the key areas that countries in East Africa may need to pay particular attention to when developing policies and solutions to enhance the capacity of IWT for improved transport, logistics and intra-regional trade. These gap areas are elaborated in the subsections below.

**Table 3.0: Summary of Gaps in the Coverage of Key Issues Related to IWT**

Key Word/Key Phrase	Brazil	China	Egypt	India	Europe
<b>Sustainable Development</b>					
Job (Creation)				✓	✓
Gender / Equality / Women				✓	✓
Nature-Based Solution / Work with Nature					
Water Resources Management		✓			
<b>Transport and Logistics Infrastructure and Approach</b>					
Cold Storage				✓	
<b>Digitalisation</b>					
Start-Up				✓	
Cyber Risk / Cyberattack / Cybersecurity				✓	✓
<b>Collaboration, Cooperation and Partnership</b>					
Civil Society / Local Community Participation	✓				

#### 3.1.1 Sustainable Development

Policies, regulations and programmes across the five countries/region broadly acknowledge the vital contribution of transport and logistics, including IWT, to sustainable social, economic and environmental development. However, areas that require attention include gender-sensitive approaches to IWT and the creation of jobs for the local community. This is further elaborated in Section 3.1.4.

The comparative analysis also shows a general lack of emphasis on integrating IWT development with water resources management. Yet, it is important to address conflicting demands and needs as rivers and lakes are used by local communities for multiple



purposes. For example, during a drought, the IWT sector requires a minimum water level for navigation. Irrigation authorities need to extract more water to prevent drying/dying crops. Hydropower facilities want to safeguard a continuous flow of water through their turbines. These interests may conflict, and a coordinating platform and mechanism for cross-sectoral dialogue is required to reconcile them. Moreover, the wide variations in water levels that are likely because of climate change increase the need for such coordination.

The platform and mechanism need to be supported by well-developed and interoperable information systems to inform decision-making across sectors, corridors, regions and countries. For example, predictive modelling can help optimise the management of water volume in inland waterways for navigation, energy production, irrigation and climate actions.

Related to integrated water resources management is the adoption of Nature-based Solutions (NbS). The dredging and deepening of waterways, canalisation, cutting of river bends for easier navigation, and other physical interventions in waterways were once the norm to enhance shipping capacity. The policy trend is now moving away from these hard interventions towards NbS. A World Bank project in India, for example, is using NbS such as bamboo to channel water flow, designing shallow draft vessels, and adopting greening solutions and environmental protection measures. Dredging is done only when absolutely necessary. NbS aims to protect infrastructure assets and services from harmful environmental impacts (including those related to climate change), but also help reduce infrastructures' negative impacts on the environment. NbS are an innovative way to promote sustainability, but require strategic government leadership to coordinate and engage stakeholders.

### 3.1.2 Transport and Logistics Infrastructure and Approach

Approaches such as corridor development and multimodal linkages have been widely adopted globally to facilitate transport and trade flows. Policies, regulations, and programmes have identified priority development along these transport corridors that encompass the upgrade and modernisation of waterways infrastructure, inland ports and facilities (for example, logistics centres), and the fleet of vessels and barges.

With the urgency to tackle the growing food insecurity in light of the Russia-Ukraine war and the persistent drought and conflict, agricultural value chain development is being prioritised in national sustainable development agendas in Eastern Africa and globally. However, there has been an imbalance of emphasis on agricultural production, and much less on the processing and delivery of quality food products, as evident in the comparative analysis, with limited mention of the development of the cold chain, including temperature-controlled transport and warehousing, which are required to maintain the freshness of perishable food products.

### 3.1.3 Development and Operations

Policies, regulations and programmes generally intend to address bottlenecks that hinder the development and operations of IWT, such as the need for standards and governance mechanisms, and the need to increase and diversify financing for IWT development, operations and maintenance, particularly from the private sector.

### 3.1.4 Workforce

The need to strengthen the capacity of the transport and logistics workforce is commonly recognised, and the importance of workforce safety and security is featured strongly in all policies, regulations and programmes analysed.

However, since the transport and logistics sectors have traditionally been male-dominated sectors, gender issues are often neglected. Globally, there are no systematic gender inclusion protocols or procedures for transport and logistics, neither in the training of professionals nor in the participation of users in the design and planning of systems, services and equipment. Transport and logistics companies need to start taking more proactive steps to encourage women to apply for roles. Education also needs to be provided in schools regarding the varied roles that are available and the changing responsibilities of the transport and logistics sectors to highlight the opportunities available and the career pathways.

### 3.1.5 Digitalisation

A fundamental element featured strongly in all policies, regulations and programmes is the digitalisation of IWT, and development of interoperable systems for data and information sharing across agencies, sectors and countries. However, despite the acknowledgement of the importance of digitalisation for IWT development in all countries/region, few recognise the need to boost cybersecurity capacity or point out the existence of the digital divide, particularly in rural and remote areas where digital connectivity may still not be accessible or affordable. The digital divide limits the opportunity to fully leverage advanced technologies and data science such as satellite, GIS, remote sensing, big data, IoT, cloud technologies, AI and ML that are necessary for deploying multimodal systems.

Another area that requires attention is the promotion of a start-up ecosystem to innovate in the transport and logistics sectors. Studies show the number of transport and logistics start-ups growing rapidly. According to Price Waterhouse Coopers (PwC), most of the new entrants to the transport and logistics industry are start-ups, and many leverage digital technologies to enter the industry, offering digital solutions for improved end-to-end transport and logistics management such as sensors and asset tagging and tracking, inventory management systems, blockchain for greater visibility and security in the supply chain, logistics analytics, fleet management, smart warehousing, e-commerce logistics, autonomous vehicles and drones, and innovative last-mile delivery services.

Countries throughout Africa are building a start-up ecosystem to create decent jobs, especially for youth and women, and at the same time drive innovation in various sectors. In 2021, for example, Kenya introduced a Start-up Bill that, among other things, proposes to establish a Kenya National Innovation Agency to foster partnerships among start-ups, incubators and investors. Ethiopia's draft Start-up Act provides start-ups with access to financial and fiscal incentives, streamlined business processes, and a regulatory sandbox to test their business models. The transport and logistics sectors need to both leverage and support this start-up ecosystem.

### 3.1.6 Collaboration, Cooperation and Partnership

Cooperation and collaboration across sectors and countries are accepted as fundamental to their successful implementation in all countries/regions. This is elaborated in Sections 3.2,













3.3 and 3.4. However, an area that may require attention is local community participation in decision-making processes.

## 3.2 Bilateral and Multilateral Agreement Trends

Bilateral and multilateral agreements are applied to facilitate collaboration, cooperation and management of transport and logistics issues, harmonise the trading environment, and improve safety and security.

Most of the United Nations' conventions and agreements relating to transport facilitation have been elaborated under the United Nations Economic Commission for Europe (UNECE). Countries from regions other than Europe can become parties to the vast majority of these agreements. Some relevant UNECE conventions and agreements related to IWT are listed in Annex 3.

Generally, the purpose of these agreements is to provide for an orderly expansion of trade and integrated transport through realisation of the following:

-  Development and maintenance of adequate transport infrastructure (port facilities, roads, railways, inland terminals, border posts) that meet the technical parameters and operational standards indicated in the agreement.
-  Commitment to ensure that national plans and bilateral or multilateral agreements allow the completion of missing links and reduction of bottlenecks along the corridor designated routes.
-  Coordination of standards and methods for the movement of goods.
-  Coordination in development of the formalities and procedures used in trade and transport.
-  Coordination, simplification and unification of documentation in trade and transport.
-  Provision of efficient transport infrastructure across the corridor designated routes.
-  Establishment of preferential arrangements for different categories of cargo.
-  Development of shared information systems throughout the trading and transport system.
-  Resources mobilisation.
-  Cooperation in capacity building of institutional and human capital.

## 3.3 Africa's Transport Agreements

African countries have low participation in international conventions on transport, such as the UNECE transport agreements and conventions. However, all the countries in this study, except for Ethiopia and South Sudan, have ratified the World Trade Organisation (WTO) Trade Facilitation Agreement (TFA) and have formally established a National Trade Facilitation Committee to facilitate the domestic coordination and implementation of the agreement's provisions. One of the key roles of the committee is to bring together

representatives of public and private parties related to international trade and transport facilitation in a country, such as government entities, service providers and transport users, and to organise regular consultations with these stakeholders. The implementation of the WTO TFA's provisions is one of the ways to incorporate best practice trade facilitation instruments in transport and logistics operations, including inland waterways development.

Despite the lack of participation in international agreements, African countries are more likely to participate in regional and subregional transport agreements, such as those facilitated by the Regional Economic Communities (RECs), the New Partnership for Africa's Development (NEPAD) and the Programme for Infrastructure Development in Africa PIDA. The Eastern African subregion has two main multimodal corridors – the Northern Corridor and the Central Corridor – established through intergovernmental agreements, connecting the landlocked countries by road, rail, pipeline and inland waterways to the following seaports. These are described in Section 4.2.

Although over the years, African countries have established bilateral agreements for transport, such as a Memorandum of Understanding (MoU) signed by the governments of Tanzania and Uganda in July 2017 to cooperate in the improvement of ports, inland waterways and railway transport, with a view to strengthen the critical Mwanza-Port Bell-Kampala link for the Central Corridor. Another example is the Malawi-Tanzania Agreement on Lake Shipping Services 1995 for transport and trading on Lake Malawi. The trend, however, is towards the establishment of multilateral agreements along corridors. The advantage of corridor-based multilateral agreements is that they provide a coherent framework for standardised services and procedures across the member state territories.

### 3.4 Multi-Sector Stakeholder Collaborations and Partnerships

Multi-sector stakeholder collaborations and partnerships involving government, the private sector and Civil Society Organisations are imperative in the successful development of inland waterways and multimodal connectivity for sustainable transport and logistics. Policies, regulations and programmes generally recognise the need for private sector participation, particularly in attracting investments and their engagement in developing and managing the transport infrastructure and logistics hubs through public-private partnerships.

However, as evident in the comparative analysis table presented above, the participation of Civil Society Organisations in IWT and multimodal corridor development has been limited, and requires attention as they play a crucial role in promoting sustainability principles along inland waterways and transport corridors, and help ensure that transport infrastructure serves people and the environment. They include those related to environmental sustainability (for example, environmentally-friendly, low-carbon, clean energy use, and climate resilience), and social inclusiveness (for example, affordable and accessible transport and logistics services, gender equality, and voicing the concerns of marginalised groups).

Moreover, collaborations and partnerships are essential, not only in infrastructure planning, development, management and operations, but also in promoting innovation and joint research through South-South and triangular cooperation.

### 3.5 Implications of the UN Sustainable Development Goals

IWT development supports targets in all the Sustainable Development Goals (SDGs). Linked with the concept of sustainable development are two additional concepts—inclusion and resilience.



Inclusive development is generally defined as development that includes and pays special attention to the needs of the poor and the excluded, such as women, people living in rural and remote areas, Small- and Medium-sized Enterprises (SMEs) and informal workers. The implication here is that no real and sustained development can take place if certain segments of the population are excluded from the benefits of development. IWT can reach rural and remote areas that do not have road and rail access, enhancing access to essential services and improving food security for marginalised groups, but intentional and concerted effort will be needed to ensure that IWT development is inclusive and leaves no one behind.




Sustainable development also implies resilience to shocks or the ability of communities to cope during crises. Allowing continued mobility of goods and passengers during crisis situations, such as the one created by the COVID-19 pandemic, strengthens resilience. Building the resilience of transport and logistics networks is critical in preparation for future crises. This will require holistic and integrated developments in infrastructures, systems, governance and capacity, and adoption of a people- and environment-first approach. Without this holistic approach, inequalities are likely to widen. We have seen that the COVID-19 pandemic has hindered the flow of goods, increased logistics costs, and imposed a higher risk on marginalised groups related to the shortage of medical supplies, food and other necessities. Similar pandemics and crises are likely to occur in the future, and the transport and logistics sectors need to be prepared.

Rivers and lakes are among the most altered ecosystems in the world. For example, at its peak between 1970 and 1975, nearly 5,000 large dams were built. Although dam construction has declined, there is a total of about 57,000 dams that are impacting upon the freshwater ecosystem – the best-documented cases are the disruption of fish migration resulting in a decline in their population. Overall, freshwater vertebrate populations have declined by 86% since 1970 – twice the rate experienced within terrestrial or marine ecosystems – and almost a third of freshwater fish species are now threatened with extinction.

Energy production, freshwater transfer, agriculture, deforestation, pollution, urbanisation, drainage and flood protection schemes can lead to ecological deterioration and the loss of critical functions, which in turn can threaten future uses of these systems. The provision of navigation infrastructure and operations can also impact the ecological character and functions of waterways. Likewise, degradation of waterway conditions from any of the above factors can adversely impact the suitability of waterways for navigation.

To achieve sustainability, IWT development and operations must consider the long-term impacts on the aquatic ecosystem. With this awareness, many countries have already enacted environmental laws and regulations and, in some cases, the IWT sector has developed plans to green the sector. For instance, China's Ministry of Transport has issued various plans for promoting green inland shipping, such as:

-  Promoting the use of Liquefied Natural Gas (LNG) and other clean-energy vessels
-  Promoting research and development on electric inland vessels

-  Promoting the application of electric shore power in ship docking that can reduce noise and air pollution
-  Reducing ship garbage and oil sewage by establishing overwater tank-cleaning stations
-  Establishing the Green Port rating standard

However, the operationalisation of these plans will require political commitment, financing, capacity building, cooperation and collaboration, as well as innovation.

### 3.6 Innovative Technology Applications and Trends

In East Africa, access to digital connectivity and technology is generally low by international standards and unequal (between and within countries). Nevertheless, with COVID-19 lockdowns moving many essential services online, and the adoption of the African Union's Digital Transformation Strategy 2020-2030 that aims to bring universal digital access and develop a single pan-African digital market, the digitalisation of logistics and transportation and the use of advanced technologies is recognised as a priority.

According to a World Bank report, East Africa is experiencing rising mobile phone penetration, improved broadband connectivity and widespread adoption of mobile money. This has spurred the development of a small, but rapidly growing tech sector, particularly in urban hubs, with innovative entrepreneurs launching new digitally-enabled services. Additionally, East African governments have begun to take advantage of these trends by moving public services online and utilising data to improve policymaking.

Advanced technologies and data science such as satellite, earth observation, remote sensing, big data, IoT, cloud technologies, AI and ML are transforming the IWT sector, including how infrastructure, multimodal transport routes and linkages, and vessels are designed, constructed, operated and maintained.

Related to infrastructure development, building information modelling and digital twins can enhance the effectiveness of planning, design and maintenance. IoT systems are being used to manage multimodal transport routes and linkages by providing real-time data on depth, fog, flood risk, water quality and traffic. Advances in these information systems are moving IWT closer to autonomous operations. For example, vessel-to-vessel communication can increase safety, efficiency and environmental sustainability. China has been developing and testing new technologies, such as autonomous shipping and emission-free vessels.

With the corridor development approach and emphasis on multimodal linkages, it is becoming increasingly important to be able to communicate with stakeholders and other modes of transport. Since 2005, the European Union (EU) has been supporting the deployment of harmonised River Information Systems (RIS) to enable seamless transport and traffic management on European inland waterways. The RIS Directive has been one of the main drivers of digitalisation in the IWT sector. The RIS Directive focus on the digitalisation of navigation information, traffic management and safety on waterways, with plans to expand information services for logistics operators and cargo operators.

Relatedly, the RIS Corridor Management Execution (COMEX) is a project that seeks to define, specify, implement and sustainably operate corridor RIS services through the sharing of



information by infrastructure managers, port authorities, waterway users and logistic partners. The Digital Inland Waterway Area (DINA) and Digital Multimodal Nodes (DMN) projects interconnect information on infrastructure, people, operations, fleet and cargo in the IWT sector with other transport modes.

## Innovations to Tackle Climate Change

In response to the Paris Agreement, many governments, associations and businesses have set bold climate targets. Europe aims to be the first climate-neutral continent in the world by 2050. The European Green Deal calls for actions to shift a substantial part of the freight transported by road (currently accounting for 75% of inland freight) to inland navigation and rail. Similarly, the Sustainable and Smart Mobility Strategy adopted on 9 December 2020, which lays the foundation for how the EU transport system can achieve its green and digital transformation and become more resilient to future crises, underlines the need to increase the use of more sustainable transport modes, and indicates that IWT and short-sea shipping should increase by 25% by 2030 and by 50% by 2050. Zero-emission mobility is also the major objective of the Zero Pollution Action Plan adopted on 12 May 2021. The EU is supporting the development of zero-emission vessels, and the Central Commission for the Navigation of the Rhine is coordinating studies assessing alternative fuel technologies for inland vessels and the most suitable financial instruments for supporting those technologies.

China is another key player in the greening of the IWT sector. China has invested heavily in LNG transport, but market breakthrough has not yet been realised. Pilots have shown that LNG is not an alternative for the entire fleet, but it offers advantages in specific cases, depending on vessel size and type of operations. Other fuel systems are also being explored, such as fuel cells or hydrogen, solar and electric solutions.

Besides climate mitigation, innovations are helping to better adapt to climate change. The greater frequency of low-water events will require a faster development and roll-out of innovative, climate-adaptable vessels able to sail with low water levels while minimising impacts on aquatic ecosystems. India, for example, has designed shallow-draft vessels. The Inland Waterways Authority of India (IWAI) has developed sets of new, optimised designs for specific waterways and specific vessel types, which it has made publicly available. Vessel operators and shipyards that are not able to design and test their own new vessels can work with these designs, which incentivises the standardisation of new vessels.

## 3.7 International Case Studies: Waterways and Lakes Transportation Developments

Eastern African countries face similar challenges and barriers when compared with other countries related to poor IWT infrastructure and facilities, and lack of multimodal linkages, policy and legal frameworks and standards, collaboration, transparency and trust, ICT maturity, financing and investment, and skill and competencies.

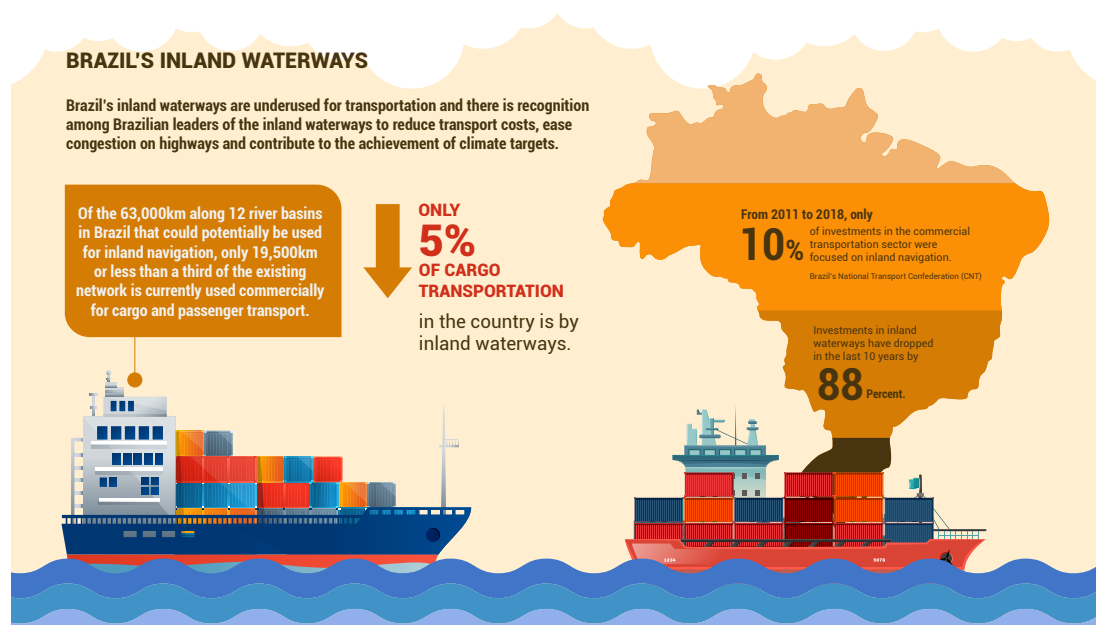
This section presents case studies from a representative mix of five countries/regions with an overview of their status and development of IWT. Four countries were selected – Brazil, China, Egypt and India – plus the European region. Brazil, China, Egypt and India

are recognised leaders of IWT development in their region/subregion. Europe has a long and well-established history of developing its IWT and insights from their experience will be valuable for developing regional IWT strategies for Eastern Africa as a whole, including effective ways to incentivise cooperation among countries in developing IWT, harmonisation of policies and regulations, and IWT integration in multimodal transport and logistics chains. In all cases, the countries/region have extensive networks of inland waterways, yet, they have experienced a decline in the IWT sector. In the selected countries/region, the respective government leaders have recognised the potential of IWT and have been making significant efforts to revive the IWT sector through various policies, regulations and strategies.

### 3.7.1 Brazil

Brazil's inland waterways are underused for transportation and there is recognition among Brazilian leaders of the inland waterways to reduce transport costs, ease congestion on highways and contribute to the achievement of climate targets.

Of the 63,000km along 12 river basins that could potentially be used for inland navigation, only 19,500km or less than a third of the existing network is currently used commercially for cargo and passenger transport. Only 5% of cargo transportation in the country is by inland waterways. According to Brazil's National Transport Confederation (CNT), from 2011 to 2018, only 10% of government investments in the commercial transportation sector were focused on inland navigation, and investments in inland waterways have dropped in the last 10 years by 88%. As a result of years of neglect, significant investment is needed to rehabilitate and upgrade the inland ports, inland waterways infrastructure, equipment and systems for navigation and safety, and the fleet, and enhance linkages with other modes of transport.



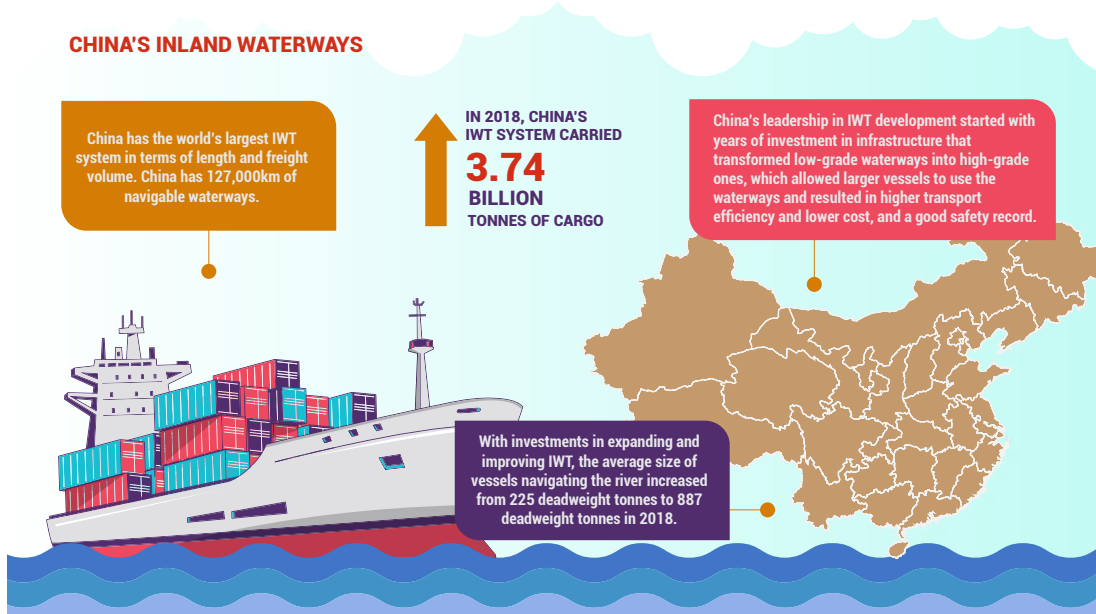
Transport planning in Brazil is guided by the National Plan for Logistics and Transport. The main objective of this plan is to provide the country with a more balanced, only transport mix by

2025. To revive IWT, the Ministry of Infrastructure launched the “BR dos Rios” programme in September 2020 to promote the development of inland navigation. The programme aims to standardise navigation with the participation of the Brazilian Army to work on the management of the routes to be connected and monitor traffic on the routes. The programme also aims to attract private investments in IWT.

Relatedly, CNT is preparing an integrated plan for the logistics of transport over water and land to increase efficiency and safety. Negotiations are underway with foreign governments, businesses and academia to secure technology transfer in the fields of hydrodynamics, morphology, nautical expertise and modelling through the National Institute of Waterway Research. In 2020, Rolls-Royce signed an agreement with the Brazilian company, Amazonica Energy, to develop 20 barges and five tugs powered by natural gas that will be used in the commercialisation of LNG in northern Brazil.

### 3.7.2 China

China has the world’s largest IWT system in terms of length and freight volume. China has 127,000km of navigable waterways and its IWT system went from carrying less than 150 million tonnes of cargo in 1978 to carrying 3.74 billion tonnes of cargo in 2018 – six times more than the EU. China’s leadership in IWT development started with years of investment in infrastructure that transformed low-grade waterways into high-grade ones, which allowed larger vessels to use the waterways and resulted in higher transport efficiency and lower cost, and a good safety record. For example, Hunan, a landlocked province with one of the longest IWT networks in the country, carried only 10% of the province’s overall freight in 2009. With investments in expanding and improving IWT, the average size of vessels navigating the river increased from 225 deadweight tonnes to 887 deadweight tonnes in 2018. Moreover, transportation costs decreased by CNY0.039 (about half a US cent) per tonne-km between 2012 and 2019. China also invested heavily in upgrading skills and technical capacity building.



A milestone for China's IWT development was in 1995 at the first national conference on IWT organised by the Ministry of Transport to bring together academia, industry and the public sector to address the bottlenecks of IWT. This resulted in the creation of a master plan and the pooling of finances from central and local governments for building an integrated network of navigable waterways, endorsed by the highest level of government to meet rising demands for transport and logistics as China's economy and trade grew rapidly. In the same year, the State Council approved the establishment of a special IWT fund (from motor vehicle purchase surcharges) to rehabilitate and upgrade the inland waterways, the inland ports and the fleet of vessels, as well as develop supporting systems such as RIS, and safety and emergency response systems.

This marked the start of the exponential growth of China's inland waterways for transport and trade, and simultaneously during this period, various regulations and standards were developed and adopted to promote the development of IWT. Detailed regulations and standards were prepared for construction, maintenance, navigation, safety, contracts for freight on waterways, local shipping enterprises, use of navigation channels and waterway management. After a review of IWT bottlenecks, preferential policies on taxation remission, freight rate readjustment, supply of diesel oil and loans were released and piloted in various provinces.

To sustain support for IWT development, it has been incorporated in several five-year plans for the national economic and social development of China. More recently, China has incorporated the need to address environmental concerns in inland waterways in addition to economic and social issues, resulting in the issuance of guidelines on promoting green shipping development of the Yangtze River Economic Belt in 2017.

During the early years of reform, attention was focused on the development of the major waterways and the capacity increase of ports. Once the standardisation of the waterways was realised, China took up the upgrading of the fleet (through the barge standardisation programme) and the development of supporting systems, such as ICT, incentives and funding. In recent years, greater attention has been given to improving environmental performance and preventing waste and spills. Elements of more recent policies include the integration of inland waterways in multimodal supply chains, improved multimodal connectivity, and improved planning of industrial and economic zones in combination with logistics zones and inland waterways.

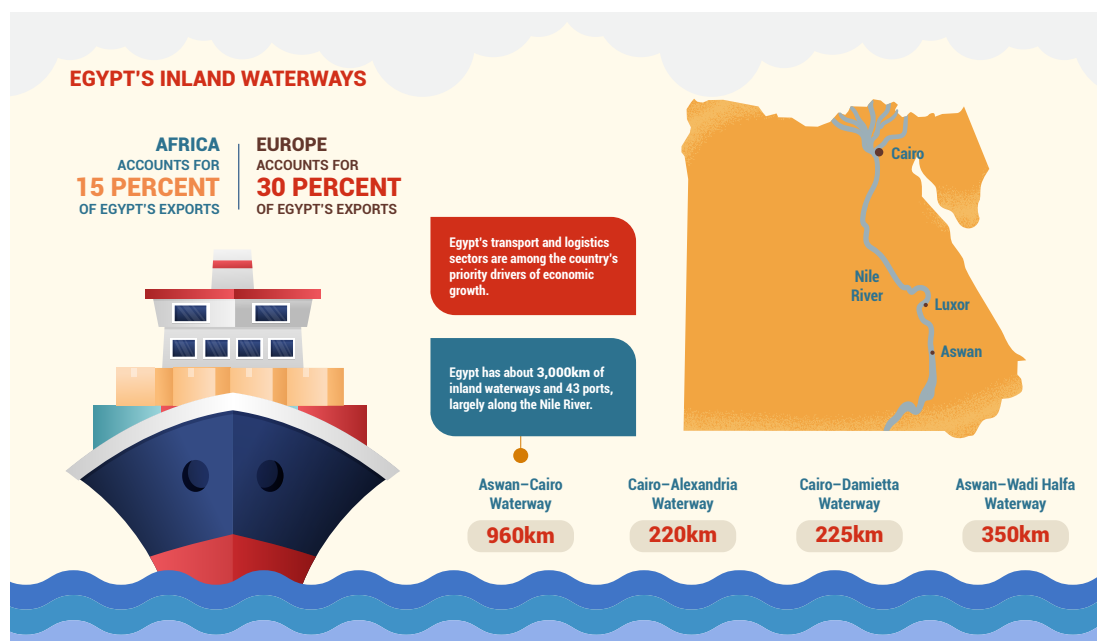
In May 2019, China issued an Intelligent Shipping Development Guideline that was jointly developed by seven ministries. It identified a long-term development plan that applies advanced digital technologies to shipping – the first such structured approach in the world.

### 3.7.3 Egypt

Egypt's participation in intra-Africa trade is low – in line with trends in the continent. Africa accounts for 15% of Egypt's exports while Europe accounts for over 30%. Nevertheless, Egypt has been strengthening transport links with Africa in preparation for AfCFTA. Egypt's transport and logistics sectors are among the country's priority drivers of economic growth. There have been concerted efforts by the government to leverage and transform the transport network via a 10-year infrastructure plan (2015-2024), which aims to boost foreign trade, and promote urban and economic development.



Egypt has about 3,000km of inland waterways and 43 ports, largely along the Nile River. This comprises the Aswan–Cairo Waterway (960km), the Cairo–Alexandria Waterway (220 km) and the Cairo–Damietta Waterway (225km). The Egyptian network is linked to Sudan and other upstream countries through the Aswan–Wadi Halfa Waterway (350km). All the waterways have been equipped with hydraulic structures and navigation facilities to allow for all-year traffic.



Yet, river transport accounts for less than 1% of all goods transported within the country. Historically, the Nile was Egypt's main transport route, but the advent of the railways and later, highways, made river transport seems outdated. As a result, the sector suffered from a lack of investment, particularly in the maintenance and modernisation of inland ports. Today, 95% of goods in Egypt travel on the country's roads, which has become increasingly dangerous. Given that some 95% of the population lives along the Nile, authorities are looking to revive the IWT sector.

The President of Egypt is spearheading the establishment of a navigation line from Lake Victoria to the Mediterranean Sea via the River Nile – also known as the VICMED project – under the Presidential Infrastructure Championing Initiative (PICl) with the participation of all the Nile Basin countries, including Burundi, DRC, Egypt, Kenya, Rwanda, South Sudan, Sudan, Tanzania and Uganda.

In addition, based on the Egyptian Exports to African Markets Strategy 2020, the Egyptian Ministry of Public Business Sector, in collaboration with the state-owned Holding Company for Maritime and Land Transport and the Misr Insurance Holding Company, is implementing the Gosour (Bridges) project to develop shipping lines and promote foreign trade between Egypt and Central and Eastern Africa.

As part of the first phase of Gosour, a shipping line from Ain Sokhna (Egypt) to Mombasa (Kenya) was launched in 2019. A storage and logistics centre was established in Kenya in 2017. Egypt also implemented the National Single Window under the project, which was

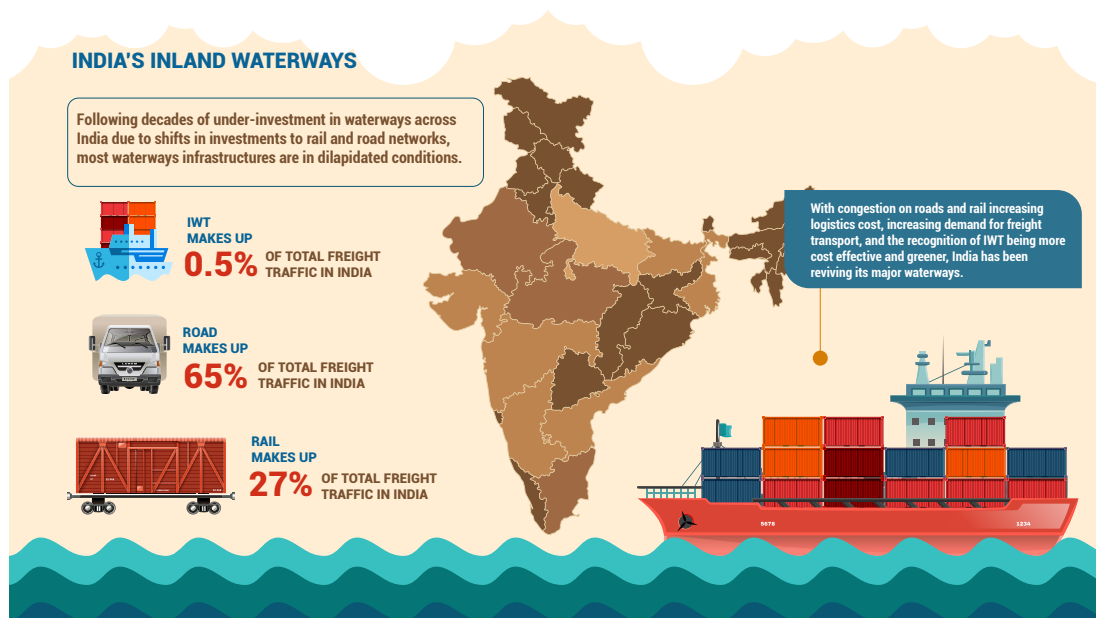
launched by the Prime Ministerial Decree in 2020, and which Egypt aims to link with the Regional Single Window in Africa.

### 3.7.4 India

Following decades of under-investment in waterways across India due to shifts in investments to rail and road networks, most waterways infrastructures are in dilapidated conditions. As a result, IWT makes up only 0.5% of total freight traffic in India, compared to 65% by road and 27% by rail. With congestion on roads and rail increasing logistics cost, increasing demand for freight transport, and the recognition of IWT being more cost effective and greener, India has been reviving its major waterways.

The revival and development of waterways for transport and trade is being led by the Prime Minister as part of the Prime Minister's Gati Shakti or the National Master Plan for Multimodal Connectivity, and the Maritime India Vision 2030, a 10-year blueprint with the aim of overhauling the Indian maritime sector including port projects, shipping and inland waterways. These high-level policies enable the rapid progress in IWT development. The strong leadership has resulted in a 13% increase in cargo movement on national waterways in 2020-21, compared to 2019-20.

As part of the effort to promote IWT, the Ministry of Ports, Shipping and Waterways has declared under the National Waterways Act of 2016, 106 new National Waterways in addition to 5 existing ones, giving a total of 111 National Waterways (NW-1 to NW-111). These waterways cover almost 15,000km across 24 states and two union territories.



Inland Waterway Authority of India (IWAI) conducted a techno-economic feasibility study to identify waterways that could be developed as part of economic corridors to facilitate movement of both cargo and passengers. Results from the study found 26 out of 111 national waterways navigable. Of these 26 national waterways, upgrade and rehabilitation work is already underway in 13 of them.

In August 2021, the Indian Parliament passed the Inland Vessels Bill 2021, which replaces the Inland Vessels Act 1917. The bill brings inland waterways in India and movement of vessels on them for any purpose under a central regulatory regime. All vessels are required to register with the respective states or union territories and their movement and identities will be logged in a central database. The bill also improves navigational safety and environmental sustainability by requiring that vessels adhere to specifications for signals and equipment for navigational safety, and to the kinds of pollutants and sewage that can be discharged and how much.

The Ministry of Ports, Shipping and Waterways has introduced various initiatives to promote the growth of IWT that include revision of levy and collection of fees on national waterways to finance development. Towards data-driven decision-making, the ministry has developed the Portal for Asset Navigation Information, an integrated solution that compiles river navigation and infrastructure information on a single platform. The portal provides detailed information about the features of national waterways and assets such as the fairways, infrastructure facilities, cross-river structures and emergency services for facilitating transportation of cargo. Additionally, the ministry is planning the development of the CAR-D (Cargo Data) portal for collection, compilation, analysis and dissemination of cargo movement data on national waterways.

Initiatives to speed up IWT in India include:

- 🌐 Jal Marg Vikas Programme (see Box 1)
- 🌐 Arth Ganga and Arth Brahmaputra initiatives for holistic and sustainable development leveraging NW-1 and NW-2 for freight and passenger movement
- 🌐 Inland Vessels Bill
- 🌐 Land Use Policy for Inland Waterways
- 🌐 Dredging Policy for Inland Waterways
- 🌐 Promoting private participation in terminal operations and maintenance

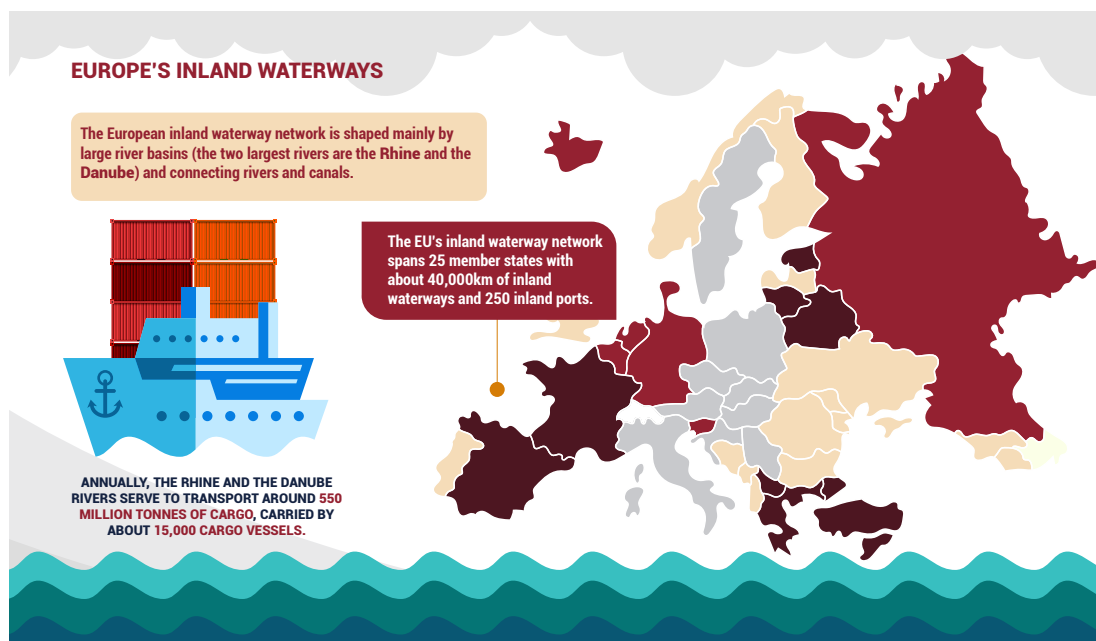
Among the National Waterways under development, NW-1 and NW-2 hold immense significance as they connect the neighbouring countries with India. These waterways have been leveraged for trade with countries such as Bangladesh, Bhutan, Myanmar and Nepal through trade agreements and treaties.

### 3.7.5 Europe

The European inland waterway network is shaped mainly by large river basins (the two largest rivers are the Rhine and the Danube) and connecting rivers and canals. The EU's inland waterway network spans 25 member states with about 40,000km of inland waterways and 250 inland ports. Annually, these serve to transport around 550 million tonnes of cargo, carried by about 15,000 cargo vessels.

Parts of these waterways have been adjusted to accommodate the growing sizes of barges during the past century. With basins interconnected, the need for standardisation of waterway dimensions and regulations on the technical and safety aspects of navigation

became apparent. In 1954, the transport ministers of the European countries adopted the Conférence Européenne des Ministres des Transports classification to align inland waterway dimensions. The EU issued a series of directives on technical requirements to enable vessels to navigate in all basins without barriers. Standards for automatic identification systems and digital data exchanges were also developed.



The waterways network of Europe has become an open navigation market for vessels from numerous European states. However, up until 1998, national markets were protected and ships that were registered under the flag of any country could only operate within national borders. Two important exceptions were:

- 🌐 The River Rhine, on which international traffic dates to the signing of the Convention for the Rhine Navigation in Mannheim (the Mannheim Act) in Germany on 17 October 1868.
- 🌐 The Danube River, where, since 1948, the Convention regarding the Regime of Navigation on the Danube (the Belgrade Convention) signed on 18 August 1948 regulates free navigation.

In 1998, the Cabotage Agreement was implemented in the EU, permitting transport on the entire waterway system, irrespective of the member state of registration.









Although IWT has a long history in Europe, recently, the importance of IWT has further increased as policymakers seek to shift freight to more environmentally-friendly modes and meet climate commitments. It is also crucial to point out that inland waterways in Europe evolved from a standalone transport mode to a mode integrated in supply chains and multimodal transport networks through the TEN-T and other networks.

The policy to develop IWT in Europe is encapsulated in the Navigation and Inland Waterway Action and Development in Europe (NAIADES) Action Programme. The first NAIADES 2006-2013 focused on five strategic areas for a comprehensive IWT policy: market, fleet, jobs



and skills, image, and infrastructure. Issues addressed under NAIADES I include working time arrangements, professional qualification requirements, administrative and regulatory barriers, innovative technologies, and infrastructure improvements. By creating favourable conditions for the further development of the IWT sector, the EU aimed to encourage more companies to use inland waterways for transport and trade. The evaluation of NAIADES I concluded that the IWT sector needed additional specific support, given the entry barriers to the market and the high initial cost of setting up a new service. The NAIADES II package 2014-2020 aimed to create the conditions that can make inland navigation a high-quality mode of transport.

In June 2021, the European Commission published NAIADES III – Boosting Future-proof European Inland Waterway Transport. It outlines the Inland Waterway Transport Action Plan 2021-2027 to deliver on the objectives of the European Green Deal and the Sustainable and Smart Mobility Strategy and address the challenges faced by the IWT sector. Under NAIADES III, eight flagships have been identified:

-  Help waterway managers ensure a high level of service (Good Navigation Status) along EU inland waterway corridors
-  Update the EU's legal framework for intermodal transport to stimulate IWT
-  Speed up certification procedures for innovative and low-emission vessels
-  Guarantee IWT investments take into account climate and environmental objectives
-  Develop inland ports as multimodal alternative fuels infrastructure hubs
-  Create a roadmap for digitalisation and automation of IWT
-  Formulate smart and flexible EU crewing rules
-  Support the sector and member states in the transition to zero-emission vessels

The EU is supporting a number of projects to implement NAIADES III, such as PLATINA 3 (platform for the implementation of a future inland navigation action programme, IW-NET project (innovation-driven collaborative European inland waterways transport network) and DT4GS (digital twin models to enable green ship operations).

### 3.8 Global Multi-dimensional Challenges and Barriers

As illustrated in the above case studies from Brazil, China, Egypt, India and Europe, inland waterways have generally been underused and neglected in favour of road networks, but we are seeing a revival of IWT as government leaders recognise its potential to reduce transport costs, ease congestion on highways and contribute to the achievement of climate targets. Plans for IWT development often include their integration in transport corridors and linkages with other modes of transport. It also incorporates efforts to digitalize and green the IWT sector. However, efforts to operationalise the plans are met with numerous challenges and barriers, which is summarised into seven main categories listed below. We will see in Section 4 that these challenges and barriers are similar to what is being experienced in the East Africa subregion. The subregion can therefore learn from these case studies to leapfrog and accelerate IWT development. The additional multi-dimensional

challenges and barriers experienced in the East Africa subregion, such as the impact of food insecurity and climate change, the lack of sustainable economic models, and various risk and security threats are discussed in Section 4.3.

### 3.8.1 Poor IWT Infrastructure

Infrastructure availability and quality are major obstacles to IWT development. As a result of years of neglect, significant investment is needed to rehabilitate and upgrade the inland waterways infrastructure, inland ports, equipment and systems for navigation and safety, and the fleet, and enhance linkages with other modes of transport.

### 3.8.2 Lack of Multimodal Linkage

Traditionally, IWT provided port-to-port transport of mainly commodities carried in bulk (coal, iron ore, sand and stones, oil, grain) that were stored or processed at the port. The advantage of road transport is its fast door-to-door delivery service through direct trucking. For IWT, door-to-door delivery needs to rely on multiple modes of transport, particularly in cases where the origin/destination is not located close to waterways, and the total cost and time must be competitive with road transport. Therefore, transport modes need to be combined to optimise logistic chains so that friction costs associated with interchanging between different modes of transport are as low as possible. To be part of multimodal chains, inland ports must serve as comprehensive interfaces between waterborne and land transport modes (rail and road) and function as hubs of logistics services in their region.

### 3.8.3 Lack of Policy and Legal Frameworks and Standards

As IWT and multimodal corridors require collaboration between countries, there is a need for intergovernmental agreements on issues such as border crossing point infrastructure, infrastructure capacity, design standards, control systems, et cetera. Policy and regulatory reforms are needed to facilitate efficient movement along inland waterways, transport corridors and at border crossings, by streamlining administrative procedures, harmonising and standardising rules and documentation, and simplifying border control and procedures.

The international case studies demonstrate that inland waterways classification is an essential first step for inland waterways policies and programmes as it allows the identification of the limitations and potential of navigable waterways, and makes it possible to monitor the development of their capacity for the transport of goods and passengers. For example, the European classification divides inland waterways into 10 classes, based on their capacity to accommodate vessels of certain sizes. In China, classification of the waterways was a critical first step, which enabled the development of the inland fleet and the ports.

### 3.8.4 Lack of Collaboration, Transparency and Trust

In multimodal networks, information is key, particularly real-time traffic information and forecasts about the traffic on the multimodal transport network. Such information is critical for optimising the efficiency and reliability of multimodal transport. Information on delays and disruptions in the network (for example, due to peaks in demand, maintenance

works, accidents) can help divert cargo flows to other modes of transport or transhipped at certain ports. However, this requires strong collaboration and trust between transport and logistics operators, and improved transparency of the transportation system.

### 3.8.5 Lack of ICT Maturity

To provide real-time information and leverage advanced technologies, countries need a high level of ICT maturity in terms of access to reliable high-speed broadband connectivity, as well as the capacity and skills to develop and deploy effective information systems, and analyse the data for different purposes – operations, management, planning, policymaking, et cetera. Digitalisation of the IWT sector is essential for the stronger integration of inland navigation into transport and logistics value chains. The lack of interoperability between ICT systems hampers the flow and integration of data for seamless transport and logistics management across borders on inland waterways, across different modes of transport along corridors, and among different stakeholders along the value chain.

Additionally, standards and protocols for interoperable systems and data exchanges need to be in place to manage navigation, customs, safety, ports, vessels, cargo, cold chain, logistics, carbon emissions et cetera. in an integrated and transparent manner.

### 3.8.6 Lack of Financing and Investment

In all aspects of IWT development, the lack of financing is a common challenge faced by countries. The investment needs to close the infrastructure gap and modernise the IWT sector far outweigh the resources available from any single source. Increasing and diversifying financing for IWT development, operations and maintenance are necessary, including attracting private sector investment and leveraging climate funds for IWT.

### 3.8.7 Lack of Skills and Competencies

Dedicated education and learning institutions for all aspects of IWT are needed to revive the sector to ensure IWT personnel are qualified in an ever-changing landscape. The current and future workforce needs to be equipped with the skills and competencies to deal with the modernisation of the sector in a sustainable manner, green and digital transitions, upgrading of vessels and equipment, adoption of advanced technologies and associated cyber risks, handling of hazardous cargoes, et cetera. Policies for lifelong learning and research and development also need to be developed so that advanced technologies, skills and competencies can be introduced.



# 4

## Waterways and Lakes Transportation System Development for Eastern Africa







*Aerial of Juba, the capital of South Sudan, with the River Nile running in the middle. Juba downtown is upper middle close to the river, and the airport can be seen upper left. The picture is from the south to the north.  
Photo Credit: Phototreat/Getty Images*



## 4.0 Waterways and Lakes Transportation System Development for Eastern Africa

This section focuses on IWT development in Eastern Africa and explores the opportunities and challenges in the subregion.

### 4.1 Key Critical Success Factors and Best Practices for Eastern Africa

This subsection highlights the best practices and critical success factors that need to be considered for IWT development in East Africa based on an analysis of the international case studies in Section three and on the actual context of the region.

#### 4.1.1 Infrastructure and Facility Upgrade and Modernisation

As a result of years of neglect, significant investment is needed to rehabilitate and upgrade the inland waterways infrastructure, inland ports, equipment and systems for navigation and safety, and the fleet, and enhance linkages with other modes of transport. This includes their transformation into smart infrastructures and facilities.

Traditional funding sources for infrastructure include domestic revenues through direct and indirect taxes, ODA in the form of multilateral, bilateral and blended financing, private sector financing including public-private partnerships, and funding by international development banks and commercial banks.

In addition to these funding sources, innovative funding sources to mobilise the needed financing for IWT such as the utilisation of pension funds and insurance reserves, and climate finance through the Green Climate Fund, or the issuance of green and blue bonds, can be explored. Green and blue bonds are types of fixed-income instruments where proceeds are earmarked to finance projects related to climate change and the blue economy, respectively. Both Malaysia and Seychelles have successfully implemented such bonds.

The concept of the blue economy has been at the centre of the AU Agenda 2063, where it was unanimously declared: “Africa’s blue economy shall be a major contributor to continental transformation and growth, advancing knowledge on marine and aquatic biotechnology, the growth of an Africa-wide shipping industry, the development of sea, river and lake transport, and fishing.” Integrating environmental and social considerations into bonds can incentivise policymakers and project developers to integrate climate change, and sustainable green and blue recovery considerations into project design and development.

#### 4.1.2 Leadership and Champions to Drive Policy and Regulatory Changes

Leadership at the highest level is clearly a crucial success factor in reviving the IWT sector. Strong and sustained support from the highest levels of government coupled with coordinated central planning and support systems are prerequisites for addressing the multi-sector and multi-stakeholder challenges in IWT revival. In Egypt and India, the revival of IWT is being led by the Prime Minister and considered a national priority. Similarly, in China, the revival of IWT has been incorporated in several national five-year development plans, which stresses the strong links between the development of IWT with economic and social growth.

### 4.1.3 Coordination and Cooperation Framework and Bodies for Success

Strong institutions with clear roles and responsibilities are needed for coordinated development of IWT, such as the engagement of waterways management boards in East Africa. The coordination and cooperation of different parties involved in IWT development have been a major factor in the sector's success. In India, the Prime Minister's Gati Shakti incorporates a digital platform that brings 16 relevant ministries together for integrated planning and coordinated implementation of multimodal and seamless connectivity projects, and IWAI was established to develop and maintain the inland waterways for shipping and navigation. In China, the central government established river navigation and administrative institutions to oversee navigation along individual waterways. In addition, provinces were given explicit responsibility for funding and maintaining the fairways. This responsibility was backed by the regulatory authority to raise financing for implementation.

### 4.1.4 Responsiveness to Multiple Sectors and Industries

Transport and logistics need to be responsive and supportive of the needs and demands of sectors and industries such as agriculture, tourism, mining and manufacturing – the users of transport and logistics services. For instance, IWT development also contributes to tourism growth, which is clearly demonstrated by contributions from the Zambezi River in Africa; Danube and Rhine Rivers in Europe and the Ganges River in India and Bangladesh. As many national parks and wetlands are situated near water bodies, well-developed inland waterways could potentially enhance tourism and further contribute to increased revenue and job creation.

With growing food insecurity and in light of challenges faced during the COVID-19 pandemic in transporting medicine and vaccine, a critical success factor is the development of an uninterrupted end-to-end cold chain to ensure that perishable products are safe and of high quality at the point of consumption.

### 4.1.5 Transformation of Inland Ports into Logistics Hubs

Inland ports are critical links in the supply chain, and efficient port services are a prerequisite for IWT's competitiveness. Inland ports should be standardised, eco-friendly and connected with each other to coordinate operations. In addition, inland ports should be connected with other modes of transport and be planned as comprehensive transportation junctions that link production, storage and distribution (including cold storage and distribution) to improve overall utilisation rates and reduce logistical costs.

While all ports form nodes in the supply chain, they do not always play the role of logistics hub or industry cluster. In Europe, inland ports are often multimodal hubs on the European transport corridors. Shippers especially appreciate the possibilities of customs clearance at the inland ports, one-stop shops and the value-added services (for example, storage, repair facilities). Some inland ports function as logistics hubs and are located near commercial zones.

This requires harmonisation of legislation on transport and port operations and customs procedures for cargo. It also requires a process of digital transformation to develop

a unified vessel endorsement, port management system, single window system and multimodal traffic information exchange where law enforcement departments can share their information and coordinate their actions related to customs procedures, insurance, inspections, et cetera.

#### 4.1.6 Prioritisation of Job Creation and Capacity Building

China and Europe have consistently prioritised job creation and capacity building in their IWT policies and plans. In both countries, governments are aware that automation has replaced lower-skilled, repetitive job roles. They have therefore stepped up their effort to reskill and upskill the IWT workforce, and at the same time, attract and nurture IWT professionals.

China established a full spectrum of educational institutions related to IWT – it is the only country in the world to have established inland shipping universities. In all other countries, IWT personnel are educated in vocational schools and IWT professionals cannot generally achieve academic qualifications in the sector. In addition, China has established many shipping colleges and schools with continuously upgraded curricula to meet the demands of the rapidly evolving sector.

In Europe, the harmonisation of training requirements and certification of crew members from different countries was prioritised to realise standards for safe and green IWT operations. In June 2008, during a roundtable conference of the Central Commission for the Navigation of the Rhine, a MoU was signed by leaders to create and formalise the Educational Network of Inland Waterway Navigation Schools and Training Institutes (EDINNA). Through EDINNA, the sector is working to harmonise training and education in IWT. It has developed sets of standardised training packages and courses to ensure that staff members of vessels receive qualified training. To improve training and international cooperation, EDINNA has opened membership to all countries.

#### 4.1.7 Research and Development

Waterways are different from railways and roads, in the sense that each river or lake has its own characteristics and may require specific and dedicated solutions. Technologies imported from other waterway basins may not be fully adaptable to local characteristics because of differences in geography, currents, climate, and even modes of economic development.

In China, the Ministry of Transport established several research centres to tackle the challenges of IWT projects. The research centres are active in upgrading technologies related to IWT and adopting international standards and practices to local situations. Examples of their work included barge standardisation programmes, the implementation of ICT and RIS, and the greening of IWT. As a result of investments in research and development in IWT, China is now a leading innovator in several areas, such as autonomous shipping and emission-free vessels.



### 4.1.8 Holistic and Integrated Approach

The case studies show that a holistic and integrated approach is necessary. From improving the infrastructure and the classification of waterways, to the standardisation and upgrading of vessels, installation of navigational aids to enhance safety, strengthening of human capacity, establishment of links between IWT and other modes of transport, and the digitalisation and greening of IWT – all aspects need to be developed in a synchronised manner. This synchronisation of development is an important good practice. An IWT programme in India supported by the World Bank has adopted such an approach (see Box 1).

#### Box 1: India's Jal Marg Vikas Programme:

With support from the World Bank, the Government of India launched the Jal Marg Vikas (JMV) programme in 2014 to rehabilitate NW1 along the river Ganga. The NW1 that stretches from the Eastern seaport of Haldia to Varanasi, some 1,360km inland, has the potential to emerge as the leading logistics artery for northern and western India. The NW1 passes through one of India's most densely populated areas that produce 40% of the country's traded goods, connecting four neighbouring Gangetic states with other parts of India and major waterways in Bangladesh and Nepal. This programme is in line with the Prime Minister's Gati Shakti National Master Plan that aims to create seamless multimodal connectivity for the movement of cargo and passengers.

Since the absence of essential infrastructure such as cargo terminals and jetties has been one of the reasons for the slow development of IWT in the region, the programme will help establish six multimodal freight terminals at Varanasi, Ghazipur, Kalughat, Sahibgunj, Triveni and Haldia. In addition, five new roll-on/roll-off crossings at different locations will help trucks and other vehicles transfer from the road to the river and vice versa. The six new cargo terminals have the potential to evolve into thriving logistics hubs, providing jobs for thousands of people in one of the poorest and most populous parts of the country. The programme will also help set up a vessel repair and maintenance facility at Doriganj.

IWAI, the lead agency for the JMV programme, is piloting a Public-Private Partnership (PPP) model for the development of Kolkata and Patna terminal facilities along this Haldia-Allahabad Corridor. Bangladesh's Summit Alliance Limited (SAPL) won the contract to operate and develop two river terminals under a revenue-sharing agreement yielding almost 40% to IWAI. This South-South investment will encourage economic integration between India and Bangladesh.

The programme is expected to be completed by 2023, and once fully operational, the NW1 will form part of the larger multimodal transport network being planned along the river. It will link up with the Eastern Dedicated Rail Freight Corridor, as well as with the area's existing network of highways. Improvements so far have been promising. After SAPL took over the Kolkata facility in late 2018, the cargo turnover reached 563,000 tonnes in the first nine months of operations, compared to 20,000 tonnes per year in 2015. This modal shift of cargo from road to water helped decongest India's roads and avoid 26,000 tonnes of greenhouse gas (GHG) emissions per year.

Furthermore, the programme will set up a RIS to enable vessel and cargo operators to track their vessels and goods, locate berths in advance in terminals and better plan their logistics. To make navigation safe both day and night, the programme will help mark out the central channel for vessels to ply in and install night navigation facilities. Besides, detailed protocols are being laid down to deal with emergencies, including tackling the spillage of oil from vessels.

To address environmental concerns, IWAI has sought to adopt the least intrusive methods of making the river navigable using NbS. A 45m wide channel has been earmarked in the river's deepest part, and the Least Available Depths needed for navigation has been determined, keeping in mind the need to reduce dredging. The channel's depth follows the river's natural gradient in different stretches and is sufficient to support the two-way movement of large barges. These measures will reduce the need for dredging to just 1.5% of the river's annual silt load of 10-11 million cubic metres. Dredging will only be done when absolutely necessary using modern, less intrusive technologies.

Among these technologies is the proposed water injection method that will use water pressure to liquefy silt deposits and wash them away. The dense slurry that results will then be deposited – either naturally or through induced currents – into depressions along the riverbed, ensuring that sediments remain within the river's ecosystem. Where large shoals and islands exist, temporary structures made of natural materials such as bamboo will be placed to channelise or channel the water flow and protect the Ganga's diverse fauna.

IWAI is ensuring that water traffic does not impact the two aquatic wildlife sanctuaries that fall along this stretch of the river – the Kashi Turtle Sanctuary at Varanasi and the Vikramshila Dolphin Sanctuary at Bhagalpur. As a first step, information about these protected aquatic habitats and other sensitive areas, such as wetlands, will be fed into the new RIS being developed. This will ensure that vessels plying in these areas comply with the operational framework that has been put into place for minimising impacts in sensitive zones. This framework includes:

- A ban on dredging in protected habitat areas.
- In other areas that are known to be the habitat of valued aquatic species, no dredging will be allowed in the breeding and spawning seasons.
- The speed of barges travelling along the protected areas of the sanctuaries will be restricted to 5km per hour.
- All vessels plying on the Ganga will be fitted with noise control and animal exclusion devices, such as the installation of propeller guards and sound mufflers, so that aquatic life is not unduly disturbed.
- All vessels will also have to comply with zero discharge standards to prevent solid or liquid waste from flowing into the river and affecting its biodiversity.

To prevent further pollution in the Ganga, cleaner fuel options such as LNG will be used, and all cargo terminals and ship repair yards will be zero-discharge facilities, and will be powered by solar energy.

The legal framework for vessel operation is being revised in the form of a new Inland Vessels Act, and a strategic plan for IWAI staffing and capacity building has been adopted. IWAI has signed several MOUs with the Indian Maritime University and the Indian Institutes of Technology for conducting research and development, problem-solving and training of personnel.

## 4.2 Opportunities for Transportation Systems in Eastern Africa

Africa has widely adopted the corridor approach in the development of transport and logistics networks. The subsections below give an overview of the status of PIDA and two multimodal corridors of Eastern Africa – Northern Corridor and Central Corridor. Additionally, Eastern Africa is implementing a number of integrated lake transport initiatives that are described below. These corridors- and lake-wide initiatives are important opportunities for enhancing IWT capacities.

## 4.2.1 Programme for Infrastructure Development in Africa (PIDA)

PIDA is a multi-sector programme that links transport, energy, ICT and transboundary water resources together. The programme aims to facilitate continental integration through improved regional infrastructure, strengthen the consensus and ownership of large cross-border infrastructure projects, and support implementation, of the African Economic Community. PIDA is a joint initiative of the AU Commission, AU Development Agency (AUDA-NEPAD), African Development Bank and ECA.

As of September 2022, there are a total of 232 transport-related projects. Projects are identified through the RECs – in the case of Eastern Africa, the EAC has a pipeline of about 40 infrastructure projects planned under PIDA to develop two multimodal corridors of Eastern Africa – Northern Corridor and Central Corridor. The Northern and Central Corridors have been established through intergovernmental agreements, connecting landlocked countries by road, rail, pipeline and inland waterways to seaports in Mombasa (Kenya) and Dar es Salaam (Tanzania), respectively.

Under the first PIDA Priority Action Plan (PAP) for the period from 2012 to 2020, the IWT projects include:

- 🌀 Bujumbura Lake Port upgrading on Lake Tanganyika (Burundi)
- 🌀 Kalemie Port upgrading on Lake Tanganyika (DRC)
- 🌀 Kigoma Port upgrading on Lake Tanganyika (Tanzania)
- 🌀 Kisumu Lake Port upgrading on Lake Victoria (Kenya)
- 🌀 Mwanza Port dredging and upgrading on Lake Victoria (Tanzania)
- 🌀 Port Bell upgrading on Lake Victoria (Uganda)
- 🌀 Port Jinja upgrading on Lake Victoria (Uganda)
- 🌀 Development of Lake Kivu navigation routes/aids
- 🌀 Improvement of Akagera River navigability

Programme for Infrastructure Development in Africa – Priority Action Plan (PIDA-PAP-1) has helped to add 16,066km of roads, 4,077km of railway lines, 3,506km of energy transmission lines, 7GW hydro-electric energy generation, as well as submarine cables and regional fibre-optic cables and Internet exchange points providing global and intra-African connectivity. PIDA has also established one-stop border posts to enable more efficient movement of people and goods by integrating border clearance and entry/exit formalities at a single location. However, according to the Virtual PIDA Information Centre, none of the IWT projects under PIDA-PAP-1 mentioned above has started physical implementation as of September 2022.

As the first phase of PIDA ended in 2020, the second PIDA PAP for 2021 to 2030 was adopted by heads of state and government at the AU Summit in January 2021, which sets the priorities for regional infrastructure development in the next decade. Among the 69 approved projects, three involve improving the IWT infrastructure:

- 🌐 Improvement of Akagera River transport, led by EAC.
- 🌐 The establishment of a navigational line between Lake Victoria and the Mediterranean Sea – feasibility study phase 2, led by the Common Market for Eastern and Southern Africa (COMESA).
- 🌐 Extension of national ICT broadband backbone to DRC by construction of optical fibre cable across Lake Tanganyika, led by the Southern Africa Development Community (SADC).

PIDA recommends that all transport corridors in Africa be transformed into smart corridors, through the provision of adequate energy and ICT networks. It includes putting in place regional regimes for harmonised data and systems, sharing of data and information, interconnection of systems, and the installation of tracking and traceability systems to manage navigation, customs, safety, ports, vessels, cargo, cold chain, logistics, carbon emissions, et cetera.

## 4.2.2 Northern Corridor

The Northern Corridor is a multimodal trade route linking the Kenyan hinterland, Burundi, DRC, Rwanda, South Sudan and Uganda to the Kenyan maritime seaport of Mombasa. The Northern Corridor Transit and Transport Agreement (NCTTA) is a treaty signed in 1985 and revised in 2007 for regional cooperation with a view of facilitating trade between the countries. It is a comprehensive agreement with 11 protocols on strategic areas for regional cooperation relating to: Maritime Port Facilities, Routes and Facilities, Customs Controls and Operations, Documentation and Procedures, Transport of Goods by Rail, Transport of Goods by Road, Inland Waterways Transport of Goods, Transport by Pipeline, Multimodal Transport of Goods, Handling of Dangerous Goods and Measures of Facilitation for Transit Agencies, Traders and Employees.

The objectives of the NCTTA are based on three pillars of sustainable transport namely, the economic pillar aiming at promoting efficient and competitive transport, the social pillar with the view to fostering an inclusive transport, and the environmental pillar for a green freight transport. Under the legal framework of the NCTTA, the Northern Corridor Transit and Transport Coordination Authority (NCTTCA) was established in 1985 to coordinate the joint planning and implementation of projects along the corridor.

Media news report that the Northern Corridor Council of Ministers approved a budget of USD 5.53 million for the 2022/2023 financial year for roads, rail and inland waterways projects along the corridor – this is USD 1.1 million more than the previous financial year – which will include the upgrade of the three ports in Lake Victoria – Kisumu in Kenya, Port Bell in Uganda and Mwanza in Tanzania.

For example, in Kenya, the government has upgraded Kisumu port and linked it with road networks and the revamped Nakuru-Kisumu Meter Gauge Railway (MGR) line. Goods ferried through the Standard Gauge Railway from Mombasa to Naivasha are transported to Kisumu port through the revamped MGR line for onward shipment to various destinations through Lake Victoria. With the reopening of Kisumu port in 2018, the cargo passing through the port has increased from 3,000 metric tonnes in 2019 to 54,000 metric tonnes in 2021.



Besides infrastructure development, the Northern Corridor is also strengthening the capacity of corridor personnel, and identified the Bandari College in Mombasa as a resource centre for training and skills development for both maritime and overland logistics covering freight forwarding, warehousing and transport.

There is scope to expand cross-border infrastructure in Eastern Africa, both within the Eastern African subregion, as well as with other subregions. Not only does Eastern Africa need better intra-regional infrastructure, but it also needs to be better connected with the rest of the continent. For the subregion to benefit from AfCFTA, such cross-border infrastructure projects are crucial. For example, according to a trade and transport logistics survey of the Northern Corridor, the report noted the potential for Lake Tanganyika to offer IWT to connect the Eastern African subregion to Southern African countries is yet to be exploited.

### 4.2.3 Central Corridor

The Central Corridor connects Burundi, the Eastern part of DRC, Rwanda, Uganda, and central and north western Tanzania to the Port of Dar es Salaam in Tanzania. The cargo is distributed through an integrated rail/ferry system, travelling on rail through Tanzania to the port of Kigoma or Kasanga on Lake Tanganyika (connecting to Bujumbura in Burundi, to Kalemie and Uvira in DRC, and to Mpulungu in Zambia) or to the port of Mwanza on Lake Victoria (connecting to Kisumu, Kenya, and Port Bell, Uganda).

The corridor is managed by the Central Corridor Transit Transport Facilitation Agency (CCTTFA), a multilateral agency established in September 2006, formed by an agreement by the five governments of Burundi, DRC, Rwanda, Tanzania and Uganda. Through cooperation among private and public sector stakeholders, the CCTTFA is charged with the promotion of transport utilisation of the Central Corridor, encouraging maintenance, upgrading, improvement and development of infrastructure, and supporting service facilities at the port, rail, lake, road border posts and along the route, to meet user requirements, ensure open competition and reduce the costs of transit transport for landlocked member states. The CCTTFA Agreement has 11 protocols that are categorised in the same way as the NCTTA.

The CCTTFA released its Strategic Plan 2021-2025, which places the revival and improvement of IWT as one of its top priorities (as Outcome 1.1). The plan notes that more than 90% of current transit traffic on the Central Corridor is carried by road, resulting in high trade logistics costs, low reliability in the delivery of shipments due to congestion, and negative social and environmental impacts. The plan also notes the underutilisation of inland waterways due to the poor and degraded condition of the ports along the lakes. The plan stresses the urgent need for upgrading and expansion of port infrastructure, modernisation of docking facilities and cargo handling equipment, increase and improvement of warehousing facilities on Lakes Victoria, Tanganyika and Kivu and River Congo, and installation of navigation aids. They include lighted buoys for navigation in the dark, unlighted buoys, beacons and markings for shoals, channel bends, and shallow patches.

The strategic plan also emphasises the need to improve waterways logistics along with rail and road logistics. Traditionally, the Central Corridor relied mostly on ferries operated by the railway companies or other public agencies. However, most of these ships are currently grounded due to lack of maintenance. The situation is further complicated by the fact that



*Felucca sailboats on River Nile, Aswan, Egypt.  
Photo Credit: Peter Adams/Getty Images*



ship repair facilities and services are in short supply around the Central Corridor, particularly around Lakes Tanganyika and Kivu, as well as River Congo. The lack or breakdown of the ship repair facilities has resulted in most vessels operating without minimum technical specifications and standards.

Other constraints are related to limited institutional capacity at both public and private levels. Ship operators lack the required financial and human resources capacity. In all the countries along the Central Corridor, there is a shortage of specialised skilled labour, particularly at the operational level. The legal environment also needs to be updated to harmonise and speed up cross-border procedures, as well as to improve safety and security and ensure environmental and social safeguards are in place.

The strategic plan calls for a revival of the historical intermodal rail-lake-road trade routes to raise the Central Corridor's competitiveness and optimisation of services, in terms of efficiency, cost and reliability, as well as safety and environmental sustainability.

#### 4.2.4 Integrated Lake Transport Initiatives

In addition to corridor-wide initiatives and investments, there are also lake-based initiatives and investments being implemented with support from various development partners. They include:

- 🌀 Lake Victoria Integrated Transport Project that is being supported by the African Development Bank, World Bank and other development partners.
- 🌀 Lake Tanganyika Integrated Transport Project that is being supported by the African Development Bank, Japan International Cooperation Agency and other development partners.
- 🌀 Lake Kivu Integrated Transport Project that is being supported by various donors through TradeMark Eastern Africa and African Development Bank.

The main interventions under the projects include:

- 🌀 Upgrading and rehabilitation of lake ports.
- 🌀 Rehabilitation or building of ferries, ships and vessels.
- 🌀 Development of transport information systems, such as vessel management systems.
- 🌀 Upgrading, rehabilitation and installation of navigational aids.
- 🌀 Improvement of search and rescue facilities and systems to increase navigational safety and capacity to respond to emergency needs in lakes and lake ports.
- 🌀 Improvement of IWT logistics operations and management.
- 🌀 Harmonisation and implementation of legal and regulatory frameworks related to navigation on lakes, such as the Lake Victoria Transportation Act 2008 and the Convention on the Sustainable Management of Lake Tanganyika, that was adopted in 2003 and entered into force in 2005.

### Box 2: Lake Tanganyika:

In a feasibility study conducted for African Development Bank's Lake Tanganyika Transport Corridor Development, results showed that a rail/lake multimodal link is much cheaper than the road and rail/road options from Dar-es-Salaam in Tanzania to Bujumbura in Burundi. The increased use of the lake as part of the multimodal option is expected to reduce transport costs for Burundi by 30% or USD 2,400 per 20-foot container (from Dar-es-Salaam Port to Bujumbura). In a 2015 joint World Bank/World Food Programme study, results also showed similar findings regarding the cost-effectiveness of IWT. By replacing road-only transport with lake transport from Mpulungu in Zambia to Bujumbura in Burundi, the report estimated a reduction in transportation costs from USD 230 to USD 74 per tonne for maize deliveries.

Zambia is the main regional supplier to food-importing countries such as Burundi, South Sudan, Rwanda and DRC. The increased use of Lake Tanganyika will have significant regional impacts on food security, fragility and resilience in the subregion. It will reduce food costs, improve the reliability of supply, and accelerate humanitarian responses in emergency situations in countries such as South Sudan and DRC, thereby enhancing stability in the subregion. Increased use of the lake will also create business opportunities, boost the blue economy, and create green jobs for the growing and young population of 12 million people living in the areas served by the lake, thereby helping to consolidate peace and stability in the region. However, port infrastructure and cold storage facilities will have to be upgraded.

The Convention on the Sustainable Management of Lake Tanganyika provides the legal framework for regional cooperation between Burundi, DRC, Tanzania and Zambia in developing Lake Tanganyika. Article 23 of the convention created the Lake Tanganyika Authority (LTA) in 2008. Based in Bujumbura and financed by all four countries and international development partners, the authority manages and coordinates the implementation of the convention. However, the work of the LTA is focused on environmental and fisheries management, and not trade, transport and logistics. Regarding trade and transport, the convention provides limited and very general coverage under Article 12, guaranteeing freedom of navigation and equal treatment, while also limiting cabotage (for instance, the transport of passengers and goods between two domestic ports by a foreign operator). Despite the lack of expertise and operational experience in the area of trade and transport, the LTA is nonetheless in a unique position, with a legal mandate and the experience of coordinating not only with all four national governments, but also with regional authorities around the lake. A study commissioned by the Netherlands Enterprise Agency proposed to empower Lake Tanganyika Authority to take the lead in promoting and coordinating trade, transport and logistics on the lake.

## 4.2.5 Country-Based Initiatives

Some countries have incorporated corridor development into their national economic and social development plans. An example is Tanzania, that aims to become the leading multimodal transport and logistics hub for regional and global trade.



### Box 3: Multimodal Transportation and Logistics Hubs in Tanzania:

Tanzania has invested in improving the lake ports of Mwanza and Kigoma and rehabilitating or building new vessels, as well as expanding and modernising its seaports, establishing the Kwana dry port, upgrading and constructing railway lines, and paving trunk roads. At the same time, Tanzania is investing in the development of logistics hubs to attract manufacturing and processing industries that would use the transport networks built.

The abundance of agricultural land and the potential for agribusiness close to the lake, such as the development of the Southern Agricultural Growth Corridor of Tanzania (SAGCOT), including near Lake Tanganyika, are reasons for rehabilitating and expanding the inland waterways infrastructure and facilities. Also, in Tanzania, there are plans to create the Kigoma Special Economic Zone near Kigoma port on Lake Tanganyika to support the logistics for agrifood processing and light manufacturing. However, the Special Economic Zone faces infrastructure challenges, and the development of Lake Tanganyika can help boost its operationalisation. Another opportunity in Tanzania is the fish processing hub of Mwanza near Lake Victoria, with the installed capacity to process about 1,065 tonnes of fish per day.

In addition, Tanzania has leveraged digital technologies to streamline transport and logistics processes. The government has already introduced various digital systems, including the electronic single window, the Tanzania Customs Integrated System for customs clearance, and the integrated digital payment system. A one-stop centre has been established that brings together port operators, freight forwarders, customs officials, government agencies and regulatory bodies.

## 4.3 Multi-Dimensional Challenges and Barriers

The IWT infrastructure and inland ports in Eastern Africa have generally suffered from a lack of investment, poor maintenance and safety measures, and underutilisation. The navigational charts of lakes are often outdated and the navigational aids non-functional, leading to an increased propensity for accidents. IWT connections to other transport modes such as rail, road and air are generally unreliable, broken or missing. Warehousing space is limited, and there are often no cold storage facilities for agriculture, fish and seafood products, medicine and vaccine. Vessels are limited in numbers and in their capacity, and are often outdated or poorly maintained. Furthermore, there is a lack of shipbuilding and ship repair facilities and capabilities, which has led to the importation of vessels, adding to IWT costs. The digital connectivity in the lake ports is generally at a low level of maturity. There is no navigation aid or port communication system in place for any of the ports on Lake Tanganyika, with port operators and shippers relying mainly on WhatsApp or telephone calls.

Some key challenges and barriers specific to Africa are discussed below.

### 4.3.1 Impact of Food Insecurity and Climate Change

Despite the abundant use of natural resources and economic growth in Eastern African countries, food insecurity persists. Socio-political conflicts, poor governance of natural resources and land tenure issues, as well as insufficient agricultural production due to

low rainfall, premature crop failures, and localised floods and droughts, constitute the major causes of the food security crisis. Africa also has the lowest water storage capacity and irrigated agriculture in the world, and about half the continent faces some sort of water stress or water scarcity – while demand is expected to surge. To deal with the often-conflicting demands for water for food production, hydropower and navigation, it is vital to integrate IWT development with water resources management.

Climate change is likely to change patterns of rainfall, which will impact upon water levels and disrupt transport along inland waterways. Fluctuations in the lake level and changing economic conditions have brought the closure of several ports on the lakes of Eastern Africa. There are reports of seasonal and annual variations of water levels in the lake, and sedimentation in the ports, preventing ships from docking. Since infrastructure systems are interdependent, climate change impacts on one infrastructure asset can cascade through value chains. It is, therefore, crucial to build the climate resilience of IWT infrastructure and facilities, including ports, logistics hubs and vessels.

Building climate resilience is a relatively new concept to embed into infrastructure planning, maintenance operations and management. Public policy and regulation play a key role in enabling and promoting climate-resilient infrastructure development. Possible interventions include developing climate adaptation plans to identify entry points for mainstreaming climate resilience, and creating awareness that investments in resilient infrastructure will be cost-effective. This will require the conduct of cost-benefit analyses that include an assessment of the lifetime costs of infrastructure, integration of climate change scenarios and quantification of climate-related costs.

The IWT sector needs to effectively adapt to climate change. At the same time, it plays a vital role in climate mitigation. However, a report indicates that the region's transport sector is yet to start its greening and is lagging behind other parts of the world in revising policies to promote climate mitigation and apply new low-carbon technologies. Bridging the gap will involve, among others, having the appropriate understanding of the issues at stake, building a consensus among key stakeholders involved on the need to develop sound policies and strategies to incentivise green transport, and strengthening the capacity of institutions involved in driving the policy dialogue at the national, corridor and regional levels.

### 4.3.2 Sustainable Economic Models

Inland waterways are known for their advantages in transporting low-value bulk goods. Currently, the type of products that are being formally transported via inland waterways are limited to products that are heavy and bulky, are not time-sensitive, not easily damaged and are traded in large quantities, such as cement, sugar and maize. Other products, such as agricultural or consumer products, are not well-served by the existing inland port infrastructure and fleet. These products are typically not bulky, might require refrigeration, and are traded in smaller consignments (but might be traded more frequently). For these types of products, the absence of container handling capacity in ports, of multipurpose or container vessels, and of a cold chain are barriers.

However, in the lakes of Eastern Africa, there are many informal providers, porters and traders, and their roles and interests must be taken into consideration. There is limited data

on informal trade to accurately identify the volume and type of products being traded, but there is anecdotal evidence that informal trading is more diversified.

The major lake ports are often closely linked to informal landings, for example, the Ngwenya market that is right next to the Port of Mpulungu, or Kibirizi and the Port of Kigoma at the opposite ends of a bay. While informal landing sites exclusively serve small-scale and informal trade and passenger transport, the major ports often serve both formal, large-scale and informal, small-scale trade. These informal providers use wooden boats that transport passengers and cargo, and traders travelling with their merchandise. Wooden boats carry all kinds of goods and products, including fish, agricultural commodities, consumer goods and construction materials.

An assessment of the status of informal ports and providers could be conducted to identify new business models or ways to integrate them into the formal system, providing them with access to finance for facilities upgrading and safety improvement, as well as capacity building, data and information to further boost the competitiveness of IWT for all types of goods and shipments, including small shipments, e-commerce, urban logistics and short-distance transport, as part of multimodal solutions. For example, goods such as processed food, detergents and sanitary products are already traded informally between the Zambian port of Mpulungu and ports in DRC and Tanzania.

### 4.3.3 Risk and Security Threats

#### Lack of Cooperation in the Development of Ports, Fleet and Lake Navigation and Safety

Improvement of lake infrastructure for IWT requires the cooperation of the relevant countries to improve several lake ports, fleet and navigation simultaneously otherwise, systems and services cannot be harmonised. For example, on Lake Victoria, reports of stalled projects in Uganda to upgrade its lake ports and build an oil jetty are causing frustration among Kenyan leaders that are ready with tankers to ferry petroleum products across the lake.

Explanations for the lack of cooperation include the different economic, cultural and political orientations of the countries, the divide between Anglo- and Franco-phone countries, incompatibilities between SADC and EAC, and the security situation, corruption and bureaucracy.

For instance, the potential of Lake Tanganyika is recognised by national governments, regional authorities and international development partners. However, the lake is at the boundaries of several subregions, located between Eastern, Central and Southern Africa, between Anglo and Franco-phone Africa, and between the EAC and SADC. This is a challenge as existing regional institutions or regional donor programmes do not always cover all four neighbouring countries.

Moreover, as with most regional integration activities, the costs of infrastructure improvements tend to accrue to one country, while the benefits accrue also to regional partners. This creates a challenge, as without strong cooperation countries tend to invest less than is optimal from a regional point of view.

## Border Disputes

A reason why some of Eastern Africa's lakes are not being developed or incorporated into corridor programmes, is likely because of unresolved boundary disputes between countries due to the legacies of colonial policies and treaties. For example, in Lake Edward, the arrest of Congolese fishermen accused of operating in Ugandan waters led to violent clashes between Uganda and Congolese patrols in 2019, and at least 13 people died. Significant oil and gas deposits found in Lake Edward complicates an already tense situation and increases the pressure on all countries to reach resource-sharing and border management agreements. Similarly, on Lake Malawi, disputes have been ongoing for a long time, although it has heightened due to possible oil and gas reserves in the lake.

## Political Security Threats

The Eastern African subregion faces many daunting security challenges, which have a negative impact on transport and logistics. Investments and development of transport and logistics in Eastern Africa can be jeopardised by a number of political security threats and vulnerabilities, such as the smuggling of drugs, natural resources (for example diamond, gold, timber, various minerals), wildlife animals (for example, elephants, rhinos), weapons and goods, and the dumping of illegal and toxic waste. These organised crimes resulting from poverty, weak governance, corruption, impunity and conflict erodes Africa's social and human capital, drives businesses away, discourages investors, and undermines the ability of economies to promote development.

To address the intricacies of security challenges in the subregion, there is a need for innovative geostrategic solutions, in which African diplomacy plays a central role. An Eastern African perspective within a holistic and integrated approach to overcoming insecurity will be required to ensure that the benefits of sustainable logistics and transportation reach the most marginalised populations. This can only be achieved through innovative and equally beneficial partnerships, and building on existing regional groupings, coordination mechanisms and initiatives at all levels including those of the AU and ECA.

### 4.3.4 Social and Environmental Analysis and Impact to the SDGs

Shipping is the most environmentally sound mode of transport, both in terms of energy efficiency and pollution reduction. However, there are several environmental aspects of port development and shipping that require attention, such as noise pollution, discharge of ballast water (for example, potential invasive species); potential for leaks, spillage and direct and indirect emissions, impacts on water quality, soils and sediments, and infrastructural developments that can affect freshwater ecosystems. The dumping of harmful and toxic wastes in the region's waters is also raised as a concern.

Sanitation and health concerns cover a range of areas where interventions are needed. Concerning shipping and ports in the lakes, the implementation of good practices of garbage and waste management on ships and in ports is a must. Concerning the basin, a lack of adequate sanitation infrastructure leads to faecal contamination of water resources and the lake. Open defecation is prevalent, and many urban areas lack both a formal sewerage system and an established solid/liquid waste disposal facility. Faecal contamination in lakes and the lack of sanitation periodically result in diseases, including amoebiasis, bilharzia, cholera and typhoid.



Environmental regulations to prevent pollution and protect the water quality of the lake will be needed to minimise impacts of transport and other sectors to other activities in the lakes, such as fishing, tourism, drinking water supply and the environment. The lack of regulations regarding waste disposal, engine leakages and overall practices regarding contamination is already a visible reality. Significant concentrations of pesticides and fertilizers (phosphorous, nitrogen) from agricultural activities and oils from commercial enterprises also contribute to reduced water quality, as do mercury and other chemicals used in small-scale gold and diamond mining. The reduction of water quality has adversely impacted drinking water provision within the region, and increased costs of water treatment.

## 4.4 Potential Drivers for Implementation of Waterway and Lake Transportation Systems

Political commitment to address the challenges and barriers specific to Africa can be transformed into potential drivers for IWT development.

### 4.4.1 Infrastructure Champions

The development of a network of champions for IWT development in the form of high-profile entities and state officials or people in the corporate world can drive the development of inland waterways and mobilise resources. In the framework of PICI, the AUDA-NEPAD has appointed a number of African Presidents as champions for various regional infrastructure projects. There are currently 11 PICI projects, and only one is related to inland waterways that is being championed by H.E. President Abdel Fattah El Sisi of Egypt on the establishment of a navigational line from Lake Victoria to the Mediterranean Sea via the River Nile Project (VICMED).

This project was launched by the Egyptian Government and AUDA-NEPAD in June 2013 to promote intermodal transport by integrating river, rail and road transport facilities along the Nile Corridor and develop river management capacity. Phase 1 of the project will comprise the section from Lake Albert in Uganda to Khartoum in Sudan, the section from Gambela in Ethiopia to the White Nile in South Sudan, and the section from Khartoum in Sudan to Aswan in Egypt. Phase 2 will comprise the section from Lake Victoria to Lake Albert, both in Uganda, and the section between the Blue Nile Basin in Ethiopia and the Main Nile in Sudan. In 2020, a feasibility study for the first phase was completed with funding support from the African Development Bank. It included an institutional, legal and regulatory framework and training needs assessment. The feasibility study for phase 2 is being planned, which is one of the approved projects under PIDA PAP 2.

### 4.4.2 Agricultural and Fisheries Value Chain Development

With the urgency to tackle the growing food insecurity, and given the fact that agriculture is a significant part of Eastern African economies, the agricultural and fisheries value chains and agribusiness cluster facilities with transport and logistics services, including cold chain solutions such as temperature-controlled transport and warehousing, can drive IWT and multimodal corridor development, and vice versa.

### 4.4.3 Africa's Unemployment Crisis

According to data on unemployment in the region, more than 80% of young people in Eastern Africa are unemployed. The forecasted demand for transport and logistics and interventions to grow the IWT sector can create decent jobs and help tackle the unemployment crisis. However, the digitalisation of the IWT sector will increase automation and replace lower-skilled, repetitive job roles, but also create new, higher-skilled roles. Therefore, policies to create jobs in the IWT sector must be in tandem with efforts to develop relevant skills and competencies, including digital skills.

### 4.4.4 Africa's Climate Crisis

Climate change is having a significant impact on inland waterways with the lowering of water levels affecting not all sectors of the economy and the livelihoods of people in Eastern Africa. At the same time, IWT can contribute significantly to Eastern African countries' climate commitments, which can drive the greening of the IWT sector. The coordinated development of a strategy and plan for greening the IWT sector, focusing on both climate change mitigation and adaptation, as well as the use of NbS will be important.

## 4.5. Critical Multi-Sector Stakeholder Partnerships for Sustainable Models

As illustrated in this paper, addressing the multi-dimensional challenges and barriers of sustainable IWT development as part of multimodal corridors requires multi-sector stakeholder partnerships. However, in practice, mechanisms are often not in place to adopt a multi-sector approach in IWT policy planning, project development and implementation, which can lead to negative impacts on the wider economy and society.

From the global and African case studies and best practices, the sustainable development and implementation of inland waterways systems for transport and logistics appear to be more effective when inland waterways are integrated in corridor development initiatives. At the same time, the case studies and best practices suggest that it is useful to also have in place a coordination and management body that specifically addresses the concerns of one or more inland waterways and engages the various stakeholders of the inland waterways, such as the waterways management boards in East Africa. The corridor development bodies and the inland waterway bodies will need to coordinate closely to align and harmonise policies and plans, and collaboratively drive the development of IWT development and multimodal connectivity.

The stakeholders that need to be engaged for IWT policy planning, project development and implementation include:

- ✿ Corridor Development Bodies (for example, NCTTCA, CCTTFA).
- ✿ Inland Waterway Bodies (for example, EAC Lake Victoria Basin Commission, Lake Tanganyika Authority).
- ✿ Regional and Subregional Stakeholders (for example, AU, EAC).

- 🌐 United Nations, Development Banks and International Development Agencies (for example, ECA, African Development Bank, UNECE).
- 🌐 Governmental Stakeholders from Relevant Sectors (for example, Ministries of Transport, Agriculture, Energy, ICT, Tourism, Trade, et cetera.).
- 🌐 Private Sector Stakeholders (for example, Port Operators, Fleet Operators, Logistics Service Companies).
- 🌐 Civil Society and Academia Stakeholders (For example Universities, Training Institutions, Non-governmental Organisations).

Leveraging an existing platform to bring together these multi-sector stakeholders for open dialogue, building a common understanding of the issues that need to be tackled, sharing progress and updates on IWT development, and identifying and scaling potential solutions and partnerships, are essential. This will also provide an opportunity to strengthen trust and promote transparency among stakeholders.

The ECA, as the regional commission of the United Nations working on sustainable development and regional integration, with a long track record of analytical and field work in transport, logistics and trade issues, could lead and facilitate dialogue on the platform.



# 5

## Conclusion and Recommendations







*Aerial of Juba, the capital of South Sudan, with the River Nile running in the middle. Juba downtown is upper-middle close to the river, and the airport can be seen upper-left. The picture is from the south to the north.  
Photo Credit: Guenterguni/Getty Images*

## 5.0 Conclusion and Recommendations

### 5.1 Conclusion

Countries in Eastern Africa recognise the potential of IWT and have been reviving the IWT sector to meet the rising demand for transport and logistics and support the implementation of AfCFTA. By learning from international experience and transport development trends, Eastern Africa has embraced the corridor development approach and leapfrogged IWT development. However, for Eastern Africa to leapfrog further into the future, a number of conditions must be met, including:

- ⊗ Increased and diversified investment in IWT infrastructure and facilities.
- ⊗ Harmonised policy and regulatory environment for seamless transport and trade across borders and along multimodal corridors.
- ⊗ Strengthened capacity building, research and development, science and technology, including the development of smart transport and logistics systems.
- ⊗ Enhanced growth of transport and logistics start-ups to innovatively develop local solutions.
- ⊗ Digitalisation and greening of the transport and logistics sectors.

An emphasis on holistic and integrated thinking is vital to developing and providing sustainable solutions to IWT and its incorporation in multimodal corridors. This means not only ensuring transport modes are integrated at various points in the network, but also ensuring that transport is responsive to the needs of the productive sectors such as agriculture, tourism, mining and manufacturing, and involves government, the private sector, Civil Society Organisations and academia to address economic, social, political and environmental issues in a holistic manner. It also means ensuring that the entire value chain is inclusive and resilient.

### 5.2 Recommendations

The recommendations for enhancing the operational capabilities for logistics and transportation for inland waterways and lakes in Eastern Africa are organised and summarised below in 12 categories. These recommendations have been drawn from the insights uncovered from the comparative analysis of best practices and lessons learnt from African and international case studies. Furthermore, the top three priorities for each category (in italics) were identified by consensus during the roundtable policy discussion conducted in Kigali, Rwanda, with key regional stakeholders in November 2022.

#### 5.2.1 Infrastructure, Facility and Cold Chain Modernisation

1. *Identify missing links through a comprehensive mapping exercise*
2. *Develop a plan to modernise inland ports and transform them into logistics hubs to facilitate multimodal linkages, with services such as;*



- i) 'one-stop stop' - customs clearance and
  - ii) storage, cold chain services and ship repair facilities
3. *Explore opportunities to connect the Eastern Africa subregion with other subregions of Africa*
- ⊗ Align and fast-track the implementation of IWT infrastructure projects under PIDA (II).
  - ⊗ Incorporate training, capacity building and knowledge transfers, particularly in infrastructure projects.
  - ⊗ Establish an uninterrupted end-to-end cold chain.
  - ⊗ Access to 'traceable and monitored cold logistics', cold storage facilities and cold transport to ensure safe and secure delivery of perishable products such as:
    - i) agrifood,
    - ii) fish and seafood,
    - iii) medicine and
    - iv) vaccine.
  - ⊗ Explore opportunities to connect the Eastern Africa subregion with other subregions of Africa 'Economy and Scale.
  - ⊗ Enable greater visibility to existing and potential networks of inland waterways in the Eastern African subregion by:
    - i) providing information on the capacity of waterways to accommodate a certain volume of cargo ship traffic,
    - ii) the degree to which inland waterways have been or could be integrated with sea, road and rail corridor (multimodal linkages) – 'Multimodal',
    - iii) prioritise missing links that require infrastructure investment and iv) information and progress displayed and monitored 'Digital Dashboard'.
  - ⊗ Appoint a body to monitor the development of waterways capacity in Eastern Africa, including:
    - i) monitoring of changes and developments in the waterways network,
    - ii) addressing the missing links,
    - iii) identify weaknesses in the network and facilitate the identification of strategic projects for national and regional infrastructure development plans and,
    - iv) identify opportunities for integrating inland waterways with other transport modes.

### 5.2.2 Policy and Regulatory Reform

1. *Adopt a holistic and integrated approach to IWT development in national and regional transport, logistics and trade policies and plans.*
2. *Harmonise the policy and regulatory environment across countries for seamless transport and trade across borders and along multimodal corridors.*

3. *Develop a comprehensive action plan linked to the EU model.*
  - ④ Streamline administrative procedures, standardise rules and documentation, and simplify border control and procedures.
  - ④ Mainstream gender perspectives and leave no one behind principles in all aspects of IWT development.
  - ④ Mainstream climate mitigation and adaptation and environmental sustainability – protection, conservation, preservation, sustainable use and management of natural resources in all aspects of IWT development.
  - ④ Conduct regular multi-stakeholder reviews of the intergovernmental agreements of the Northern and Central Corridors to assess their impact on IWT development.
  - ④ Identify ways to promote and optimise IWT and its linkages with other transport modes.
  - ④ Develop an action programme for IWT like EU’s NAIADES to shape;
    - i) the joint IWT vision,
    - ii) an implementation roadmap,
    - iii) cross-border cooperation with a focused approach and clear priorities at the Eastern African subregional level. Focused efforts on i) conflict resolution, ii) harmonised legislation, iii) uniform standards, regulations and SoPs, iv) increased awareness of IWT, v) improved insight in market development, vi) increased innovation and investment, and vii) coordination of national and subregional implementation.
  - ④ Develop a classification system for navigable inland waterways in Africa.
  - ④ Engage the private sector in IWT policy and planning.
  - ④ Identify opportunities for public-private partnerships.
  - ④ Engage civil society in IWT policy and planning.
  - ④ Ensure the voices of marginalised groups are considered in decision-making processes.


### 5.2.3 Collaboration, Cooperation and Partnership

1. *Diversify training and capacity building for corridor development bodies across East Africa.*
2. *Strengthen the capacity of corridor development bodies, waterways management boards and lake and river management bodies in East Africa to lead multi-country, multi-sector coordination, cooperation and collaboration, conflict mediation and trust building.*
3. *Promote innovation and joint research related to IWT and multimodal transport, knowledge and technology transfers – global case studies, South-South and triangular cooperation.*
4. *Incorporate, as part of these initiatives, interventions to build trust and improve transparency.*




### 5.2.4 Financing


1. *Develop a network of leaders or champions for IWT development to help mobilise resources, possibly through the Presidential Infrastructure Champion Initiative (PICI) and other highly visible initiatives.*
2. *Develop innovative business models – private sector partnerships – win-win scenarios.*
3. *Build the capacity of the IWT sector to leverage alternative funding sources such as the green climate fund, other forms of climate financing and future pandemic preparedness funds.*


 Increase and diversify investment in IWT infrastructure, facilities and capacity


### 5.2.5 Digitalisation and Leveraging of Advanced Technologies

1. *Digitalise IWT and transport corridors and put in place standards and protocols for interoperable systems and data exchanges to manage navigation, customs, safety, ports, vessels, cargo, cold chain, logistics, carbon emissions, et cetera, in an integrated and transparent manner.*
2. *Transform transport corridors into smart corridors through provision of adequate energy and ICT networks.*
3. *Strengthen the digital capacity of corridor development bodies, lake and river management bodies, and national government agencies to leverage advanced technologies. This includes the use of remote sensing, satellites and GIS to plan and optimise multimodal transport routes, and IoT, AI, ML and data analytics for the analysis and presentation of real-time data on dashboards for informed decision-making and transparency.*

 Boost cybersecurity capacity through training, technical support, and development of guidelines and tools.

 Advocate and support the increase in access to digital services, particularly in rural and remote areas and among marginalised and vulnerable groups.

 Jointly develop a plan to integrate and interoperate information systems that interconnect data and information in the IWT sector with other transport modes.

 Jointly develop a capacity-building plan to improve the ICT maturity of the IWT sector.

### 5.2.6 Job Creation, Start-Up Ecosystem and Capacity Building

1. *Develop a strategy to create jobs in the IWT sector and along corridors, particularly for youth and women, in light of the implementation of AfCFTA.*
2. *Equip the current and future workforce with the skills and competencies to deal with the modernisation of the sector in a sustainable manner, including green and digital transitions, upgrading of vessels and equipment, adoption of advanced technologies (AI, blockchain, GIS, IoT, ML, satellite, et cetera.) and associated cyber risks, handling of hazardous cargoes, intermodal connectivity, et cetera.*





*A new FPSO vessel (Floating Production, Storage and Offloading) at a dockyard under construction in Nantong, China.  
Photo Credit: Yaorusheng/Getty Images*



3. *Participate in the development of the start-up ecosystem to innovate in the transport and logistics sectors.*

- 🌀 Promote growth of transport and logistics start-ups to innovatively develop local home-grown solutions by supporting transport and logistics techno-preneurs and green-preneurs with access to financing, technical advice and skills development opportunities.
- 🌀 Jointly develop a capacity-building plan for the IWT sector together with multi-sector stakeholders.
- 🌀 Create a skills and competencies framework for the IWT sector, including their certification – understand and highlight the gaps.
- 🌀 Expand opportunities for IWT personnel to retrain and upgrade skills, through the provision of digital and cybersecurity skills development programmes, role models and networks, as well as incentives.
- 🌀 Strengthen educational and training institutions offering IWT-related courses – prepare for the future of work.
- 🌀 Enhance the technical capacity of corridor development bodies and lake and river management bodies.
- 🌀 Develop a research and development plan for the IWT sector together with multi-sector stakeholders.

### 5.2.7 Inclusion

1. *Develop policies to diversify the workforce, offer opportunities and incentives for women to develop a career in transport and logistics.*
  2. *Identify and engage with Civil Society Organisations in the IWT planning processes.*
  3. *Engage local communities, including informal workers in transport and logistics, those living around inland waterways, SMEs, and local start-up companies in decision-making processes.*
- 🌀 Ensure IWT developments are sustainable and meet the needs and improve the lives of local communities and marginalised groups.
  - 🌀 Explore opportunities to train and engage youth and nurture multiple ecosystems to grow a sustainable future.
  - 🌀 Adopt gender-sensitive approaches to IWT.
  - 🌀 Communicate transformational impact regularly to the communities.
  - 🌀 Develop gender inclusion protocols and procedures for the transport and logistics sectors, in the training of professionals, and in the participation of users in the design and planning of systems, services and equipment.
  - 🌀 Conduct an assessment of the status of informal ports and providers to identify opportunities to diversify IWT and boost competitiveness for various types of goods and shipments, including small shipments, e-commerce, urban logistics and short-distance transport, as part of multimodal solutions.

### 5.2.8 Climate Resilience

1. *Develop a strategy and plan for greening the IWT sector, focusing on both climate change mitigation and adaptation, as well as the use of NbS.*
2. *Build capacity to conduct cost-benefit analyses that include assessment of the lifetime costs of infrastructure, integration of climate change scenarios and quantification of climate-related costs.*
3. *Incorporate the planning and development of climate-resilient infrastructure in national policies and plans, monitor the impact.*
  - 🌀 Create awareness of the benefits of developing climate-resilient infrastructure and incorporate the planning and development of climate-resilient infrastructure in national policies and plans.

### 5.2.9 Crisis Resilience

1. *Incorporate in transport, logistics and trade policies and plans, the strengthening of IWT resilience to allow continued mobility of goods and passengers and uninterrupted cold chain during crisis situations, such as the one created by the COVID-19 pandemic.*
2. *Reduce risks and failures and timely mitigation of disruptions along the value chain with real-time monitoring and predictive analytics.*
3. *Adopt multi-risk management strategies for shocks, such as multi-sector assessments, timely forecasts, early warning systems and contingency plans to prevent and anticipate major disruptions.*

### 5.2.10 Safety and Security

1. *Jointly develop a safety and security policy.*
2. *Jointly develop a safety and security plan.*
3. *Upgrade, rehabilitate and install navigational aids on inland waterways and lakes.*
  - 🌀 Update navigational charts of inland waterways and lakes leveraging modern technology.
  - 🌀 Improve search and rescue facilities, systems and capabilities to increase navigational safety and capacity to respond to emergency needs in inland waterways, lakes and ports.
  - 🌀 Create a common code of conduct and response.

### 5.2.11 Food Security

1. *Promote collaboration between IWT and the agrifood sector in enhancing the delivery of quality agrifood products.*
2. *Incorporate the development of cold chain, including temperature-controlled transport and warehousing, in IWT development.*
3. *Support the growth of agrifood clusters alongside inland ports and logistics hubs.*



### 5.2.12 Integrated Water Resources Management and Nature-based Solutions

1. *Adopt an integrated water resources management approach to IWT.*
2. *Create a platform and mechanisms for cross-sectoral dialogue on managing waterways in an integrated and sustainable manner.*
3. *Develop interoperable information systems to support the implementation of an integrated water resources management approach through the monitoring of key indicators for IWT, agriculture, energy, climate actions, et cetera.*

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*Aerial view to under construction Kigongo–Busisi Bridge, Mwanza Gulf crossing. Geita region, Lake Victoria, Tanzania.  
Photo Credit: Keneth K/Getty Images*

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*The River Rhine near Karlsruhe during sunset.  
Photo Credit: Dennis Fischer Photography/Getty Images*



## Annex 1: Summary of Comparative Analysis on Coverage of Key Issues Related to IWT

The analysis provides an indication of areas that Eastern Africa may need to pay particular attention to when developing policies and solutions to enhance the capacity of IWT for improved transport, logistics and intra-regional trade. These areas are highlighted in grey in table below;

Key Word/Key Phrase	Brazil	China	Egypt	India	Europe
<b>Sustainable Development</b>					
Sustainable Development	✓	✓	✓	✓	✓
Climate Change / Carbon	✓	✓	✓	✓	✓
Environment	✓	✓	✓	✓	✓
Economic	✓	✓	✓	✓	✓
Trade	✓	✓	✓	✓	✓
Social	✓	✓	✓	✓	✓
Job (Creation)				✓	✓
Gender / Equality / Women				✓	✓
Resilience			✓	✓	✓
Agriculture / Food	✓	✓	✓	✓	
Industry / Manufacturing	✓	✓	✓	✓	✓
Waste		✓		✓	✓
Energy Efficiency / Renewable Energy	✓	✓	✓	✓	✓
Nature-Based Solution / Work with Nature					
Water Resources Management		✓			
<b>Transport and Logistics Infrastructure and Approach</b>					
Corridor	✓	✓		✓	✓
Multimodal / Intermodal (Linkage)	✓	✓	✓	✓	✓
Regional (Development / Connectivity / Trade)	✓	✓	✓	✓	✓
(Logistics) Hub / Cluster		✓	✓	✓	✓
Port	✓	✓	✓	✓	✓
Vessel / Barge / Fleet	✓	✓	✓	✓	✓
Warehouse / Storage		✓	✓	✓	
Cold Storage				✓	
<b>Development and Operations</b>					
Standards / Regulations	✓	✓		✓	✓
Governance	✓	✓		✓	✓
Financing / Investment	✓	✓	✓	✓	✓
Maintenance	✓	✓	✓	✓	✓
Monitoring / Inspection	✓	✓		✓	✓



Key Word/Key Phrase	Brazil	China	Egypt	India	Europe
<b>Workforce</b>					
Skills	✓	✓		✓	✓
Training / Capacity Building	✓	✓		✓	✓
Certification		✓		✓	✓
Safety / Security	✓	✓	✓	✓	✓
Health / Well-Being	✓	✓		✓	✓
<b>Digitalisation</b>					
Digital	✓	✓	✓	✓	✓
Innovation	✓	✓		✓	✓
Start-Up				✓	
Data	✓	✓	✓	✓	✓
Information System / Platform	✓	✓	✓	✓	✓
Cyber Risk / Cyberattack / Cybersecurity				✓	✓
<b>Collaboration, Cooperation and Partnership</b>					
Collaboration / Cooperation / Partnership	✓	✓	✓	✓	✓
Private / Private Sector / Private Investment	✓	✓	✓	✓	✓
Civil Society / Local Community Participation	✓				

## Annex 2: List of Documents Selected for Comparative Analysis

- Brazil** – Ministry of Transportation, Ports and Civil Aviation, Government of Brazil “National Transport Policy: Executive Summary - English Version,” 2018, [https://www.gov.br/infraestrutura/pt-br/centrais-de-conteudo/resumo\\_executivo\\_pnt\\_ingles.pdf](https://www.gov.br/infraestrutura/pt-br/centrais-de-conteudo/resumo_executivo_pnt_ingles.pdf)
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### **Annex 3: List of Relevant UNECE Conventions and Agreements Related to IWT**

- 1960 Convention relating to the Unification of Certain Rules concerning Collisions in Inland Navigation, entered into force on 13 September 1966.
- 1965 Convention on the Registration of Inland Navigation Vessels, entered into force on 24 June 1982.
- 1966 Convention on the Measurement of Inland Navigation Vessels, entered into force on 19 April 1975.
- 1991 European Agreement on Important International Combined Transport Lines and Related Installations (AGTC), entered into force on 25 June 1998.
- 1999 European Agreement on Main Inland Waterways of International Importance (AGN), entered into force on 26 July 1999.
- 2000 Budapest Convention on the Contract for the Carriage of Goods by Inland Waterway (CMNI), entered into force on 1 April 2005.
- 2000 European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterway (ADN), entered into force on 28 February 2008.





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